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Does size matter? Organisational slack and visibility as alternative explanations for environmental responsiveness

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DOES SIZE MATTER? ORGANISATIONAL SLACK AND VISIBILITY AS ALTERNATIVE EXPLANATIONS FOR ENVIRONMENTAL RESPONSIVENESS

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Summary

Does size matter in explaining firms' environmental responsiveness? Are large corporations more likely to engage with green issues for fear of losing stakeholder support? Are bigger companies greener because they have more resources to devote to environmental problems? Environmental management researchers routinely include company size in empirical studies of environmental responsiveness, but with mixed results. This thesis will argue that explaining the ambiguous relationship between company size and environmental responsiveness depends on disaggregation. Researchers should examine alternative explanations for the size-responsiveness relationship, different levels of analysis, and distinct types of environmental responsiveness.

Two alternative explanations for the relationship are derived from a jointly institutionalist and resource dependent perspective : visibility and organisational slack. A model is developed which examines the relationships between size, visibility and slack, and environmental responsiveness at both the business unit and operating unit levels of analyses. Qualitative interview data gathered at the business unit level, and a quantitative survey of operating units within the business units, indicate broad support for the disaggregated approach employed.

Slack and visibility account for much of the variety in environmental responsiveness previously attributed to firm size. Slack and visibility also affect different types of environmental responsiveness in predictable ways. The thesis extends two core debates in organisational theory : on the complementarity of institutionalist and resource-based perspectives, and on the connection between corporate economic and social performance.

This research suggests that size does not always matter for predicting environmental responsiveness. It is not size *per se* which promotes environmental responsiveness, but elements of an organisation's visibility and the resources available to it which may result from its size. Large firms may make more proactive strategy declarations forced upon them by their high visibility in society. However, these declarations are not always translated into implementation actions. The implementation of environmental initiatives at operating units at multi-plant firms depends more on the incentives and the resources available to those operating units. Primary among these incentives and resources are the visibility of their activities and impacts, and organisational slack at a local level. When slack and visibility are considered separately from size, size matters far less in predicting environmental responsiveness.

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Chapter 1 : Introduction

1.1 Size and Environmental Responsiveness

Some of the UK's leading firms have incorporated environmental aims into their corporate vision. BP Amoco's mission statement, for example, states its goal "to play a leading role in meeting world energy needs without damaging the environment" (www.bpamoco.com). Yet 43% of business leaders admit that British companies do not pay enough attention to their treatment of the environment (MORI 1999), and the majority of directors still believe that firms suffer on cost grounds from having to address environmental regulations (Institute of Directors 2000). The overall level of engagement with environmental issues in UK companies is increasing, but there remains a wide range in the priority attributed to environmental issues within UK companies, and the managerial actions taken to integrate environmental concerns (Business in the Environment 2000). This begs the question of why some firms are more responsive to environmental demands than others.

As managers have grappled with how and why environmental issues should be incorporated into the more conventional strategic (e.g. Sharma and Vredenburg 1998) and operational (e.g. Angell and Klassen 1999) considerations of their firms, research interest in environmental management has intensified[1]. Central to these debates are several core questions : what determines why some firms are apparently more responsive on environmental issues than others? Are large firms more likely to "go green" than small firms? Is environmental awareness a luxury that only successful companies can afford? Does public interest in the environment have any effective impact on firms' approaches to environmental issues? How can regulators and legislators better design the incentives facing firms to encourage environmental responsiveness?

This thesis will address several of these questions in its focus on whether size

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[1] The spread of academic literature on the environmental responsibility, responsiveness and performance of commercial organisations has gone far beyond specialist environmental journals, and begun to appear in mainstream management journals (see Chapter 2). Examples of environmental research in mainstream journals include Nerht (1996) and Sharma and Vredenburg (1998) in the *Strategic Management Journal*, and recent Environmental Special Issues in *Academy of Management Review, Academy of Management Journal* and *International Journal of Operations and Production Management.*

matters in promoting environmental responsiveness. Conventional wisdom suggests that large firms are more environmentally responsive : they are more visible in society so come under more environmental pressure, and have more resources to afford environmental improvements to their operations. Evidence presented in the thesis, however, suggests that this conventional wisdom should not be accepted uncritically. Extant empirical results are mixed on whether size does indeed matter in environmental responsiveness. More importantly, it is not clear *why* size matters, even if it does.

This thesis will extend and clarify these debates by focusing on two particular potential reasons for the size-responsiveness relationship, organisational slack and visibility. It will also draw a sharp distinction between environmental responsiveness in the forms of corporate strategy, and actual implementation actions at operating units. A multi-level analysis is conducted which focuses on slack and visibility as alternatives to size as promoters of green organisational changes. It is argued that this disaggregated approach exposes the conventional wisdom on whether size matters, and better reconciles theory with the extant empirical results.

This chapter provides the initial context for the theoretical and empirical work. The first section addresses the nature of environmental responsiveness and the way it may be manifested in commercial organisations. This is followed by a brief outline of common drivers for environmental responsiveness, including organisation size. The importance of the organisation size–environmental responsiveness relationship is then addressed. Once the central motives for the study have been described, the chapter concludes with the aims, objectives and outline of the thesis.

1.1.1 What is environmental responsiveness?

"Environmental responsiveness"[2] is used throughout this thesis to mean corporate social responsiveness specific to green issues. Corporate social performance has long been divided into (1) obligations put on corporations by society (corporate social

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[2] The term "environmental" is used throughout the thesis to mean the natural, bio-physical environment, as separate from the business or institutional environment of firms (here called the business or institutional "surroundings" or "context").

responsibility); (2) a process of responding to those demands within the boundary of the firm (corporate social responsiveness); and (3) the social outcomes of corporate behaviour (corporate social performance) (Strand 1983; Wood 1991). The second element, corporate social responsiveness, captures organisational processes that occur when organisations receive, interpret, and process social demands and expectations put on them. It also includes organisations' specific responses to these demands (adapted from Strand, 1983 and Wood 1991). Thus "environmental responsiveness" is the process of receiving, interpreting, processing and responding to demands and expectations put on firms which arise from concerns about the natural environment.

At the most basic level, environmental responsiveness involves firms meeting society's expectations that they will comply with all relevant environmental laws and regulations. A range of strategies and initiatives have been identified, however, which clearly exceed these basic expectations (see below). When an organisation's environmental responsiveness exceeds that required by the laws and regulations, they are said to have gone "beyond compliance" (Roome 1992; Hart 1995). As will be argued in more detail later (see section 2.2.3), this represents a strategic and operational choice in the level of environmental responsiveness selected by firms. It is choice behaviours, which are beyond compliance, which form the focus of this thesis. Beyond compliance there are a range of environmental responsiveness options available to firms which are usually considered more "proactive" the further they are in advance of the regulatory compliance base-line (Hunt and Auster 1990; Roome 1992; Sharma and Vredenburg 1998). The environmental responsiveness range is therefore anchored with "compliance only" at one end of the spectrum, and "highly proactive" approaches at the other (e.g. Roome 1992; Aragon-Correa 1998).

Environmental responsiveness can take many forms. Most common are corporate environmental policy statements such as this typical example from Pilkington PLC :

> *"Our companies strive for the highest standard in all the countries in which we operate. Senior management ensure that environmental issues are regularly discussed at all levels in all Group companies."*
>
> *Pilkington PLC website (www.pilkington.co.uk)*

In a proactive corporate environmental strategy, firms state their intention to follow a planned course of action on environmental issues which is in advance of that required by current regulatory requirements. The majority of very large UK companies have now appointed a board member responsible for environmental issues, and have a written corporate policy, with many also setting corporate objectives and targets (Business in the Environment 2000). These forms of environmental responsiveness are strategic in the sense that they affect "the direction and scope of an organisation over the long term, which achieves advantage for the organisation through its configuration of resources within a changing [context], to meet the needs of markets and to fulfil stakeholder expectations" (Johnson and Scholes 1999, p. 10).

As with any strategy, however, these declarations, plans and policies need to be implemented at the operating level of the business. Environmental responsiveness at the operating level takes the form of implementing specific environmental initiatives such as pollution prevention and control (Nehrt 1996; Russo and Fouts 1997; Atlas 1998), waste treatment and minimisation (Barkenbus and Barkenbus 1989; King and Lenox 2000), communicating with stakeholders (Aragon-Correa 1998; Klassen and Whybark 1999), green design (Atlas and Florida 1997; Lennox, King et al. 2000), or green supply initiatives (Green, Morton et al. 1996; Bowen, Cousins et al. 2000).

From this perspective, a very broad range of environmental initiatives are considered potential manifestations of environmental responsiveness at the operating level. Environmental initiatives are any organisational innovation within a company which are interpreted by managers as being implemented primarily for environmental reasons. There is no implication in this definition that any implemented environmental initiative should lead to an actual improvement in a firm's environmental performance[3]. Environmental initiative implementation can be a perfectly acceptable form of environmental responsiveness to the constituents that

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[3] This is entirely consistent with the discussion of corporate social performance above. Corporate environmental responsiveness is distinct from both corporate environmental responsibility and corporate environmental performance.

demand it even without a consequential improvement in environmental performance.

Thus environmental responsiveness can take the form of corporate environmental strategies or environmental initiative implementation at the operating level. In either case, firms have a series of choices to make on their environmental responsiveness, including how proactive any strategy or implementation actions should be, and which precise form they should take.

1.1.2 Does size matter?

As managers have increasingly considered environmental issues throughout the 1990s, researchers have generated more and more empirical studies on the predictors of environmental responsiveness. Firms are environmentally responsive to different degrees because of a variety of factors beyond straightforward regulation and market forces (Green, Morton et al. 2000). These include institutional pressures (Henriques and Sadorsky 1996; Clemens 1997; Bansal 1999); internal organisational attributes such as organisational structure (Maxwell, Rothenberg et al. 1997; Sharma 1997) or capabilities (Hart 1995; Sharma and Vredenburg 1998); managerial characteristics (Dodge 1995; Sharma 2000); supply chain pressures (Green, Morton et al. 1996; Carter and Carter, 1998) and cost-benefit considerations (Porter and van der Linde 1995; King and Lennox 2000).

Among these myriad of explanations, the most consistent variable included in empirical models is organisation size (see section 2.4 for a fuller review). This is despite "the absence of a compelling argument for the effect of organisation size on environmental strategy" (Sharma 2000, p. 34). There are two main opposing views on the relationship between size and responsiveness. The first group posit a positive relationship between organisation size and environmental responsiveness. Larger firms have more resources at their disposal to attempt costly and / or risky environmental investments (Henriques and Sadorsky 1996; Ahmed, Montagno et al. 1998). They have a greater ability to influence environmental standards, and so are more likely to engage with environmental issues (Arora and Cason 1995). They also may reap economies of scale in environmental technologies (Gray and Deily 1996; Dasgupta, Hettige et al. 2000). Large firms are also more visible in society, and are thus more susceptible to institutional pressure (Henriques and Sadorsky 1996; Bansal 1999). Within this view, small firms are more reactive and resistive to environmental issues than large firms (Klassen 2000).

However, there is not necessarily a connection between organisation size and either excess or appropriate resources for environmental responsiveness (Nohria and Gulati 1996; Sharma 2000). As Sharma (2000) notes, smaller firms may also have slack resources to be able to prospect environmental strategies. They may also possess capabilities appropriate for environmental initiative implementation, and find it easier to implement them (Hart 1995; Bowen, Cousins et al. 2000). Thus small firms may be faster and more flexible in exploiting niche environmental innovation opportunities (Green, Morton et al. 2000). Similarly, there is no necessary connection between organisation size and visibility, so some small firms may be equally recognisable in society as large ones, especially at a local level. Indeed, it is likely that firms highly visible at the local level might act quicker in response to environmental demands than a larger firm which may be more remote or bureaucratic (Parkinson 1957).

Given the need for policy recommendations on what makes organisations more likely to address the environmental impacts of their activities, a clearer consensus is required on the relationship between size and environmental responsiveness. Even if there was conclusive proof one way or the other whether size matters for environmental responsiveness, it is not clear why. Policy-makers need to know the relative importance of each of the alternative explanations. A more disaggregated view would enable them to design optimal incentives to promote the integration of environmental issues into business practice. It is now necessary to answer Sharma and Nguan's (1999) call to investigate the reasons why company size seems to have an influence on environmental responsiveness.

1.2 Aims and Objectives

Having established the importance and ambiguity of the size-environmental responsiveness relationship, this thesis has the following aims and objectives :

1.2.1 Aim

To undertake an investigation of the environmental responsiveness of organisations which focuses on the alternative roles of organisational slack and visibility as explanations for the relationship between organisation size and environmental responsiveness.

1.2.2 Objectives

1. to identify emerging themes and gaps in existing knowledge on the size-responsiveness relationship based on the current theoretical and empirical literature.
2. to build a model of the relationship between size and environmental responsiveness which :
    a) builds on and extends the extant literature
    b) empirically separates the roles of organisational slack, visibility and size
    c) disaggregates the relationship to different levels of analysis and types of environmental responsiveness
    d) provides a list of testable hypotheses within the scope of the study
2. to conduct empirical research to test the model and hypotheses using an appropriate research design, data collection methods and analyses
3. to assess whether the findings indicate support for :
    a) the model, hypotheses and the broader disaggregated approach
    b) organisational slack and visibility as alternative explanations to size for environmental responsiveness
4. to gauge the strength of the findings based on the methods employed
5. to suggest future research directions based on a disaggregated approach to the size-responsiveness relationship

1.3 Overview of the Thesis

The main structure of the thesis essentially follows the list of objectives above. This Chapter, which has provided a flavour of the main motivations for the thesis, is followed in Chapter 2 by a more detailed exploration for gaps in existing knowledge on size and environmental responsiveness. Three main bodies of literature which have addressed the organisation size - environmental responsiveness relationship are reviewed. A meta-analytic review of 38 empirical studies suggests that size only matters in some specific circumstances. Chapter 2 argues, based on previous theory and the meta-analysis, that the size-responsiveness relationship depends on the level of analysis considered, and the measure of environmental responsiveness used. Chapter 2 concludes with five recommended extensions to the extant literature which would help to refine investigations of whether and how size matters for environmental responsiveness. Primary among these are that size, organisational slack and visibility should be empirically separated.

Chapter 3 begins with these themes in the literature, and uses them to build a new, disaggregated model of the size-responsiveness relationship. The model draws on institutionalist and resource dependency perspectives of environmental responsiveness. It is explicitly multi-level and incorporates different types of environmental responsiveness. Of central importance to the model are the alternative roles of organisational slack and visibility in promoting environmental responsiveness in large organisations. Chapter 3 ends with a summary of testable hypotheses derived from the model. These hypotheses become the main focus of empirical work conducted in support of the thesis.

Chapter 4 describes and justifies the methods selected to test the models. It acts as a foundation for the following four empirical chapters (Chapters 5 - 8) by illustrating the overall research design for the study and describing specifically how the research problem was investigated and why. The empirical data was gathered in a multi-organisational, multi-level, cross-sectional framework. The final samples consisted of 25 business units and 95 operating units drawn from within those business units. Interviews at the business unit level (supplemented by a brief standardised questionnaire), and a mail survey at the operating unit level were the main data collection instruments.

One of the contributions of the thesis is to develop new conceptual frameworks and operationalisations of environmental visibility and organisational slack. For this reason, detailed explanation of the operationalisations employed is not provided in Chapter 4, the methodology chapter. Instead, the development of each set of operationalisations is given thematically in Chapters 5, 6 and 7 along with the main empirical results. Although this is not the conventional structure for reporting empirical research, it is used here as it allows greater clarity of the derivation of measures from the qualitative interview data which was then later used in the quantitative questionnaire stage.

Chapter 5 examines the measures of size and environmental responsiveness used, and the direct relationships between them as revealed in the current sample. Chapters 6 and 7 use similar approaches to examine the roles of visibility and slack respectively in environmental responsiveness. In each case, qualitative analysis of the interview transcripts gave rise to initial evidence of each phenomenon's importance in environmental decision-making and guidelines for their quantitative operationalisations. These operationalisations were then validated, and patterns of size (Chapter 5), visibility (Chapter 6) and slack (Chapter 7) across operating units were used to explain elements of environmental responsiveness using cluster analysis, analysis of variance and regression analyses.

Chapter 8 brings the previous three empirical chapters together by treating size, visibility and slack as complementary or rival explanations for environmental responsiveness. It compares the environmental responsiveness of different types of operating units based on their visibility and slack characteristics. This is then followed up by a fuller set of regression analyses including size, slack and visibility (and industry group controls) as alternative explanators of various types of environmental responsiveness.

The findings are outlined in Chapter 9, which begins by accepting, rejecting or modifying each of the hypotheses based on the evidence presented in the previous four chapters (Chapters 5 to 8). It then proceeds to outline some of the broader findings of the empirical work as a basis for assessing its contributions in Chapter 10. Chapter 9 argues that there is broad support for the central argument of the thesis: that assessing whether size matters depends on disaggregation to the alternative effects of visibility and slack, to different levels of analysis, and to various types of environmental responsiveness. However, these findings are tempered by a series of limitations and delimitations of the empirical work conducted.

The final chapter, Chapter 10, draws together the main approaches, findings and contributions of the thesis. It links the themes in the literature identified in Chapter 2 and the model built in Chapter 3, with the findings identified in Chapters 5 to 8 and Chapter 9. It also extends the delimitations of the research mentioned in Chapter 9 and suggests future research directions based on the thesis. The thesis holds implications for two of the core debates in organisational theory : on the complementarity or otherwise of institutionalist and resource dependency perspectives, and on the contentious relationship between economic and social performance. New directions and extensions are outlined for each of these debates, as well as for the emerging line of enquiry on organisational capabilities as facilitators of environmental responsiveness. Other future directions are also identified which are based on replication of certain aspects of the research on different samples, or in different research contexts, or on correction of certain limitations of the research.

This research suggests that size does not always matter for predicting environmental responsiveness. It is not size *per se* which promotes environmental responsiveness, but elements of an organisation's visibility and the resources available to it which may result from its size. Large firms may make more proactive strategy declarations forced upon them by their high visibility in society. However, these declarations are not always translated into implementation actions. The implementation of environmental initiatives at operating units at multi-plant firms depends more on the incentives and the resources available to those operating units. Primary among these incentives and resources are the visibility of their activities and impacts, and organisational slack at a local level. When slack and visibility are considered separately from size, size matters far less in predicting environmental responsiveness.

1.4 Chapter Summary

This chapter has introduced the main argument of the thesis : that assessing whether size matters for environmental responsiveness depends on disaggregating the relationship (1) to the separate effects of visibility and slack; (2) to different levels of analysis; and (3) to various types of environmental responsiveness. Its motivation lies in the rise in interest in the predictors of environmental responsiveness among policy makers, researchers and managers. Studies so far have routinely included organisation size as a cause of environmental responsiveness, but with mixed results. This has resulted in ambiguity over whether "size matters" for environmental responsiveness. This thesis aims to undertake an investigation into size and responsiveness to explore the ambiguities. The detail of the thesis begins in the next chapter by reviewing the literature pertinent to the relationship between organisation size and environmental responsiveness.

Chapter 2 : Theoretical and Empirical Literature Review[1]

[1] An earlier version of the meta-analysis contained in this Chapter was previously reported in Bowen, F. E. (2000), "Does Size Matter? : A meta-analysis of the relationship between organisation size and environmental responsiveness", in Kathy Getz and Duane Windsor (Eds.), *Proceedings of the Eleventh Annual Meeting of the International Association for Business and Society*, pp 78-83.

2.1 Introduction

This Chapter will review the theoretical and empirical literature relevant to the organisation size and environmental responsiveness relationship. It will outline the main ways in which organisations' responsiveness to environmental issues have been considered in recent years, relying on three main bodies of knowledge : environmental management, strategic management and organisational theory. The thesis is then framed by building on environmental studies from the organisational theory tradition.

The main theoretical background for the thesis is in organisational theory, where researchers have become increasingly interested in the causes and contingencies of organisational responses to social or political pressures. Particularly prominent have been debates on the relative importance of institutional forces and resource dependency in determining organisations' responses, and on whether organisation size and performance promotes or hinders social responsiveness. This thesis, on the relationship between organisation size and organisational environmental responsiveness is designed to contribute to both of these debates.

The aims of this Chapter are :

- to review recent theoretical approaches to modelling organisations' responsiveness to environmental issues.
- to introduce the role of organisation size in environmental responsiveness.
- to conduct a meta-analytic review of empirical studies of the relationship between organisation size and environmental responsiveness.
- to highlight the weaknesses of current models and to begin to develop new approaches to old debates.

Having argued the importance of examining the organisation size and environmental responsiveness relationship in Chapter 1, this chapter will identify developing themes in the theoretical and empirical debate. The main new research opportunities identified are to approach the relationship from multiple levels of analysis, to distinguish environmental strategy and implementation measures and to focus on different types of environmental responses. A meta-analysis is then conducted which supports these potential extensions and adds a further requirement : that the size-responsiveness relationship is explicitly examined by considering and distinctly operationalising the causal paths between organisation size and environmental responsiveness.

All these features are then incorporated into the model tested in the thesis. Thus this chapter provides the theoretical context for the model developed in Chapter 3, and will be used in Chapter 10 to help assess the thesis' contribution.

2.2 Schools of Thought on Environmental Responsiveness

The aim of this section is to provide a practical and theoretical background upon which the study will be overlaid, and to highlight the main bodies of knowledge where companies' responses to the environmental agenda are considered. This thesis primarily builds upon organisational theory to explain the environmental responsiveness of organisations, but will draw on three interrelated areas of current literature which have considered environmental issues : environmental management, strategic management, and organisational theory. Each of these areas rest on different assumptions, and have differing emphases, but all have attempted to address the predictors of organisational environmental responsiveness, including organisation size.

2.2.1 Environmental management

The environmental management literature can most easily be described as appearing in books or journals whose specific theme is environmental, or having been written for a practitioner audience. Examples of this literature include early editions of the "Business Strategy and the Environment" journal, textbooks such as Welford (1994) or Beaumont et al. (1993), and papers appearing in more practitioner oriented journals such as Azzone et al. (1997), Newman and Breeden (1992), Hunt and Auster (1990), Winsemius and Guntram (1992) and Vandermerwe and Oliff (1990).

Studies in this mould tend to provide generalisations based in environmental management practice, without particular reference to mainstream management theory. The literature focuses on the systems, programmes and policy of environmental management either as desirable targets for companies to aim towards or as actually observed. Main themes include environmental drivers for change, environmental management systems, audits and reporting. These works are accessible and attractive to practising managers, focussing as they do on best practice, or on providing a range of tools, techniques and tactics for engaging with environmental issues. They have also provided a valuable function to modellers of corporate environmental behaviours by outlining a range of strategies and tactics available to corporate managers for environmental improvement.

The environmental management literature has directly addressed the pressures on firms for environmental improvement. A prominent feature of the environmental management literature has been the attention paid to so called "environmental drivers", "environmental threats" or "environmental pressures" (Welford and Gouldson 1993). Several authors have derived similar conceptual frameworks, with environmental responses in companies being driven variously by regulators, public opinion, contractors/suppliers, customers, the media, shareholders, employees and the company's own management (see for example Hutchinson 1992; Newman and Breeden 1992). The main view of environmental management literature on the relationship between organisation size and environmental responsiveness seems to be: big companies *should be* environmentally responsive (see for example Vandermerwe and Oliff 1990; Newman and Breeden 1992). There is little systematic attempt in this literature to determine whether and why larger companies are indeed more environmentally responsive or not.

Despite its popularity in some management textbooks and practitioner journals, the environmental management literature suffers from several failings. Much of this literature is of an intrinsically prescriptive nature (Rasanen, Merilainen et al. 1995; Bansal and Howard 1997; Schaefer and Harvey 1998), and has a tendency to suggest that improved environmental performance should be desired without any consideration of the costs or available technologies (Bansal 1993). This is a common problem in the environmental management literature, where authors often attempt to propose generic step-by-step paths to environmental engagement. As Hass (1996) correctly observed, there is no problem with proposing prescriptive models per se, but they do not appear to provide good research frameworks. Further, the approach of this literature is often to emphasise the inevitability of companies having to engage in environmental issues, rather than to describe actual pressures (Beaumont, Pederson et al. 1993). They consider "the environment" as a special case, and aim to build separate conceptual frameworks to describe environmental issues which are apparently not applicable to other business decisions. More significantly, they may broadly agree or even overlap, but they are not unified by any consistent theoretical approach (Gladwin 1993; Bansal 1995; Meima and Welford 1997).

Over time, however, researchers more grounded in their own disciplinary traditions have attempted to apply theory from other substantive areas to environmental issues (see for example Bansal and Howard, 1997). The two main sets of traditions which have examined the environmental responsiveness of organisations are based in strategic management and organisational theory. These form the next two sets of literatures outlined here.

2.2.2 Strategic management

Few areas of management enquiry have as many different perspectives, directions and emphases as strategic management (Moore 1992). Each approach is predicted upon a particular view of the processes and outcomes of strategic decision-making which determines the phenomena considered and the focus taken (Whittington 1993). Given this plurality, a review of all the ways environmental issues could be treated from the various strategic management perspectives is not attempted here. Instead, a few core works which exemplify the type of contributions to the environmental responsiveness debate which have been made by strategic management thinkers are presented. These are mainly, though not exclusively, from the classical approach to strategic management (Whittington 1993).

Strategic management authors have included some environmental issues in their research for at least two decades (see Ansoff, 1979 for an early example). One of the core areas of strategic management is analysing and designing responses to the external surroundings of companies (e.g. Porter 1980; Tregoe and Zimmerman 1980; Mintzberg, Quinn et al. 1988) and these models have been explicitly drawn upon by some environmental researchers (e.g. Roome 1992). The focus here is often on the potential threats and opportunities of environmental issues, and the ways in which companies can use environmental characteristics of their processes or products to capture competitive advantage (Porter 1980; Porter and van der Linde 1995; Shrivastava 1995). Thus firms may have an incentive to be environmentally responsive if they can differentiate their products based on their environmental characteristics (Porter 1980; Bansal and Howard 1997).

Firms may also have an incentive to implement some types of environmental initiatives which may help reduce costs (see section 3.2.7 for more detail on types of environmental initiatives). Improved cost efficiency can increase the value added for a given output (Porter 1985; Grant 1995). Many environmental initiatives such as waste reduction and energy efficiency have been identified as having cost reducing and performance enhancing effects (Hart and Ahuja 1996). So-called "lean green" approaches (Lamming and Hampson 1996; King and Lenox 2000) and "win-win" environmental initiatives (Lankoski 2000) promise both environmental and economic benefits and are often considered as motives for green organisational responses.

In contrast, a resource-based view of environmental management argues that firms differ in their environmental responsiveness due to their possession of particular capabilities (Hart 1995; Den Hond 1996; Russo and Fouts 1997; Bowen, Cousins et al. 2000). Following a proactive corporate environmental approach can even foster the development of competitively valuable capabilities (Sharma and Vredenburg 1998). According to this line of argument, firms are not environmentally responsive because of specific incentives to do so, but rather because they have the ability (i.e. capabilities) to do so at comparatively little cost.

So what are the contributions of the strategic management literature to understanding the relationship between organisation size and environmental responsiveness? The differentiation, cost reduction and resource-based arguments for environmental responsiveness outlined above are all largely independent of company size[2]. Despite the inclusion of organisation size as a control variable in some of the strategic management-based environmental studies (e.g. Nehrt 1996; Russo and Fouts 1997), this seems to be more due to the broader convention of including size in strategy models (see section 2.4). There is little theoretical basis for a study of environmental responsiveness and organisational size based exclusively on strategic management theories. Thus, although the strategic management studies are more theoretically grounded, and less prescriptive than their environmental management counterparts outlined above, they do not provide a convenient framework for a model of organisation size and environmental responsiveness.

2.2.3 Organisational theory

Organisational theory is the study of the structure, functioning and performance of organisations and the behaviour of groups and individuals within them (Pugh 1997). Corporations and their sub-units are specific, commercially oriented forms of organisations, and organisational theory is routinely applied to analysing corporate behaviours. Throughout this thesis, the term "organisation" will be used to refer both to the corporate whole, and to groups within the organisation such as operating units. Thus "organisation size" can mean "firm size" or "operating unit" size, depending on the context. Where the text refers specifically to an operating unit in its capacity as a part of a larger whole, the terms "organisational sub-unit", and "sub-unit size", will be used. This contrasts with "total organisation" which is used to denote the entire firm, or corporate whole.

Organisations do not exist in isolation. A realistic inquiry into elements of social systems, such as organisations, cannot be undertaken separately from the institutions surrounding and pervading them (North, 1990; Powell and DiMaggio, 1991). Institutions consist of a collectively experienced phenomenon which constrain individual and/or organisational free choice through the enforcement of rules, values or shared symbols (Scott, 1995). They exert pressure on organisations through a

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[2] This comment refers to direct relationships. Further consideration of possible indirect relationships especially derived from the growing resource-based school bearing upon this study are discussed in more detail in Chapter 10 (see section 10.3.4).

variety of mechanisms from rules and laws (North, 1990), through routines (Cyert and March, 1963), to isomorphic norms (DiMaggio and Powell, 1983). Organisations must respond to these demands in their social surroundings (Meyer and Rowan, 1977). This "institutionalist" line of thought argues that organisations are subject to isomorphic pressures which lead them to conform to social norms.

The conception of institutions completely dominating organisational choice is too passive (Oliver 1991; Suchman 1995), and does not conform to the empirical reality of some organisations apparently choosing to resist or avoid institutional pressure (Goodstein 1994; Ingram and Simons 1995). Organisations can and do adapt to their surroundings, and actively determine responses to them (Hitt and Tyler, 1991; Goodrick and Salancik, 1996). They make strategic choices within resource and social constraints (Pfeffer and Salancik, 1978; Hrebiniak and Joyce, 1985). "Resource dependence" theory agrees with institutionalists that external forces affect how firms organise, but recognises that organisations require resources, and must interact with others in order to gain control over, and utilise those resources (Pfeffer and Salancik 1978). This balance between institutional pressure on organisations and their ability to mobilise resources and exercise strategic choice has been a key research question in organisational theory for many years (Child, 1972; Hannan and Freeman, 1977).

The same tension between institutional determinism and resource dependence can be seen in attempts to model organisational responses to social and political pressures (including environmental issues). Earlier institutional systems models described corporate social performance as derived entirely from society's imposition on organisations of a certain level of corporate social responsibility (e.g. Preston and Post 1975; Strand 1983; Carroll 1989). Firms' reactions to institutional pressure (corporate social responsiveness) were later separated from their obligations to society (corporate social responsibility) (Wood 1991). Later, these models were also criticised as too passive, and were modified to allow strategic responses to institutional pressures rather than passive conformance (Oliver 1991; Clemens 1997; Tsai and Child 1997). The latest models all recognise the importance of isomorphic institutional forces. However, they place equal emphasis on cost-benefit considerations (Beliveau, Cottrill et al. 1994; Goodstein 1994; Greening and Gray 1994; Ingram and Simons 1995; Milne and Blum 1998) and reputational and legitimacy effects (Beliveau, Cottrill et al. 1994; Bansal and Roth 2000) derived from the resource dependence view. Researchers now recognise the complementarity of institutional and resource dependence explanations for firms' responsiveness to social and political pressures.

A core implication from these studies is that organisational environmental responsiveness is a choice situation for firms. They may have pressures on them to respond to environmental issues, but ultimately they may choose their level and type of responsiveness based on their material conditions. All companies must implement a basic set of environmental initiatives without which they risk losing their license to operate or leave themselves open to fines. Beyond legal compliance, there are a range of proactive strategy options open to companies on environmental issues (Hunt and Auster, 1990; Roome, 1992). Despite the rise in importance of environmental issues throughout the 1990s, not all companies go beyond compliance (Business in the Environment, 2000). The decision to do so is a strategic response to institutional pressures, and is based, at least in part, on the resources available to the organisation.

The list of predictors of environmental responsiveness has grown rapidly in recent years. It includes core institutional pressures such as regulatory pressure (Henriques and Sadorsky, 1996; Clemens, 1997; Green, McMeekin et al., 1994) and interest from the local population (Bansal, 1995; Bansal, 1996; Henriques and Sadorsky, 1996; Ketola, 1997). It also indicates the importance of internal organisational attributes such as organisational structure (Rappaport and Flaherty, 1992; Rothenberg, Maxwell et al., 1992; Maxwell, Rothenberg et al., 1997; Sharma, 1997), and organisational goals (Ketola, 1997; Sharma, 1997). The motives for, and cost-benefits of, environmental responsiveness are also considered (Bansal, 1995; Bansal, 1996; Maxwell, Rothenberg et al., 1997). Many of the empirical models include the effect of organisation size (see section 2.4).

The majority of contemporary studies hypothesise a positive relationship between organisational size and environmental responsiveness. Three main arguments are used to support the positive relationship view within institutional and resource dependence perspectives of organisational theory - organisational visibility, organisational resources, and economies of scale. Each of these arguments will be briefly outlined below. They will be pursued in more depth during the model development in the next chapter (see sections 3.2.3 and 3.2.4), alongside counter-arguments based on small firms' ability to innovate and act on niche opportunities quicker than large firms.

Several studies explicitly cite firm size as a proxy for organisational visibility (e.g. Henriques and Sadorsky 1996; Clemens 1997; Sharma and Nguan 1999). Henriques and Sadorsky (1996) argue that visible firms are more susceptible to public scrutiny or may be called upon to act as industry leaders, and so are more likely to possess an environmental plan. Similarly, Sharma and Nguan (1999) suggest that larger organisations are subject to greater media scrutiny and are forced to adopt a leadership stance on biodiversity conservation. Hettige et al. (1996) argue that in local economies, large plants are more visible, and therefore more susceptible to pressure for cleanup. The visibility explanation for a positive relationship between environmental responsiveness and firm size centres on the role of reputation capital and the potential effect on brand name of negative environmental information (Konar and Cohen 1997; King and Lennox 2000). It is also the explanation most commonly found in the broader, and longer established, corporate social responsiveness literature (Mahon and Griffin 1999; Roman, Hayibor et al. 1999).

Large firms may not only be more visible, but may also have more resources to devote to environmental issues (Nehrt, 1996). Indeed, the main alternative theoretical logic for the positive relationship between size and environmental responsiveness highlights organisational resources or organisational slack (Nehrt 1996; Sharma 1997; Aragon-Correa 1998; Sharma and Nguan 1999). Excess resources or slack can facilitate creative search behaviour for appropriate environmental response options, and allow managers to experiment with green organisational responses (see section 3.2.4). Conversely, smaller companies may find it riskier to invest in environmental strategies due to their resource constraints (Ahmed, Montagno et al. 1998). Although organisation size and organisational slack are not synonymous (see section 3.2.4), larger organisations are expected to possess greater capacity to engage in environmental behaviours due to their relatively more abundant funds, personnel or corporate connections (Atlas and Florida 1997).

The third rationale for a positive relationship between organisational size and environmental responsiveness is based on economies of scale in environmental programmes (Gray and Deily 1996; Hettige, Huq et al. 1996; Hartman, Huq et al. 1997; Dasgupta, Hettige et al. 2000). Particularly popular among economists, and organisational theorists leaning towards resource dependency theories, this argument suggests that there are scale economies in abatement technologies which make it relatively cheaper for large plants to introduce them (Dasgupta, Hettige et al. 2000). In larger organisations, the fixed costs associated with engineering skills, managerial effort and other relevant inputs can be distributed across a larger number of activities, making environmental investments relatively more attractive (Dasgupta, Huq et al. 1997). Larger plants are thus more likely to implement (costly) environmental initiatives.

The organisation size and environmental responsiveness debate is closely related to a broader debate on economic and environmental (or social) performance. An extensive literature has examined whether and how economic and social performance are related (see for example Ullmann 1985; Roman and Hayibor 1999; Griffin and Mahon 1997). To the extent that large firms can be considered high performers (i.e. they have been successful in previous time periods and have grown), this debate is relevant to the size – environmental responsiveness relationship examined in this thesis. Given that there is not a direct connection between economic performance and organisation size, this literature is not reviewed extensively here. It will, however, be drawn upon at various stages during the theory development, and be considered when discussing the broader implications of the thesis in Chapter 10.

Thus organisational theory provides a useful theoretical background to considering the relationship between organisational size and environmental responsiveness. A theoretical perspective based jointly on the conformance of organisations to institutions and strategic choice based on resource dependency provides several reasons for an expected positive relationship between size and responsiveness. Despite the apparent consensus of the complementarity of these two theoretical approaches, several extensions to the debate can be made, which will be outlined in the next section.

2.2.4 Summary of schools of thought

Three main schools of thought have been briefly described. Environmental management, strategic management and organisational theory approaches to the organisation size and environmental responsiveness relationship were mentioned, and some of their more salient features discussed. The most useful of these traditions for the study of size and responsiveness is organisational theory, where there has been an extended debate on the complementarity of isomorphic institutional pressures and strategic choice based on resource dependence as explanations of organisational responsiveness. Also prominent have been studies of the relationship between economic and social performance. The detailed examination of the relationship between organisation size and environmental responsiveness contained within this thesis is designed to contribute to each of these debates.

2.3 Emerging Themes in the Theoretical Debates

This section will outline some of the deficiencies in the existing theoretical approaches to the relationship between size and environmental responsiveness. There are three main areas that require further examination : levels of analysis within the organisation; the possible divergence between responsiveness strategy and implementation actions; and the customisation of the debate to include different types of environmental initiatives. Each of these will now be examined in turn.

2.3.1 Multiple levels of analysis

The models outlined above were only undertaken at one level of analysis, usually the corporate or business unit level. Although many of the models could be separately applied to any unit of analysis within an organisation (e.g. entire corporation, business unit, function, division, operating unit etc.), the models are not usually explicitly considered in a multi-level setting. An extension to existing theory is to recognise that the pressures on and the responses of the organisation can occur at more than one level of analysis. The corporation as a whole may be subject to pressures surrounding its legitimacy at a societal level (Miles, 1987). Individuals are subject to pressures both as agents of organisations, and as members of society through their exposure to the media, education, professional group or broad societal norms (Preston and Post, 1975).

In between these extremes lies a range of levels within the corporation which are not often studied in the literature. Every division, functional area, product group, company or subsidiary within the company is also exposed to institutional pressures in the same way as the corporate centre or individuals. This is most clearly seen in the literature surrounding the environmental performance of multinational corporations (MNCs) (Rappaport and Flaherty 1992; Levy 1995; Tsai and Child 1997), where international subsidiaries are confronted by a variety of regulations and societal norms, and need to decide between a standardised or differentiated response, and if standardised, which norms to follow.

Pressures arising from the environmental agenda may be experienced and require attention at several different levels in the organisation. It is argued here that Granovetter's (1985) observation that strategy depends on the particular social system (i.e. national system) in which the strategy-making takes place, can be extended to include the particular local situation of a subsidiary. This may be possible even if it is in the same country, and therefore national social system, as the corporate centre. The reason for this lies in the distinctive characteristic of the environment as a social and political issue - its geographic specificity. Environmental pressures in the social system in different parts of the same firm may vary considerably due the importance of particular environmental impacts arising from certain processes only undertaken at some operating units. Alternatively, some operating units may face pressure from specific local populations who are affected by a given unit's activities. These pressures may be exerted at the operating unit level but may not appear to be relevant to the corporate centre.

In the same way that organisations cannot be considered separately from their institutional context, sub-units must be considered with their broader organisational context in mind. Any given sub-unit within the firm will be influenced in its response by both the external institutional pressures it experiences and its position as part of a larger corporate whole (Lawrence and Lorsch, 1963). In business firms, which are characterised by their hierarchical nature (Coase, 1937; Williamson, 1975; Chandler, 1977), a corporate HQ has overall control over major organisational sub-units, which in turn have influence over minor sub-units (Chandler, 1963).

The response of an operating unit to institutional pressure may come directly from its local surroundings, or be directed by a higher hierarchical level in the firm, or a combination of both. It is vital to understand the relative strengths of these two forces on the operating units of large firms. This is particularly important because the response of the corporate centre may be in the form of words (i.e. strategy or policy), and the operating unit's in actions (i.e. implementation) (see sections 2.3.2 and 5.3). A core contention of this thesis is that the relationship between organisation size and environmental responsiveness may differ between different levels of analysis within the same organisation (see section 10.2.3).

Treating the motives for organisational responsiveness as a multi-level phenomenon opens up many research questions not yet considered - are the environmental responses of operating units more strongly influenced by their firm's external environment as a corporate entity, or by their own position within the organisation? Do corporate policy-makers and operating units perceive the same motives for environmental initiatives? Are the incentives aligned in the organisation for effective transmission of an environmental policy into action where this is desired by the corporate policy-makers? Are bottom-up processes observed, where operating units identify pressures which require environmental action without the corporate policy-makers responding to the pressure for the organisation as a whole? Is the relationship between organisation size and environmental responsiveness consistent across corporations and their constituent organisational sub-units?

Many of these questions have been raised by authors who have recognised the multi-level nature of environmental pressures and responses (e.g. Bansal 1995; Schaefer and Harvey 1998). However, no formal multi-level model of environmental responsiveness was found in the literature review process. Nearly all studies with a multi-level aspect focussed on the international diversity of environmental responses (Rappaport and Flaherty, 1992; Rothenberg, Maxwell et al., 1992; Maxwell, Rothenberg et al., 1997), rather than diversity within the same country and company. They emphasised the differences caused in sub-units of multinational corporations (MNCs) due to their host institutional and legal contexts (Doz, 1986; Bartlett and Ghoshal, 1989) as predictors of environmental response. The ability to examine different predictors of environmental responsiveness at various levels of analysis within the same organisation is lost in the melee of various national environmental laws and regulations. A study is required which concentrates on the differences in environmental responsiveness across different hierarchical levels and sub-units of organisations within the same national system.

2.3.2 Environmental strategy and environmental initiative implementation

Introducing a corporate environmental strategy does not necessarily lead to the even implementation of environmental initiatives throughout the organisation. An environmental policy is only the beginning of the corporate environmental management process (Roome 1992; Berry and Rondinelli 1998). Often environmental responsiveness studies equate the existence of an environmental policy with environmental responsiveness (Henriques and Sadorsky 1996; Russo and Fouts 1997; Ahmed, Montagno et al. 1998). Yet as Ketola (Ketola 1997, p. 18) notes, "companies have... routinely broken the promises they make in their environmental policy statements". Even if organisation size is positively related with environmental responsiveness as captured by corporate strategy, there may not necessarily be a relationship between organisation size and the implementation of environmental initiatives. The type of environmental responsiveness, whether in the form of strategy statements or implementation actions, may affect the strength of the size-environmental responsiveness relationship.

In classical top-down strategic management theory, the corporate centre defines the parameters of policy and the overall strategic direction. Business groups and divisions design policies for their specific activities to fit in with the overall policy. Operating units act within the more specific policies of their immediate hierarchical superior unit (Chandler 1977). Contrary to this idealised account, many examples can be found of imperfect policy flow-down (Mintzberg, Quinn et al. 1988). Indeed, the conditions under which lower hierarchical levels actually implement the strategy or policy of higher levels has been a prominent theme in recent years (Gupta and Govindarajan, 1984; Gupta, 1987; Reger, Gustafson et al., 1994; Klein and Sorra, 1996; Kostova, 1999). Evidence from the implementation of equal opportunities policies (Kremer, Hallmark et al., 1996) and environmental policies (Ketola, 1997) suggests that the link between policy from the top and action at operating units can be weak.

Research into the environmental responses of different parts of firms will prove to be of increasing importance if a current trend in environmental policy and management continues. Throughout the 1990s, firms have increasingly responded to green institutional and competitive pressures by implementing policies to signal their environmental awareness (Business in the Environment 1996, 1997, 1998). Whilst these policies may or may not have a positive effect on the bio-physical environment, they may still be seen by current society as acceptable, even sufficient, responses by organisations to the pressures put on them for environmental improvement (Ketola 1997).

However, the actual alleviation of environmental impacts may be becoming the test of environmental engagement, rather than simply environmental awareness or policies (Business in the Environment 2000). Until recently, stakeholders have judged environmental performance on the existence of environmental policies, management systems and compliance with laws and regulations (Business in the Environment, 1996; EIRIS, 1996). Increasingly, stakeholders are demanding detailed disclosure of actual environmental performance rather than merely of policies and statements of intent (ten Brink, Haines et al. 1997, Business in the Environment 2000). Although public interest in global issues such as climate change may be waning, a recent survey of nearly 30,000 people in 27 countries showed that there is an upsurge in interest in local environmental issues such as air and water pollution (The Economist 2000). If this trend continues, then firms will not only need to develop environmental policies, but will also have to actually act to mitigate their impact on the bio-physical environment, especially at the more obvious local level. Much of the previous literature in this area has at its core an assumption that if a company develops an environmental policy, then it has responded sufficiently to the pressures for environmental improvement (Henriques and Sadorsky 1996; Ahmed, Montagno et al. 1998). More demanding public disclosure of impacts on the environment and more local interest may demand more careful treatments of environmental responses which includes the implementation of specific environmental initiatives.

There is a new awareness in the empirical studies of a difference between process measurements (such as organisational systems), and outcome measures (such as regulatory compliance) of environmental performance (Illnich, Soderstrom et al. 2000; Sharma 2000). However, the link has not yet been explicitly made between these categories and the possible divergence between corporate environmental strategy and implementation. Thus a study which builds upon this separation between process and outcome, and which focuses on environmental responsiveness in the form of both corporate environmental proactivity and the implementation of environmental initiatives is required. Maxwell et al. (1997) recognise the well developed literature on predictors of the development of environmental strategies, but emphasise the lack of attention paid by academics to implementation :

> *"..the real challenge lies in moving from the formalities, generalities, and value statements of a corporate strategy document to the reality of implementation at the plant and project level... Implementation of environmental strategy represents a critical, under-examined aspect of corporate activities in the 1990s"*
>
> *Maxwell et al., 1997 : 120*

2.3.3 Types of environmental initiatives

Environmental responsiveness can take many forms. This thesis takes a broad perspective of environmental responsiveness, which includes both corporate environmental proactivity and environmental initiative implementation (see sections 1.1.1 and 5.3). Environmental initiatives can range from launching more environmentally sound products, to altering materials transformation processes for environmental benefit, implementing pollution abatement technologies or even simply implementing energy efficiency measures (see section 5.3.2). It is unlikely that organisation size will have an equal impact on the likelihood of introduction of all of these aspects of environmental responsiveness.

Indeed, it is possible that due to their characteristics, some types of environmental initiatives will be more prevalent in large, high slack or high visibility organisations than others. For example, some environmental initiatives are almost costless (e.g. publication of an environmental policy), while some can cause considerable financial cost and adjustment to normal working practices within the organisation (e.g. implementation of a certified environmental management system). It is unlikely that high cost initiatives will be undertaken in low slack organisations, or where there are few incentives to do so due to low visibility. Thus the types of environmental initiatives implemented could reveal as much about an organisation's environmental choices as the overall level of implementation.

The environmental management literature as outlined above (see section 2.2.1) provides an extensive list of environmental initiatives, tools and techniques. However, the organisational theory models do not yet account for the diversity of possible choices of environmental initiative. Indeed, there is a tendency to aggregate across all strategy or implementation types (see for example Sharma (2000))[3]. The detailed implications of each type of initiative will be described in the model development in the next chapter (see section 3.2.7). Here it is sufficient to note that some types of initiatives thrive on available organisational slack (e.g. clean technology initiatives), some may reduce costs and make available previously absorbed slack (e.g. materials-reducing initiatives), and some may be particularly visible to external constituents (e.g. stakeholder relations initiatives). Thus each type of initiative might represent an appropriate environmental response by an organisation under different slack or visibility conditions. It is therefore important for any new model of size and environmental responsiveness to consider not only the incidence of environmental responsiveness, but also the particular form it takes.

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[3] See section 10.2.5 for exceptions to this aggregation tendency.

2.3.4 Summary of emerging theoretical themes

Three main emerging themes have been identified from the organisational theory models. Firstly, new models should explicitly incorporate multi-level considerations. Secondly, the difference between corporate environmental strategy and environmental initiative implementation should be addressed, perhaps by considering some of the policy implementation literature in strategic management. Finally, the types of environmental responsiveness should be considered. This includes not only the difference between strategy and implementation as suggested by the strategic management literature, but also the types of environmental initiatives identified by environmental management researchers. The next section seeks support for these themes by reviewing the empirical literature.

2.4 Empirical Approaches : A Meta-Analytic Review

This section will assess whether size matters for organisational responsiveness by undertaking a meta-analysis of the empirical studies so far conducted on the predictors of green organisational response. Researchers have generated many empirical studies on the predictors of environmental responsiveness. Whether the studies were aimed at predicting perceptual measures of environmental responsiveness (e.g. Clemens 1997; Sharma 2000), the existence of environmental policies (e.g. Henriques and Sadorsky 1996; Russo and Fouts 1997), the implementation of environmental initiatives (e.g. Klassen 1997; Theyel 2000), or voluntary participation in environmental schemes (e.g. Khanna and Damon 1999) all have in common a desire to uncover the triggers of environmentally responsible behaviours in organisations. A common feature of many of these studies has been the inclusion of organisational size as an explanatory variable. However, organisational size has often been incorporated as a control variable required by convention rather than as the focus of the study. More importantly, the studies do not agree on whether organisational size is a significant variable in predicting environmental responsiveness.

The widespread use of organisational size as a control measure in recent empirical studies implies that the positive relationship between organisation size and environmental responsiveness is expected to hold across all organisational levels of analysis, and all types of environmental responsiveness. However, as the previous section has argued, this relationship may be moderated by both level of analysis and type of environmental responsiveness measure used (see section 2.3). Although no studies have been identified which explicitly address these emerging themes, it may be possible to shed some light on likely findings by cumulating results across existing studies.

In a research area with many similar research studies, but each with their own definitions, variables, samples and research designs, it can be frustrating for policymakers to draw conclusions on the underlying relationships (Wolf 1986). Studies are designed differently, and can therefore yield results which vary not because they disagree on the actual relationship in the population, but because of the artefacts of research design (Hunter, Schmidt et al. 1982). Relying on only one, or a selective few, studies may give rise to a biased view of potentially important relationships. Conversely, trying to summarise the research findings in a narrative literature review can be open to the subjective judgements and interpretations of the reviewer (Glass, McGaw et al. 1981). When presented with conflicting results, therefore, it would be ideal to be able to re-analyse all the available data pertaining to the question and to incorporate all the studies into the review in a systematic way. Meta-analysis enables such an approach, as it is "the statistical analysis of the summary findings of many empirical studies" (Glass et al., 1981, p. 21).

The sample of studies included in this meta-analysis has been drawn as widely as possible. The criterion for inclusion was "any empirical paper which reported on the relationship between organisation size and any aspect of environmental responsiveness". Environmental responsiveness was interpreted widely (see section 1.1.1) and this criterion yielded papers focusing on a range of responsiveness including implementing specific initiatives, introducing general corporate environmental programmes, and being adjudged to be responsive according to third party ratings. It is worth noting that the criteria did not require that the organisation size-environmental responsiveness relationship was the main focus of the study, merely that the paper reported on data pertaining to that focal relationship (Hunter, Schmidt et al., 1982).

The search included shelf searches of the *Academy of Management Journal*, *Strategic Management Journal*, *Business Strategy and the Environment* and the *Journal of Environmental Economics and Management* since 1990. This was supplemented by searching the Web of Science, ANBAR, Emerald and Wiley Inter-Science journal article indices for articles in other journals. In order to partially overcome the "file drawer problem" (Glass, McGaw et al., 1981) where only positive results tend to get published, the analysis also attempted to include working papers, conference presentations and doctoral theses. Several working papers were found by searching the Social Science Research Network Working Paper database. Conference papers and doctoral theses that were easily accessible to the researcher were included, as were relevant conference or working papers referred to in any of the other sources. Where possible, the webpages of authors were checked to see if that author was working on other, similar samples which were not yet published, or were published before 1990.

This process identified 38 studies which contained data pertaining to the organisation size – environmental responsiveness relationship (see Figure 2.1). Unfortunately, only 21 contained the Pearson correlation coefficients required to undertake a formal meta-analysis (Hunter, Schmidt et al., 1982). The other 17 studies were mostly regression-based analyses of the predictors (including size) of some aspect of environmental responsiveness, or of organisation size and environmental responsiveness as joint predictors of another variable (usually financial performance), which did not provide full descriptive statistics.

Once collated, the papers were read and coded on several dimensions. These included basic identification details, substantive characteristics (main aim of study, base discipline, motivation for including size, element of environmental responsiveness considered), methodological characteristics (date of data collection, sample details, operationalisations used, analysis techniques used, reliability of measures) and relevant results (see Figures 2.1 and 2.3 for summaries). The studies were organised into two groups - the "full" group, where sufficient information was reported to enable the study's inclusion in a full meta-analysis (K = 21), and a "partial" group, where the study contained most, but not all of the required information (K = 17). The meta-analysis was conducted using Hunter et al.'s (1982) procedures for cumulating results across studies.

The papers collated were derived from a range of base disciplines, including economics, strategic management, accounting, organisational theory, operations management and environmental management. They included data from 15 different countries in Europe, North and South America and Asia. Rationales for including size reported in the papers included visibility, resource constraints and scale economies (see sections 3.2.1 to 3.2.4 for development). Many papers, however, presented an argument based on the inclusion of organisation size in previous studies, or as a common control variable which might be relevant to the particular study design. Of the 21 "full" studies, 13 were undertaken at the total firm level of analysis, and six at the plant or sub-unit level (see Figure 2.3). Organisation size was operationalised as number of employees (or a log transformation of this) in 23 of the 38 "full" and "partial" studies. Other operationalisations included annual sales, production capacity, market capitalisation and sales-to-assets ratios. Often these measures were combined, or averaged over a few previous time periods.

Environmental responsiveness was operationalised in almost as many ways as there were studies. This is not surprising given the broad definition used in this meta-analysis, but may raise some content validity questions in comparing the results across studies (Wolf, 1986). A key feature of the meta-analysis technique, however, is that the question of whether different measures yield different results may be resolved empirically (Glass, McGaw et al., 1981; Hunter, Schmidt et al., 1982). Examining the difference in the size – responsiveness relationship between strategy-based and implementation-based measures has been highlighted as a new research opportunity (see section 2.3.2). The meta-analysis will identify whether this distinction moderates the relationship and will provide an initial test of whether the focal relationship differs between measures based on environmental strategy and measures based on the implementation of environmental initiatives. Of the 21 "full" studies, 17 used measures based on implementation of specific initiatives, and six used measures based on environmental responsiveness strategies (see Figure 2.3)[4].

[4] Some studies contained data for both the strategic and implementation measures, and some neither (see Figure 2.3)

Figure 2.1 : Main characteristics of studies containing data on size-responsiveness relationship

Study	Aim of study	Country	Industry	Measure of environmental responsiveness	Measure of organisation size	Motivation for including size	r?
Ahmed, Montagno et al. 1998	Relationship between environmental performance and company performance	USA	all	Company environmental profile	employees	• smaller companies may find it riskier to invest in environmental strategies	yes
Aragon-Correa 1998	Impact of strategic proactivity on firm approach to the natural environment	Spain	all	Implementation of environment-related practices	turnover and employees	• none given	yes
Arora and Cason 1995	Participation in EPA's 33/50 program	USA	highly polluting industries	decision to join program (binary)	employees	• large firms have greater ability to influence standards • large firms benefit more from greater consumer goodwill	yes
Atlas 1998	Relationship between advanced production techniques and pollution prevention	USA	Manuf.	Implementation of source reduction and recycling	employees	• large companies have more resources - funds, personnel or corporate sibling facilities	no
Barkenbus and Barkenbus 1989	Waste minimisation survey	USA	high waste generators	Implementation of waste minimisation practices	annual production (categorical)	• large firms more active in making changes to process equipment and technology • large firms more concerned with their image	no
Baylis, Connell et al. 1997; Baylis, Connell et al. 1998	Survey of environmental management practices	Wales	Manuf. & processing	written environmental policy	employees (categorical)	• common control in management studies	yes
Clemens 1997	Relationship between environmental interventions and strategies of regulated firms	USA	steel	Corporate environmental strategy (acquiesce or manipulate)	annual production volume and employees	• used in previous environmental studies • control variable for regulatory actions	no

Study	Aim of study	Country	Industry	Measure of environmental responsiveness	Measure of organisation size	Motivation for including size	r?
Cordiero and Sarkis 1997	Relationship between environmental proactivism and firm performance	USA	all	TRI emissions data	firm sales	• common control in financial regressions • no environmental reason	no
Dasgupta, Huq et al. 1997	Effect of regulation on discretionary pollution control	China	Manuf.	Compliance with environmental regulations	employees (log)	• economies of scale in compliance	no
Dasgupta, Hettige et al. 2000	Predictors of compliance with environmental regulations	Mexico	food, chemicals, non-metallic minerals	100 point index of environmental management practices (many beyond compliance)	employees (categorical)	• large firms experience scale economies in abatement	yes
Gray and Deily 1996	Interaction between environmental compliance, enforcement and organisational characteristics	USA	integrated steel industry	EPA compliance status	plant capacity; firm capacity and employees (logs)	• economies of scale in compliance • large firms have more political power	no
Gray et al, 1999	Social and environmental disclosure and environmental characteristics	UK	all	level of environmental disclosure	turnover (log)	• common in previous environmental reporting studies	no
Halme and Huse 1996	Impact of corporate governance, industry and country factors on environmental reporting	Finland Norway Spain Sweden	all	content analysis of annual reports	employees (log)	• common in previous environmental reporting studies	yes
Hartman, Huq et al. 1997	Determinants of pollution abatement	Bangladesh India Indonesia Thailand	pulp & paper	Implementation of pollution abatement technologies	number of employees	• economies of scale in abatement	yes

Study	Aim of study	Country	Industry	Measure of environmental responsiveness	Measure of organisation size	Motivation for including size	r?
Henriques and Sadorsky 1996; Henriques and Sadorsky 1999	Determinants of environmentally responsive firm	Canada	all	Possession of an environmental plan	sales-to-assets ratio	• large firms have deeper pockets • large firms implement environmental plans to reduce co-ordination costs • large firms are more visible	no
Hettige, Huq et al. 1996	Determinants of pollution prevention	Indonesia	Manuf.	Emission reduction	employees	• scale economies in abatement • large firms more visible and susceptible to community pressure	no
Johnson and Greening 1999	Effects of corporate governance and institutional ownership on types of corporate social performance	USA	all	Environmental information from KLD database (focus on environmental liabilities, penalties and citations)	total assets, sales and employees (log of 3 year average)	• control variable because size can affect corporate social performance ratings	yes
Judge and Douglas 1998	Antecedents and effects of integrating environment into the formal planning process	USA	all	Environmental management practices and environmental management processes	employees (log)	• control variable because can affect sophistication of planning process • no environmental reason	yes
Khanna, Quimio et al. 1998	Impact of TRI information on stock market returns	USA	chemicals	TRI emissions data	sales	• non-environmental reasons	no
Khanna and Damon 1999	Motivations for and consequences of participating in 33/50	USA	chemicals	TRI emissions data; 33/50 membership	sales volume	• size is significant in previous studies	no
King and Lennox 2000a	Industry self-regulation : the Responsible Care Program	USA	chemical	Relative emissions and Responsible Care Program membership	Employees (log)	• Not given	yes

Study	Aim of study	Country	Industry	Measure of environmental responsiveness	Measure of organisation size	Motivation for including size	r?
King and Shaver 1999	Foreign establishments' environmental conduct	USA	Chemicals and petro-chemicals	Relative emissions (TRI data relative to sector and company size)	Employees (log)	• Not given	yes
King and Lennox 2000b	Accounting for strategy selection in the relationship between environmental and financial performance	USA	Manuf.	Relative emissions (TRI data relative to sector and company size)	Company assets (log)	• Common control used in analyses of financial performance	yes
King and Lenox 2000c	Relationship between lean production and environmental performance	USA	Manuf.	Relative emissions and ISO 14001 implementation	Employees (log)	• Size affects cost associated with polluting and therefore the degree to which a facility pollutes	yes
Klassen and McLaughlin 1996	Impact of environmental management on firm performance	USA	all	positive environmental events (e.g. winning awards)	market capitalisation	• Common control for firm size on market returns • no environmental reason	no
Klassen 1997	Determinants of plant-level environmental management strategy	USA	furniture	Implementation of environmental practices	employees	• small firms are more reactive and resistive to environmental legislation	no
Klassen and Whybark 1999	Impact of environmental technologies on manufacturing performance	USA	furniture	Implementation of pollution prevention and control practices, and management systems	employees (log)	• included as control in regressions on manufacturing performance • no environmental reason given	yes
Klassen 2000	Relationship between investment in manufacturing and environmental technologies	Canada	small machine tools/ non-fashion textiles	extent of investment in environmental technologies	employees (log)	• small firms more reactive and resistive to environmental issues • large firms cleaner	yes

Study	Aim of study	Country	Industry	Measure of environmental responsiveness	Measure of organisation size	Motivation for including size	r?
Konar and Cohen 1997	Why do firms pollute (and reduce) toxic emissions	USA	all	TRI data from IRRC	total revenue	• large firms have the ability to pay • large firms face community pressures and have greater reputation capital	no
Labatt 1991	Discretionary corporate environmental performance	Canada	all	Corporate environmental processes and practices	sales and employees	• not given	yes
Labatt 1997	Corporate responses to environmental issues : packaging	Canada	chemical products packaging	waste reduction index	employees (categorical)	• common in CSR literature • large firms subject to public scrutiny • large firms have resources and expertise	no
Nehrt 1996	Timing and intensity effects of environmental investments	USA Sweden Spain Brazil Canada Finland France Portugal	Paper & pulp	extent of investments in pollution-reducing technologies	net income (log of 3 year average)	• common control variable in strategic management • profitable firms have slack	yes
Russo and Fouts 1997	Resource-based perspective on corporate environmental performance	USA	all	FRDC ratings	sales (log)	• common control variable in studies of firm performance • no environmental reason	yes
Russo and Noble 1999	Antecedents of ISO 14001 registration	USA	electronics	ISO 14001 implementation	Employees (log)	• Control variable	no
Sharma and Nguan 1999	Impact of managerial interpretations and risk propensity on strategies of biodiversity conservation	Canada & USA	Biotech. and pharma-ceuticals	Implementation of environmental management practices	annual sales	• large firms have greater slack • large firms face greater stakeholder pressure • large firms can afford to prospect risky strategies	no

Study	Aim of study	Country	Industry	Measure of environmental responsiveness	Measure of organisation size	Motivation for including size	r?
Sharma 2000	Managerial cognitions and organisational context as predictors of corporate environmental strategies	Canada	oil & gas	Implementation of environmental management practices	annual sales (log of three year average)	• size an indicator of greater absolute resources or "deep pockets"; • but small firms may be quicker to respond or better in niche markets	yes
Stanwick and Stanwick 1998	Relationships between corporate social performance and size, financial performance and environmental performance	USA	all	Relative emissions (TRI)	annual sales	• large companies have high level of attention from the public • large companies have a leadership role, more resources and more influence over stakeholders	yes
Theyel 2000	Relationship between management practices and environmental innovations and performance	USA	chemicals	Implementation of waste management practices	employees	• none given	yes

Source : Studies identified with data on the organisation size – environmental responsiveness relationship. "r?" denotes whether the study reports the Pearson correlation coefficient, or other data that can be converted into a correlation coefficient (see Wolf (1986), p. 35). If "yes", then the study is included in the "full" group analysed below (and if "no", then the study is in the "partial" group").

As a first step in the assessment of the relationship, the set of “full” and “partial” studies were subjected to a vote-count of significance (see Figure 2.2). This is not a formal meta-analytic technique, but is commonly used in narrative literature reviews to categorise the studies (Hunter, Schmidt et al. 1982). To avoid double-counting, it is the samples contained within the studies which are listed, and not the studies themselves. For example, the two studies by Dasgupta and colleagues were undertaken in different countries : Mexico (Dasgupta, Hettige et al. 2000) and China (Dasgupta, Huq et al. 1997). Both Klassen and Sharma conducted studies in two sets of industries : furniture (Klassen and Whybark 1999) and small machine tools and non-fashion textiles (Klassen 2000); and oil/gas (Sharma 2000) and biotechnology (Sharma and Nguan 1999) respectively.

Figure 2.2 : Vote Count of Significance

Negative and Significant	Not Significant	Positive and Significant
(Gray and Deily 1996) Johnson and Greening 1999 (Labatt 1991) (Nehrt 1996)	(Aragon-Correa 1998) (Atlas 1998) (Gray and Deily 1996) Gray et al. 1999 Halme and Huse 1996 (Henriques and Sadorsky 1996) Judge and Douglas 1998 King and Shaver 1999 (King and Lenox 2000c) Klassen and Whybark 1999 Klassen 2000 (Nehrt 1996) Russo and Fouts 1997 Russo and Noble 1999 Theyel 2000	Ahmed et al. 1998 (Aragon-Correa 1998) Arora and Cason 1995 (Atlas 1998) Barkenbus and Barkenbus 1989 Baylis, Connel and Flynn 1997 Dasgupta, Huq et al. 1997 Dasgupta, Hettige et al. 2000 Gray et al. 1999 Hartman, Huq et al. 1997 (Henriques and Sadorsky 1996) Hettige, Huq et al 1996 (King and Lenox 2000c) Kind and Lenox 2000a Khanna and Damon 1999 Konar and Cohen 1997 (Labatt 1991) Labatt 1997 Sharma and Nguan 1999 Sharma, 2000 Stanwick and Stanwick 1998
4 studies in total	**15 studies in total**	**21 studies in total**

Source : Analysis of the studies containing data on the size-responsiveness relationship. Studies in parentheses are included in more than one column due to different analyses yielding different results.

The vote-count indicates that the studies are quite evenly split between a positive and significant relationship between organisation size and environmental responsiveness, and a non-significant relationship. Four studies indicated a negative and significant relationship. However, it is difficult to directly compare the studies given the different specifications of regression models, which control for different variables (compare, for example, Sharma (2000) with Russo and Fouts (1997)). Further, some studies used absolute rather than relative measures of environmental performance, such as level of emissions (compare Konar and Cohen, 1997 and Khanna and Damon 1999 with the studies by King and colleagues) making comparisons even less reliable. These types of findings would usually lead a narrative reviewer to suggest a positive, but marginally significant focal relationship, bemoan the non-comparability of results, and suggest future higher "quality" studies be conducted to resolve the issue once and for all.

Figure 2.3 : Summary of meta-analysis data

Study	**n**	**r**	**Level**	**Type**
Ahmed, Montagno et al. 1998	655	0.19	Org.	Strat.
Arora and Cason 1995	302	0.34	Org.	Strat.
Baylis, Connell et al. 1997	420	0.35	Org.	Strat.
Aragon-Correa 1998	105	0.13	Org.	Imp.
Johnson and Greening 1999	252	-0.16	Org.	Imp.
Russo and Fouts 1997	486	-0.06	Org.	Imp.
Sharma 2000	99	0.23	Org.	Imp.
Stanwick and Stanwick 1998	116	0.15	Org.	Imp.
King and Lenox 2000b	639	0.07	Org.	Imp.
Halme and Huse 1996	140	0.02	Org.	Neither
King and Lenox 2000a	3,606	0.14	Org.	Both
Judge and Douglas 1998	196	-0.05	Org.	Both
Labatt 1991	12	0.25	Org.	Both
Dasgupta, Hettige et al. 2000	236	0.11	Sub.	Imp.
Hartman, Huq et al. 1997	26	0.33	Sub.	Imp.
Klassen and Whybark 1999	66	0.05	Sub.	Imp.
Klassen 2000	93	-0.01	Sub.	Imp.
Nehrt 1996	50	-0.11	Sub.	Imp.
King and Shaver 1999	4,437	0.00	Sub.	Imp.
Theyel 2000	188	-0.03	Sub.	Imp.
King and Lenox 2000c	5,119	0.00	Sub.	Imp.
OVERALL	**17, 243**	**0.05**		

Source : meta-analysis studies. "Level" of analysis is divided into the total organisation / firm ("Org."), or an organisational sub-unit ("Sub."). "Type" of environmental responsiveness is divided into strategy ("Strat.") and implementation ("Imp."). "Both" is where data is available for both strategy and implementation *measures separately. "Neither" is recorded where the study does not fit in easily to strategy / implementation divide*[5].

Meta-analysis takes a different approach. It recognises that these results cannot be directly compared because of the artefacts of each particular research design. Not all the studies tested the same models, measured the constructs in the same way, were undertaken on similar samples, or were even attempting to generalise to the same population. Meta-analysis involves re-analysing the data, taking some of these study design artefacts into account (Hunter, Schmidt et al. 1982). It makes use of reported descriptive statistics and cumulates them across studies. The main statistics required are the Pearson correlation coefficient of the relationship (r), and the number in the sample (n). Unfortunately, not all of the studies reported r, so they could not be included in the formal meta-analysis which follows. The following results are based only on the "full" set of studies, which contained all the data required (see Figure 2.3).

Figure 2.3 shows the raw data used in the meta-analysis. In some cases manipulations of the reported data were required to derive the single value for r. For example, Aragon-Corea (1998) reported six different correlation coefficients between two measures of size and three types of environmental initiative implementation. The r of 0.13 used here was the arithmetic mean of these coefficients. In other cases (e.g. Judge and Douglas (1998), Labatt (1991) and King and Lenox (2000)), it was possible to record separate values for r based on strategy and implementation measures. Figure 2.3 shows the mean of these values, but they were later separated when the studies were divided by type of measurement (see results in Figures 2.4 and 2.5). Finally, in some cases, it was necessary to convert the reported data into a correlation coefficient using the conversion formulae given in Wolf (1986)[6].

[5] It is not clear whether "environmental reporting" is a strategy or implementation-based measure. Environmental disclosure may need a separate category and for a study like Ullmann (1985) to be undertaken for environmental responsiveness. Such a study is beyond the scope of this thesis, but interested readers may refer to reviews of the environmental reporting literature such as Gray et al. (1995) or Gray et al. (1999).

[6] It is also necessary to consider the uneven sample sizes, particularly the potential bias introduced by the very large sample sizes used by King and colleagues (Hunter, Schmidt et al. 1982). This bias was

Figure 2.4 : Meta-analysis results from using the Hunter et al. (1982) procedure

Studies	**r**	**n**	**K**	**variance in r across studies**	**of which, error variance**	**variance in r in pop'n**
All	0.05	17243	21	0.0094	0.0012	0.0082
Split by level of analysis						
Organisation	0.13	7028	13	0.0124	0.0018	0.0106
Sub-unit	0.00	10215	8	0.0006	0.0007	0
Split by responsiveness type						
Strategy	0.28	5191	6	0.0066	0.0010	0.0056
Implementation	-0.01	5511	9	0.0042	0.0016	0.0025

r = mean Pearson correlation coefficient across studies
n = total sample size
K = number of studies

Figure 2.4 shows a table of the meta-analysis results from following the Hunter et al. (1982) procedure[7]. For all studies, the weighted average correlation coefficient was 0.05. Thus, there is a highly significant, but weak positive relationship in aggregate across the studies. Separating variance due to sampling error from the variance in *r* across studies indicates that there is some systematic difference in the studies due to research artefacts (variance in *r* across population = 0.0082 > 0). The search then continues to identify potentially relevant moderating variables. The theoretical extensions discussion earlier in this chapter suggests organisational level of analysis as a likely moderating factor (see section 2.3.1). Figure 2.4 illustrates a significant difference in mean *r* between studies undertaken at the total organisational level (r = 0.13) and those undertaken at the plant, or sub-unit level (r = 0.00). Thus, the relationship is not significant at the sub-unit level. Further, the variance between plant-level studies is due entirely to sampling error, so there is no systematic variance in *r* not accounted for by correction for sampling artefacts (variance in *r* across population = 0).

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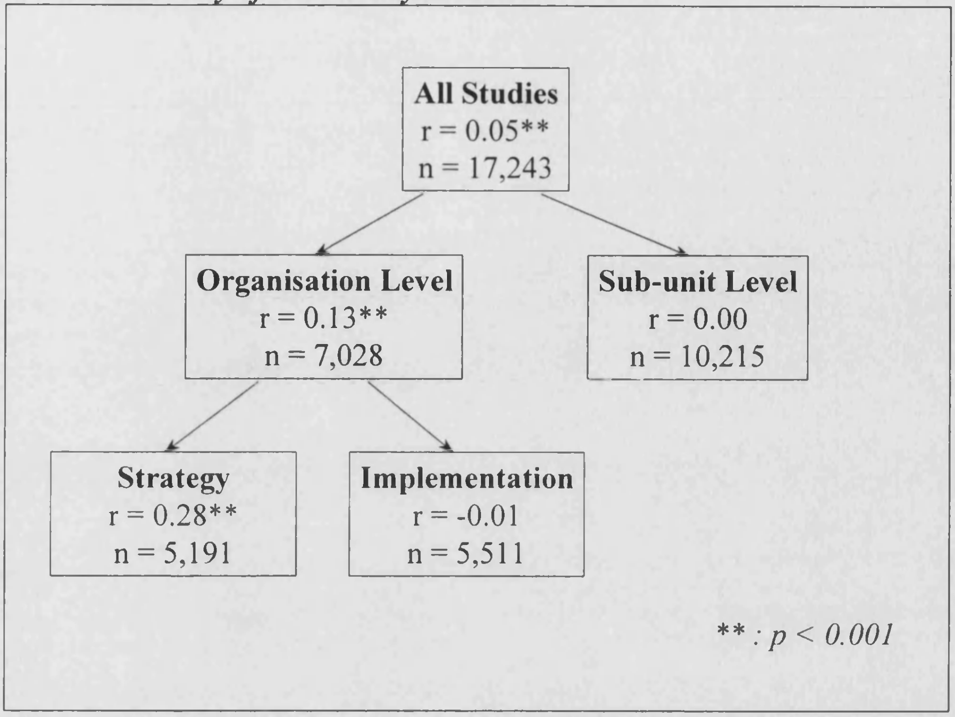
examined by recalculating the results presented in Figure 2.4 by weighting the King studies not by their actual sample sizes (i.e. 3606, 4437 and 5119), but by weighting them as the same as the next largest study (i.e. 655). The results were broadly similar to those reported based on the true sample size (overall r = 0.09**; total organisation level r = 0.12**; sub-unit r = 0.01; strategy r = 0.25** and implementation r = -0.01), and so no adjustments were made in the final results.

[7] see Hunter et al. (1982) p. 40-54 for details.

This is not the case for the total organisation / firm level studies (variance in *r* across population = 0.0106 > 0). Therefore, the search for further systematic differences between the studies continues. Type of responsiveness measure has been identified earlier in this chapter as a potential moderating factor (see section 2.3.2), and so the studies are divided by this criterion (see sections 1.1.1 and 5.3 for definitions). Figure 2.4 shows a highly significant difference between the mean *r* for studies using environmental responsiveness strategy measures (r = 0.28), and those using implementation measures (r = -0.01). The relationship is not significant for the implementation of environmental initiatives. Error variance does not account totally for the variance between studies for either strategy or implementation measures (variance in *r* across the population is 0.0056 and 0.0025 respectively). The remaining variance, due either to the artefacts of research design, or to some systematic difference between the studies, cannot be further analysed due to the small number of studies in these groups which reported the required data.

Figure 2.5 summarises the findings of the meta-analysis. Using the limited data set of the 21 "full" studies, the meta-analysis supported the validity of considering multi-level and strategy/implementation issues in examining the organisation size-environmental responsiveness relationship. The empirical evidence to date suggests that in aggregate, there is a positive and significant, but very weak, relationship between organisation size and environmental responsiveness. This relationship differs across both organisational level of analysis and the measure of environmental responsiveness used. Indeed, there is no evidence across these studies of a significant relationship between organisation size and environmental responsiveness at the sub-unit level (r = 0.00), or when using implementation measures at the total organisation / firm level (r = -0.01). The relationship is strongest for environmental responsiveness at the organisational strategy level (r = 0.28) .

Figure 2.5 : Summary of meta-analysis results



Source : See Figure 2.4 above.

It is possible, of course, that these findings are themselves an unlikely outcome due to the comparatively small number of studies included (K = 21). Confidence in these findings will only increase as the number of studies of adequate quality rises. The meta-analysis does show, however, that the relationships between organisational size and environmental responsiveness are not as uniform as the theoretical literature reviewed earlier in this chapter tends to assume. In particular, an empirical study is required which examines the size-responsiveness relationship, but explicitly separates organisational from sub-unit analyses, and strategy from implementation.

2.5 Emerging Themes in the Empirical Findings

The major weakness in the empirical studies so far conducted is the relative lack of explicit discussion of the role of size in influencing environmental responsiveness. Of the 38 studies, more than half (K = 20) included size as a control variable without explanation, or simply stated that this was common practice, or provided non-environmental reasons for its inclusion. Of the other studies, 14 gave less than three sentences of explanation of why size was included in the study. Only Sharma (2000) explicitly discussed the impact of size on environmental responsiveness, and provided arguments both for and against a positive relationship (see sections 3.2.1 to 3.2.4 for the content of these arguments). He concluded that there is no compelling argument for the effect of organisation size on environmental strategy (Sharma, 2000)

None of the studies addressed more fundamental questions of whether organisation size is a meaningful construct, and whether it is indeed a unitary dimension (Donaldson 1996). The empirical studies listed above utilise size as a general concept and then measure size by a variety of operational variables including number of employees, sales, assets, market capitalisation etc. (see 6th column of Figure 2.1). Some researchers believe that these differing variables tap distinct dimensions, that size is not unidimensional and that therefore the operationalisations are not interchangeable (Lioukas and Xerokostas 1982; Hopkins 1988). If size is multidimensional, then the validity of cumulating empirical studies with diverse measures of size is called into question (Wolf 1986; Donaldson 1996).

Detailed discussion of the validity of size as a contingency variable is beyond the scope of this thesis[8]. However, it is worth noting that the lack of explicit discussion of the nature of and reasons for including organisation size in responsiveness studies leaves open at least two new research opportunities. Firstly, embedded assumptions about the mechanisms by which organisation size affects environmental responsiveness should be clearly and explicitly examined. Secondly, operationalisations of size, and of other constructs in the causal path between size and responsiveness need to be more precise. Each of these opportunities is briefly outlined below, and is incorporated in more detail during the model development in Chapter 3.

The studies which provide a reason for including size yield the general assumptions that large organisations will be more responsive to social or political pressures where either (1) they have the incentive to do so, or (2) they have the structure or resources

[8] Interested readers are referred to Donaldson (1996), Chapter 8 for a stellar defence of the generalisation of size, and detailed critique of the Hopkins (1988) and Lioukas and Xerokostas (1982) studies.

which allows them to do so at comparatively little cost (see the 7th column of Figure 2.1). Incentives include high visibility, which attracts public attention, and economies of scale arguments. These factors increase the benefits, and decrease the costs, respectively of responsiveness for large firms. Resources which may allow larger firms to be responsive include organisational slack, or corporate connections. Thus to hypothesise a positive relationship between organisational size and environmental responsiveness, assumptions are made about the links between size, visibility, slack and responsiveness. Several of these assumptions are as yet untested, and will be a main focus of this thesis.

Further, organisation size is often posited as an operational proxy for either visibility or organisational slack (see sections 3.2.3 and 3.2.4 for details). Both of these constructs have been used in organisational empirical studies, and sometimes in environmental studies. However, there is as yet no consensus on appropriate operationalisations for either organisational slack or visibility (see sections 6.3 and 7.3), and so a study is required which attempts to empirically separate the impacts of size, visibility, and slack on environmental responsiveness. This thesis will develop new operationalisations of slack and visibility for use in an environmental context in order to attempt this empirical separation.

2.5.1 Summary of emerging empirical themes

Two main extensions to extant literature have been identified based on the empirical findings of the meta-analysis. The first is that the assumptions on the role of organisational size in environmental responsiveness need to be more explicitly examined. This will be accomplished in this thesis by modelling the causal pathways between size and responsiveness in the next chapter. The second is that new operationalisations of slack and visibility which do not require organisation size as a proxy need to be developed. This will allow the effects of organisation size, slack and visibility on environmental responsiveness to be empirically separated.

2.6 Chapter Summary

This chapter has introduced the three main bodies of knowledge which have considered the predictors of organisational responsiveness to environmental issues. It has placed the thesis as contributing to two main debates in organisational theory : the relative impacts of institutional isomorphism and resource dependence on firms' environmental responsiveness and the relationship between economic and environmental performance. By analysing extant theory, and by conducting a meta-analysis of empirical studies considering the size-responsiveness relationship, five themes to be used as a basis for extending the current debates were identified :

1. Embedded assumptions within the size-responsiveness relationship should be examined.
2. Size, visibility and organisational slack should be empirically separated.
3. Pressures on and responsiveness of firms should be considered at multiple levels of analysis.
4. Responsiveness in the form of environmental strategy and environmental implementation should be separated.
5. The specific characteristics of different environmental initiatives should be considered.

The model developed in the next chapter will refine the debate on the organisational size – environmental responsiveness relationship by incorporating all of these desirable features. It is these extensions that help define the contributions of the thesis to current debates in organisational theory, and it is these themes which will be used to assess the contribution in Chapter 10.

Chapter 3 : Model and Hypothesis Development

3.1 Introduction

This chapter will develop the specific model and hypotheses to be addressed in the thesis. Chapter 2 reviewed various approaches to the organisation size and environmental responsiveness relationship and developed five emerging themes in modelling environmental responsiveness. This Chapter builds on that discussion by developing a series of hypotheses drawing on the institutional and resource dependence perspectives of the relationship between organisation size and environmental responsiveness. The aims of this chapter are :

- to develop a new model of the organisation size – environmental responsiveness relationship which extends existing discussions in the five ways identified in Chapter 2.
- to refine the definitions and uses of the main constructs used in this thesis.
- to derive testable hypotheses from the model.

The chapter begins by introducing the main dependent variables to be used in the analyses. Two primary reasons for the size-responsiveness relationships are then derived from a combined institutional and resource dependence perspective : visibility as an incentive to act, and organisational slack as an enabling device for responsiveness. The relationships between both slack and visibility and the different types of environmental responsiveness are then discussed. A model of the mechanisms whereby size may have an impact on environmental responsiveness is developed. Thus this chapter links the literature developed in Chapter 2 with the model and hypotheses which are tested in Chapters 6, 7 and 8. It will also provide a reference point for assessing the empirical findings in Chapter 9.

3.2 Model Development

3.2.1 Five forms of environmental responsiveness : the dependent variables

A central finding of the meta-analysis conducted in Chapter 2 was that the extent to which organisation size predicted environmental responsiveness depended on the measure of responsiveness used. In particular, significant differences were found in the relationship between measures based on corporate environmental strategy and the implementation of specific environmental initiatives (see section 2.4). The meta-analysis also found that there remained a systematic difference in the size-responsiveness relationship even between studies on implementation at the sub-unit level (see section 2.4). This may be due to the types of environmental initiative under study. As outlined in Section 1.1.1, environmental initiatives can take many forms, and it is likely that different types of initiatives may be related to size in different ways. Consequently, this study will consider five separate types of environmental responsiveness, including three different sets of environmental initiatives, as dependent variables (see Figure 3.1).

Figure 3.1 : The five main dependent variables

Business unit environmental proactivity The extent to which a business unit states its intention to follow a course of action on environmental issues which is in advance of that required by current regulatory requirements.
Total environmental initiative implementation The extent to which an operating unit implements organisational innovations which are interpreted by managers as being implemented primarily for environmental reasons.
Materials-reducing initiative implementation The extent to which an operating unit implements initiatives designed to reduce the flow and stock of materials used in the transformation process.
Stakeholder relations initiative implementation The extent to which an operating unit implements initiatives designed to engage and communicate with interested stakeholders.
Clean technology initiative implementation The extent to which an operating unit undertakes long term attempts to develop cleaner products, processes or materials to minimise the environmental burden of the firm.

Source : See text here and Section 1.1.1 for more detailed explanations.

The primary distinction between the dependent variables is between environmental responsiveness in the form of corporate or business unit strategy, and the implementation of environmental initiatives at operating units. As previously outlined in Section 1.1.1, in a proactive corporate environmental strategy a firm states its intention to follow a course of action on environmental issues which is in advance of that required by current regulatory requirements. This is contrasted with environmental initiative implementation, where organisational innovations were implemented at operating units primarily for environmental reasons. Thus corporate environmental proactivity may provide the context in which environmental initiatives may be implemented (e.g. Ramus and Steger, 2000), but does not necessarily lead to the implementation of all promised environmental actions (Ketola, 1997).

A further distinction is drawn here between different types of environmental initiatives. Various categorisations of environmental initiatives have been proposed including, for example, Aragon-Correa's (1998) "information and education", "traditional/regulated correction" and "modern/voluntary prevention", and Bansal and Roth's (2000) "environmental responsibility", "legitimation" and "competitiveness" initiatives. For the purposes of the current study, types of initiatives needed to be identified which would relate in predictable ways not just to organisation size, but specifically to environmental visibility and organisational slack. No single categorisation was found in the green organisational theory literature which matched these requirements, and so the following distinctions rely on tools and techniques from the environmental management literature as well as organisational theory.

Materials-reducing initiatives are measures designed to limit or decrease the amount of resources used in any stage of the supply chain. As King and Shaver (1999) argue, "waste material, like products, go through several stages before being emitted from a facility. At each stage, management decisions and operational capabilities influence the amount and nature of material passing to the next stage" (King and Shaver, 1999, p. 5). Materials-reducing initiatives are measures designed to reduce the flow and stock of such material. Examples might include recycling programmes, reduction in the use of raw materials or improved housekeeping measures. Materials-reducing initiatives are often profit enhancing for the firm, since they often directly decrease cost (e.g. by eliminating waste). However, some materials-reducing initiatives entail a net cost to the firm, but are undertaken by organisations to signal their environmental awareness (Barkenbus and Barkenbus 1989; King and Shaver 1999).

Stakeholder relations initiatives are measures directly addressed at stakeholders and which may even require their participation. They are aimed at gaining organisational legitimacy (Bansal 1995), and at communicating and educating about environmental issues (Aragon-Correa 1998), rather than a direct profit motive. Stakeholder relations initiatives may present a net cost to the firm, certainly in the short run, but are considered necessary to maintain the firm's legitimacy and hence licence to operate. Examples might include conservation initiatives in the local area or disclosing environmental impacts in an environmental report.

The third class of initiatives, clean technology initiatives, are long term attempts to minimise the environmental burden of firm growth and development, rather than based on short term management of either pollution or the firm's stakeholders (Hart 1995). They are analogous to other types of non-environmental innovations (Nijkamp, Rodenburg et al. 1999), as they are characterised by attempts to develop environmentally superior products, processes or materials. As with other innovations, the payoffs from clean technology can be uncertain and long term. The benefits of clean technology initiatives are derived more from the development and protection of future market and technological position than from immediate cost reduction or satisfaction of stakeholders. Examples of clean technology initiatives include developing the use of alternative fuel sources or undertaking research programmes for environmental improvement.

Thus the five dependent variables used in this study include one measure of corporate strategic proactivity, three separate types of environmental initiatives, and a summary environmental initiative measure calculated by adding the three types.

3.2.3 Slack and visibility as alternative explanations to size

So how might each of these types of responsiveness be affected by firm size? A series of hypotheses are developed in the next three sections which derive answers from a jointly institutionalist and resource dependence perspective on the organisation size-environmental responsiveness relationship. As argued in Chapter 2, this stream of research is well established within organisation theory, and the thesis is intended to fit within an existing tradition of treating institutional and resource dependent explanations of organisations' responses to social or political pressures as complementary (see section 2.2.3).

As noted earlier, the reasons for including size in the empirical studies given in the seventh column of Figure 2.1 can be summarised in two main ways. Large organisations are assumed to be more responsive to social or political pressures because either (1) they have more incentive to do so, or (2) they have the resources to allow them to do so at comparatively little cost. From a jointly institutionalist and resource dependence perspective, "incentives" are provided by organisational visibility and technical cost-benefit considerations. The incentives to organisations facing a strategic choice of environmental responsiveness depend on why the institutional pressures are exerted, who is exerting them, what these pressures are, how, or by what means they are exerted, and where they occur (Oliver, 1991). These were referred to by Oliver (1991) as the cause, constituents, content, control and context of institutional pressures. Primary among these pressures are the "cause" pressures, that is to ask "why are these pressures being exerted?". If there is no cause of the pressures, then no amount of constituents or control will affect the organisation; to ask for the content is meaningless; and the context is irrelevant. When there is pressure exerted for a reason (i.e. cause), then the other elements may come into play.

For large firms, the cause of institutional pressure on them is often their visibility in society or their relatively more visible impacts (Goodstein 1994; King and Lennox 2000). Thus large firms have an incentive to respond to calls for improved environmental performance due to their visibility, and the consequences for their reputation if they fail to do so (Konar and Cohen 1997). From an institutionalist perspective, larger firms have an incentive to be environmentally responsive due to their high visibility.

Large firms may also have an incentive to be environmentally responsive due to cost-benefit considerations. From a resource dependence view, larger firms may reap economies of scale in environmental responsiveness (Gray, Kouhy et al. 1995; Hettige, Huq et al. 1996), or find it relatively less risky and costly to seek solutions to environmental problems (Sharma and Nguan 1999). Both of these enhance their ability to react in an environmentally responsive way at comparatively little cost.

From a resource dependence perspective, larger firms have an incentive to be environmentally responsive due to favourable cost-benefit considerations.

The difficulty with this resource dependence incentive is that revenues from and costs of environmental responses need to be known, so the incentives open to large firms can be quantified. Unfortunately, such a calculation is both technically difficult and uncommon in environmental practice. The payback on social responsibility strategies is particularly uncertain (Pava and Krausz 1996), and often requires discounting periods much longer than for other investment decisions. The valuation of actual environmental impacts is an imprecise science (van der Veen 2000), as is the prediction of the commercial benefit from proactive environmental strategies with a somewhat fickle consumer base and broader public (Lankoski 2000). Besides, under the assumption of managerial rationality (Williamson 1963), the agents who make the decision act in their own best interests which may be different from the strict cost-benefit considerations of the shareholders. For these reasons, a formal cost-benefit analysis is often replaced by a broad consideration of the perceived affordability of the response.

It is not necessarily the quantified net benefits which encourage managers to be environmentally responsive, but the extent to which they have the discretionary resources to enable them to do so (Sharma 2000). Lankoski (2000) models this effect as a lens through which companies weigh the short term against the long term in their environmental decision-making. The discount rate employed is influenced not only by the usual costs and revenues over time, but also by managerial interpretations, availability of slack resources, and attitudes to risk. In large companies, more resources may be available (Nerht, 1996), so conflicts in managerial interpretations can be more easily smoothed (Cyert and March 1963), and more risky strategies can be pursued (Singh 1986). Where there is increased discretionary slack, managers are more likely to interpret environmental issues as opportunities rather then as threats, and are more likely to pursue a proactive environmental strategy (Sharma 2000). Larger organisations have more resources and slack for use by their managers for environmental purposes (Russo and Fouts 1997; Sharma 2000). So large firms may have the ability to be more environmentally responsive because they have excess resources available to do so. From a resource dependence perspective, therefore, a firm's ability to respond to environmental demands is dependent on the availability of organisational slack.

From a jointly institutional and resource dependency perspective, the main reasons for the organisation size-environmental responsiveness relationship are visibility and slack. While taking this perspective has yielded two alternative explanations for the size-responsiveness relationship, there may be other reasons for the relationships which are not explicitly addressed here. Large firms may have a broader range of capabilities, for example, and so may be able to undertake certain kinds of environmental responsiveness relatively easily. The implications of delimiting the research to only two explanations based on a common stream within organisation theory are discussed in more detail in Section 9.4.2. The next two sections outline expected impacts on the dependent variables of visibility and slack respectively.

3.2.3 Visibility and environmental responsiveness

Organisations and their activities vary in the extent to which they are visible to interested constituents. This section will argue that aspects of environmental visibility can explain much of the diversity in organisational environmental responsiveness, whether that response is in the form of a corporate environmental strategy or specific environmental initiative implementation at operating units. It will go on to propose likely directions of the relationships between visibility and the five main dependent variables.

Visibility captures the extent to which the firm, the site, its activities or its environmental impacts can be seen or noticed. In organisational theory, visibility has been used in two primary ways - as a characteristic of an organisation, and as a characteristic of an issue. Organisations are visible when they can be easily seen by relevant constituents. Highly visible organisations are more likely to be vulnerable to attention from interested parties (Bansal 1996), and are therefore more exposed to institutional pressure in the social system (Oliver 1991; Goodstein 1994). Visible organisations must respond to constituent demands in order to maintain their social legitimacy (Miles 1987; Bansal 1995). Therefore organisational visibility can induce organisational responses to social or political issues because of the organisation's exposure to pressures (Oliver 1991; Goodstein 1994; Ingram and Simons 1995).

Visibility is commonly operationalised as size (Goodstein 1994; Ingram and Simons 1995) since large firms' activities are more visible in society than smaller firms (March and Simon 1958). They are more likely to be targets of regulatory authorities and consumer rights organisations (Pfeffer and Salancik 1978), and so may respond to organisational demands in order to maintain their social legitimacy (Miles 1987).

However, the concept of visibility captures far more than simply the size of the organisation. Business units with greater consumer name recognition (Rappaport and Flaherty 1992; King and Lennox 2000), which appear frequently in the media (Greening and Gray 1994), which have a high level of advertising (Greening and Gray 1994; Bansal 1996; Russo and Fouts 1997), which have an extensive product, consumer or geographic mix (Saiia 2000), or who have had a recent high profile environmental incident (Rappaport and Flaherty 1992) can be considered visible even if they are small. Operating units which are major local employers, are renowned locally for their social reputation, or are easily recognised as a part of a larger corporate whole (Bansal 1996), may be visible on a local level.

Several empirical studies have demonstrated that there is a positive relationship between the extent of an organisation's visibility and its proactivity in responding to pressure on social or political issues. For example, Ingram and Simons (1995) found support for their hypothesis that organisational visibility positively influenced the responsiveness of firms to work-family issues. They argued that visibility was a good proxy for the extent of attention from regulators, the media, and the public, which in turn influenced the organisations' responsiveness on work-family issues.

Issues are visible when they are easily noticeable by groups inside or outside the organisation. This may be because of a high level of publicity associated with the issue (Dutton and Duncan 1987; Neustadl 1990), or because the actions taken (or not taken) on the issue are likely to be visible to relevant others (Dutton, Stumpf et al. 1990; Burke and Logsdon 1996). Highly visible issues are perceived as more urgent since increased issue exposure creates pressure to take action on particular issues (Dutton and Duncan 1987; Dutton, Stumpf et al. 1990). This is especially true where an issue's visibility raises the possibility of outcry from the organisation's constituents, threatening the organisation's legitimacy (Dutton and Duncan 1987). High issue visibility also limits the available options for dealing with the issue, since constituents can easily monitor any actions which affect the issue, and so options are limited to those which would satisfy the constituents (Neustadl 1990). Empirical studies have lent support to the proposition that issue visibility can be a trigger of organisational response on social or political issues. Greening and Gray (1994), for example, found that a recent crisis heightened the visibility of issues, and influenced the structural development of issues management functions in firms.

These two bodies of organisational theory, built separately around organisational visibility and issue visibility, posit that visibility can influence organisational responsiveness to social or political pressures. Green organisational responses form a sub-set of broader social or political pressures of concern to organisational theorists (Gladwin 1993). It might therefore be expected that visibility is routinely considered in empirical environmental management studies.

The meta-analysis in Chapter 2 identified eight studies which included size as a predictor of environmental responsiveness, and attributed this to visibility of the organisation or issue (see seventh column in Figure 2.1). King and Lenox (2000a) is the only one of these studies which empirically separates visibility from size. They found support for their hypothesis that firms with better known brand or corporate names will more often participate in the Chemical Manufacturers Association's Responsible Care Program. They operationalised visibility through surveys on company and brand recognition administered on MBA students which generated a visibility index. Although separating visibility from size in this way was a useful exercise, several problems remained with their operationalisation of size. Relying on MBA students may introduce a bias since these students may be better informed than the general population (or other relevant stakeholders). Focusing on the corporate level means that visibility cannot be easily separated by level of analysis. It may be more appropriate to ask managers in the organisation how visible they perceive themselves to be, rather than how visible they are to stakeholders, since it is this perception which informs their responsiveness decisions (along with decisions on stakeholder power etc.). Finally, issue visibility is not included in their measure.

Both the logic and empirical operationalisation of organisational visibility in all the other studies is directly analogous to that exhibited in broader organisational theory. As has been argued above, visible organisations are more exposed to environmental pressure in the social system, and are therefore more likely to respond to them with environmental responsiveness. However, all the studies which operationalise firm visibility as firm size suffer from an inherent weakness - there is more captured in a measure of firm size than simply visibility. Operationalising firm visibility as firm size is inappropriate since larger firms may not only be more visible, but may also have more resources to devote to environmental issues or simply be involved in a wider range of managerial activity. It is not always clear that large firms are always more visible than smaller ones.

A further weakness in the meta-analysis studies is that they have barely considered issue visibility in an environmental context beyond a cursory mention of environmental issues being more institutionalised (and hence more visible) in industries with extensive environmental regulation (Clemens 1997). This is a particularly striking omission since managerial interpretations of environmental issues as threats or opportunities, a prominent trigger of green organisational response (Klassen 1997; Sharma 1997; Sharma and Nguan 1999; Sharma, Pablo et al. 1999), are themselves highly influenced by issue visibility (Dutton and Duncan 1987).

Notwithstanding the weaknesses in the meta-analysis studies, several qualitative or case-based studies have discussed visibility in the green organisational theory literature. A valuable attempt to characterise the visibility of the firm in an environmental context as broader than simply firm size is provided by Bansal (1996). In her study, "firms which were embedded in the local community, firms with previous legitimacy breaking incidents, or firms which engaged in a high level of advertising were considered more visible" (Bansal, 1996; p. 19). She also illustrated the importance of corporate image, in the form of a corporate logo, in contributing to firm visibility.

Most significantly, Bansal (1996) highlights the role of "transparency of activities" in limiting the firm's influence over constituents. In an example based on paint dust, she argues that "it was not the actual emissions which were of issue, but those [issues] which could be sensed by stakeholders" (p. 22). That is, it was the issues' visibility which informed the decision to act (Dutton, Stumpf et al. 1990). An extension of this argument, which Bansal (1996) did not make, is that "transparency of activities" (i.e. issue visibility) not only limits the firm's influence over its constituents, but can enhance the constituents' influence over the firm and increase the incentives for a green organisational response.

Ketola's (1997) discussion of the environmental pressures on different parts of the organisation, notes that "Texaco Pembroke's policy pays attention to local authorities, local people and local non-governmental organisations" (p. 24). Whilst it is not possible to conclude that this is because of pressure exerted by these constituents on the operating unit, it is interesting to note that the operating unit seems particularly concerned about its legitimacy at a local level. A less visible plant than a large refinery might not have such a strong focus on local constituents. Rappaport & Flaherty (1992) highlight environmental issue visibility by examining the role of a recent environmental incident as a catalyst for corporate environmental action. They also provide an alternative operationalisation for organisational visibility - consumer name recognition - which surpasses firm size as used in most of the meta-analysis studies, since it allows organisational visibility to be empirically separated from organisational resources. Howard, Nash and Ehrenfeld (2000) find that the most enthusiastically implemented elements of the Responsible Care Program are environmental initiatives easily visible by outsiders (such as community relations), while there is much less uniformity in implementing less visible initiatives (such as pollution prevention and product development).

Thus while both issue visibility and organisational visibility have been used in organisational theory to predict organisational responsiveness, attempts to do so in an environmental context have been limited. Assessing whether environmental visibility enhances organisational environmental responsiveness requires a more complete and robust research framework. This thesis develops such a framework by providing an analytical description of the various types of environmental visibility, and at which levels they impact upon the firm (see section 6.2). The framework is later used to develop operationalisations of visibility distinct from organisation size, and to test these two broad aggregated hypotheses suggested by the literature :

> ***H1 : There is a positive relationship between the visibility of the organisation and environmental responsiveness***

> ***H2 : There is a positive relationship between the visibility of environmental impacts and environmental responsiveness***

These relationships are expected to differ between studies undertaken at the level of the whole organisation and studies undertaken at the sub-unit level (see section 2.4). Firstly, organisations which are visible at the corporate level may not necessarily possess visible operating units. The visibility of operating units is as likely to be determined by having the same name as a corporate parent, being a major local employer, or appearing frequently in the local media as by either corporate or unit size.

The broadest level of analysis of concern here is the total organisation, or corporate whole. This level includes all the activities, personnel and resources within the corporation, and is limited by the conventional boundaries of the firm. The total organisation may be made up of several geographical, functional or product groups, which consist of a number of "operating units". For the purpose of this thesis, "operating units" are the units where inputs are transformed into outputs. They are the units which are devoted to the production of the firm's goods and services, and which undertake its "primary activities" (Porter 1985). They therefore include sub-units dedicated to, for example, storage, distribution, manufacturing or retailing. Operating units are usually treated within the corporation as profit centres, or at least budgetary or administrative units.

In a large firm there may be many hierarchical levels, and many sub-units in each level according to its organisational structure (Chandler 1963; Williamson 1985). Operating units are all affected by policy direction from a higher level to a greater or lesser degree, but this direction may come from different loci of control in different organisations. Specifically, some operating units may receive direction on environmental matters from the corporate headquarters, and others from the Product Group or Divisional headquarters (Rappaport and Flaherty 1992; Maxwell, Rothenberg et al. 1997).

In order to circumvent this problem, the model does not take the corporate whole as the overall unit of analysis, but the business unit. This can be defined as "the level of the organisation at which the responsibility for the formulation of a multi-functional strategy for a single industry or product-market area is determined" (Hofer 1975). The unit of analysis then becomes the corporate centre in U-form organisations, and the main business groups in M-form structures. Approaching the units of analysis in this way helps to overcome a specification problem. Inter-operating unit differences might otherwise have been attributed to differences in the characteristics of the operating units, whereas the true difference lies in the fact that the operating units are within the same corporation, but different business units.

An assumption is made in this thesis that responsiveness in the form of strategy occurs at the business unit level, whereas the responsiveness at operating units is in the form of the implementation of environmental initiatives. This is derived from classical strategic management theory where responses to the business surroundings are articulated by the corporate centre, or by business units, and policies are then transmitted to operating units for implementation (Chandler 1991; Whittington 1991). There is an acceptance in the model that business unit environmental proactivity does not necessarily lead to environmental initiative implementation at operating units. Despite this, it seems reasonable that responsiveness at the business unit level is usually in the form of strategy declarations, policies or guidelines for operating units to act upon, whereas responsiveness at operating units is in the form of implementing specific environmental initiatives. Only in the largest operating units with substantial subsidiary mandates will environmental responsiveness at operating units take the form of strategy (Birkinshaw 1995; Birkinshaw 1996). Only in the smallest, single plant business units will the business unit headquarters implement specific initiatives.

Thus the aggregated hypotheses on visibility presented above (H1 and H2) can be made more specific by identifying appropriate levels of analysis :

H3 : ***There is a positive relationship between the organisational visibility of the business unit and the proactivity of the business unit environmental approach***

H4 : ***There is a positive relationship between the visibility of environmental issues at the business unit level and the proactivity of the business unit environmental approach***

H5 : ***There is a positive relationship between the organisational visibility of the operating unit and its implementation of environmental initiatives***

H6 : ***There is a positive relationship between the visibility of environmental issues at the operating unit level and its implementation of environmental initiatives***

Figure 3.2 summarises the predicted relationships between the different types of environmental initiative and visibility. A positive relationship is expected between environmental visibility and both materials-reducing and stakeholder relations initiatives. This is because these sets of initiatives are easily visible to interested constituents, and comparatively cheap to introduce, so the incentive to implement them for visible companies is larger (Burke and Logsdon 1996). Implementing these initiatives is a visible statement by a firm that it is responding to environmental pressures put on it (Howard, Nash et al. 2000). This may be the case even where the initiative (such as environmental reporting or an employee environmental training scheme) does not lead to any substantive improvement in environmental performance.

In contrast, clean technology initiatives are not expected to be particularly prevalent in visible firms since the payoff from implementing the initiatives does not depend on the firm's visibility. As Howard et al. (2000) argue, practices such as new environmental technology development are directly visible only to people inside the firm, and are thus more likely to reflect the existing practices and values of the adopting organisation rather than of (external) interested constituents. Clean technology initiatives are often too unpredictable to yield a visible improvement in the short run. Thus the implementation of these types of initiatives is unlikely to relate directly with visibility.

Figure 3.2 : Expected relationships between visibility and different types of environmental responsiveness

Dependent Variable	**Predicted effect on visibility**	
	Organisational	**Issue**
Business unit environmental proactivity	+	+
Total environmental initiative implementation	+	+
Materials-reducing initiative implementation	+	
Stakeholder relations initiative implementation	+	
Clean technology initiative implementation	?	

Source : See text for discussion.

The foregoing discussion and the predicted relationships shown in Figure 3.2 suggest the following hypotheses :

H7 : ***There is a positive relationship between environmental visibility and materials-reducing initiatives***

H8 : ***There is a positive relationship between environmental visibility and stakeholder relations initiatives***

H9 : ***There is no relationship between environmental visibility and clean technology initiatives***

3.2.4 Organisational slack and environmental responsiveness

Recent research into environmental protection has begun to hint at organisational slack as an initiator and facilitator of the implementation of environmental initiatives. However, theoretical arguments can be posed to suggest that slack may affect different types of environmental initiatives in different ways. This section will therefore be presented in a different order from the discussion on visibility. Initial definitions of slack and presentation of evidence in an environmental context will be followed not by aggregated hypotheses (as with visibility), but by a disaggregated discussion. Once the predicted effects of slack have been addressed for each type of initiative, more general relationships will be proposed. Core to the discussion is that slack may affect environmental responsiveness in more complex ways than previous research might suggest.

Cyert & March (1963) introduced the idea of organisational slack, and described it as "the disparity between the resources available to the organisation and the payments required to maintain the coalition" (p. 36) or the "supply of uncommitted resources" (p. 54). Since their seminal discussion, organisational slack has been used as a key explanatory factor in describing many organisational phenomena, including buffering changes in an organisation's external surroundings (Thompson 1967), top management team political behaviour (Bourgeois and Singh 1983), risk taking (Singh 1986) and the amount of innovation in the firm (Nohria and Gulati 1996; Nohria and Gulati 1997). Six main functions of slack have been summarised by Bourgeois (1981). Slack acts as an inducement to maintain the coalition, a resource for conflict resolution, a buffer for the technical core, a facilitator of strategic behaviour, a facilitator of sub-optimal behaviour and a promoter of political activity (see sections 7.2.2 to 7.2.7 for more detail).

For organisational slack to be useful to managers to implement environmental initiatives, it should be easily mobilised in the short term. Various authors have termed such slack as available slack (Bourgeois and Singh 1983), short-term slack (Nohria and Gulati 1996), or high discretion slack (Sharfman, Wolf et al. 1988). Although longer term, absorbed slack has some use in protecting the long term survival of the firm, it is slack resources which can be easily recovered in the short term that may be turned to implement environmental initiatives. This thesis will concentrate on easily mobilised slack such as excess resources in budgets, unused capacity, employees' redundant time and excess short term profits. It may take the form of excess financial resources, or excess time or capacity.

Evident in the literature are two main views of slack's role in organisational responses to shifts in their surroundings (Bourgeois 1981; Cheng and Kesner 1997). Slack and responsiveness may be positively related as slack represents resources that can be used for innovation and change (Cyert and March 1963). On the other hand, slack may be viewed as inefficiency or a buffer which shields the technical core from external demands (Thompson 1967). These arguments can be adapted to an environmental context and imply different impacts on different types of environmental initiatives. The expected relationships are shown in Figure 3.3. Each is explored in more detail below.

Figure 3.3 : Expected relationships between slack and different types of environmental responsiveness

Dependent Variable	Predicted effect on slack
Business unit environmental proactivity	?
Total environmental initiative implementation	?
Materials-reducing initiative implementation	-
Stakeholder relations initiative implementation	+
Clean technology initiative implementation	+

Source : see text.

The main argument for slack stimulating environmental responsiveness is that it can facilitate strategic or creative behaviour. Slack facilitates search activity which is not necessarily problem related (Cyert and March 1963; Levinthal and March 1981), and can allow firms to initiate projects which do not have an immediate, relatively certain payoff (Levinthal and March 1981). These may not have been supported according to strict financial criteria, but may seem to have high potential by some managers, and are consequently followed up using the excess resources. Slack may also allow experimentation with new innovations (Hambrick and Snow 1977; Bourgeois 1981; Nohria and Gulati 1996; Nohria and Gulati 1997). Given the longer term and uncertain nature of the payoffs from environmental initiatives, higher slack may stimulate clean technology initiatives. Operating units are more likely to undertake long term attempts to develop cleaner products, processes or materials if they have the available and discretionary resources to do so.

Sharma (2000) recently discussed the importance of organisational slack in providing latitude for managerial discretion in environmental actions. He found managerial discretion to be positively related with proactive environmental strategies, but did not attempt to measure organisational slack's role directly. Maxwell et al. (1997) noted the slowdown in environmental strategy implementation at Volvo due to the recession of the early 1990s, and the subsequent renewed commitment. The latter was framed by the authors as a result of revisiting the environmental strategy, but they also highlighted a facilitation role for organisational slack - "improved financial performance *allowed* managers in the company to respond aggressively to this renewed commitment" (p. 122, emphasis added). Atlas and Florida (1997) hinted at an initiation role for organisational slack. They argued that "overcoming the immediate costs of simply considering green design is important in determining whether a facility adopts these practices", and that "consequently, green design facilities might be those that... more frequently have the opportunity, at little or no cost, to consider and adopt green design" (p.10). Thus a positive relationship is expected between organisational slack and clean technology initiatives.

Slack can also act as a buffering mechanism (Thompson, 1967). Firms keep slack resources and other buffering mechanisms in order to absorb changes in their surroundings. They protect their core activities by maintaining sufficient slack to reduce the need for core structural change. In the context of environmental initiatives, organisations may be able to respond to (costly) stakeholder demands by using up some of their slack. Conversely, organisations may resist environmental pressures by hiding behind excess resources. There has been little explicit interest in the buffering role of slack in an environmental context. However, King (2000) found that when faced with new water pollution regulation, managers created buffers between the firm and the outside world. Technological buffers such as waste treatment systems, and personnel buffers such as environmental management departments, were introduced so as to allow the rest of the organisation to function unchanged. This provides evidence in an environmental context that slack resources are used to buffer outside demands. Stakeholder relations initiatives such as conservation activities in the local area may be considered a form of buffer. These initiatives may be implemented using resources not required for running the core of the business, and used to insulate that core from stakeholders' demands. Thus a positive relationship is also expected between organisational slack and the implementation of stakeholder relations initiatives.

The main argument for a negative relationship between slack and environmental responsiveness is based on slack allowing sub-optimal behaviour (Simon 1957;

Bourgeois 1981). The existence of slack may allow firms to satisfice earlier in the search than might otherwise be the case, so "acceptable" solutions are accepted earlier in the search process than in low slack situations (Cyert and March 1963). Nohria and Gulati (1996 and 1997) found the relationship between organisational slack and innovativeness was negative at high levels of slack because of the costs of lack of discipline. Thus slack may allow firms not to bother prospecting for optimal environmental strategies since they have sufficient slack to allow them to settle for satisficing options.

The converse of this situation has an obvious corollary in environmental management. Search will be more intensive when organisational resources are scarce (Cyert and March 1963; Bourgeois 1981). In an environmental context, when organisational slack is low, there may be search for initiatives which are beneficial both environmentally and economically. Waste reduction, energy efficiency measures and packaging reduction, for example, are all environmental initiatives with the potential to help reduce direct costs. In bad times, the criteria for investments and initiatives tightens to preserve the survival of the firm. The types of environmental initiatives which get implemented are the ones which can promise a cost reduction (such as materials reduction measures). Materials reducing initiatives are expected to be the first types of initiatives implemented in times of decreasing slack. Thus a negative relationship is expected between organisational slack and materials reducing initiatives.

Thus slack has a complex relationship with the implementation of environmental initiatives. To date there has not been a coherent and explicit consideration of the theoretical linkages between slack and environmental initiatives. This thesis will attempt such a treatment. It will gather evidence of the various mechanisms by which slack helps or hinders environmental responsiveness. It will develop appropriate operationalisations of organisational slack for use in an environmental context, and test the following disaggregated hypotheses on slack and the implementation of environmental initiatives :

H10 : There is a negative relationship between available organisational slack at the operating unit level and the implementation of materials-reducing initiatives

H11 : There is a positive relationship between available organisational slack at the operating unit level and the implementation of stakeholder relations initiatives

H12 : There is a positive relationship between available organisational slack at the operating unit level and the implementation of clean technology initiatives

As with visibility, the level and type of organisational slack at operating units may differ from that at the total organisational level (Bourgeois 1981). The extent to which slack yields a greater capacity to engage in environmental behaviours may therefore vary by level of analysis. Unfortunately, due to the many functions of slack in organisational analysis, the aggregation of expected relationships is not as straightforward as with visibility. In contrast to the hypotheses on visibility and types of initiatives (see H7 to H9), the disaggregated slack hypotheses (H 10 to H12) imply an ambiguous effect of slack on the total level of environmental initiative implementation. It is unclear whether the proposed positive effect of slack on clean technology and stakeholder relations initiatives will be outweighed by the negative effect on materials reducing initiatives.

Extant literature has tended to state the positive role of slack resources in promoting environmental responsiveness (e.g. Lankoski 2000; Sharma 2000). In view of the uncertain predictions based on aggregating the separate types of environmental initiatives, the following hypotheses on the impact of organisational slack at the different levels of analysis are proposed in line with previous discussions of organisational slack. The following positively stated hypotheses will be tested. If they are rejected, then the more complex roles of organisational slack proposed in the discussion of types of environmental initiatives in this section is supported. To remain consistent with the treatment of visibility (see Section 3.2.3), hypotheses are stated at several levels of analysis :

H13 : Business units in corporations which have been slack gainers over the previous period are more likely to have a proactive business unit environmental approach

H14 : There is a positive relationship between available slack resources at the business unit level and the proactivity of business unit environmental approach

H15: There is a positive relationship between available organisational slack at the operating unit level and the implementation of environmental initiatives

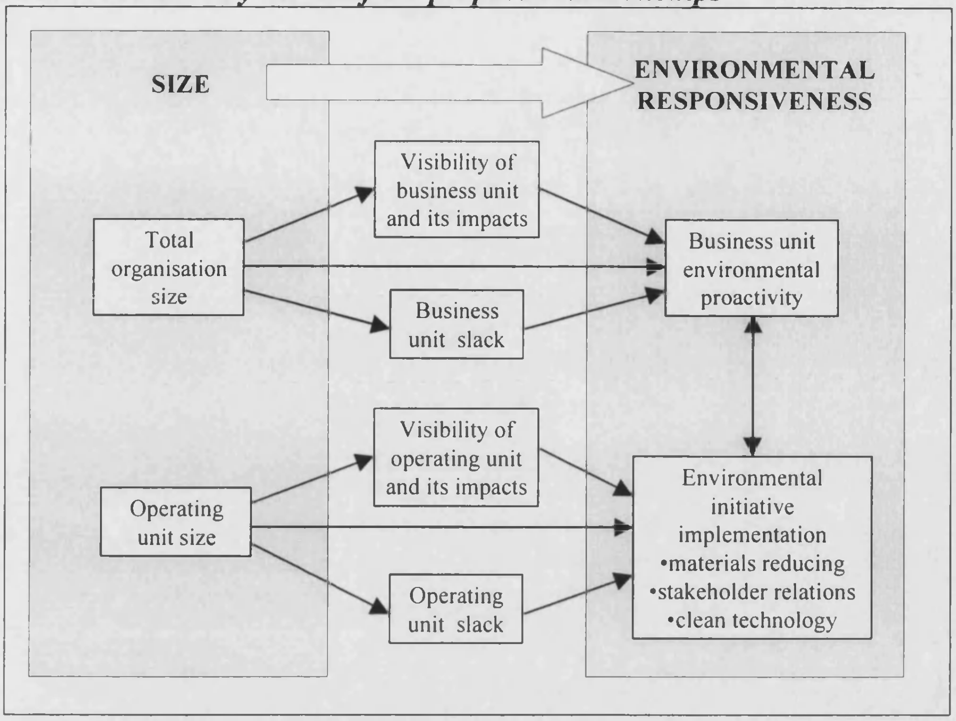
A final, aggregated hypothesis on slack is proposed in the same spirit. Previous treatments have discussed slack as a promoter of environmental responsiveness, so the hypothesis is stated in the positive format. However, if the hypothesis is rejected, then the more complex treatment of slack advocated in this section may be accepted. The final, aggregated hypothesis on slack is :

H16 : There is a positive relationship between organisational slack and environmental responsiveness

3.2.5 A summary multi-level model of the relationships between size, slack, visibility and environmental responsiveness

A summary model illustrating the suggested hypotheses is drawn in Figure 3.4. A major advantage of the model over current models of environmental responsiveness is that assumptions about levels of analysis are made explicit and fit better with recent theory and empirical evidence. Note, for example, that environmental responsiveness at the business unit level and operating unit level are considered separately (see section 2.3.2). Also, operating unit environmental responsiveness may be affected by operating unit size, visibility or slack, or by top-down policy from a higher hierarchical level (see section 2.3.1). There is at best an indirect relationship between total organisational size and implementation of environmental initiatives at operating units, reflecting the non-significant relationship found in the meta-analysis.

Figure 3.4 : A summary model of the proposed relationships



The multi-level model fits the theory and empirical evidence gathered in Chapter 2 better than other existing models. However, there is an important assumption made that size affects visibility and slack in the model which is worth further examination. This reflects the assumptions made in many of the meta-analysis studies about the relationships between size, and organisational slack and visibility. Size is often used as a proxy for visibility and slack. However, as argued in Section 2.5, this is inappropriate, and visibility, slack and size should be included in the model separately to account for different aspects of size's impact on environmental responsiveness.

The actual relationships among size, visibility and slack themselves are of secondary importance to this thesis. The important point is to assess size, slack and visibility as alternative and complementary influences on environmental responsiveness, by empirically separating them. Whether large organisations are indeed more visible or have more slack remains a research question for future research and is not extensively addressed here. Interested readers are referred to Greenley and Oktemgil (1998), Dass (2000), Sharma (2000) and King and Lenox (2000) for some empirical results on the relationships between size, slack and visibility. These studies tend to agree with the arguments presented above that while there may be some connection between size and visibility and slack, they are not perfectly related. The validity of this assumption is assessed later when examining the relationships between visibility and slack and size (see Sections 6.5.1 and 7.4.1).

Further features of note in the model are the direct relationships between size and the various types of environmental responsiveness. These relationships are included as control variables in the analysis, since there may still be a residual effect of size on environmental responsiveness even when visibility and slack have been empirically separated from size. Using size as a control reflects the earlier discussion that it is possible that there are other aspects of organisation size other than slack and visibility which affect environmental responsiveness. This issue will be addressed more fully in Section 9.4.2.

3.3 Chapter Summary

This chapter has developed a multi-level model of the relationship between organisation size and environmental responsiveness from a jointly institutionalist and resource dependent perspective. Model development addressed each of the five emerging themes in the literature identified in Chapter 2.

It was initially argued that the two main connections between organisation size and environmental responsiveness are (1) through environmental visibility which gives large firms an incentive to act, and (2) through organisational slack which gives them the ability to do so. Having extended these arguments to two levels of analysis, and considered the types of environmental responsiveness expected, a total of sixteen related hypotheses have been derived. These hypotheses are summarised in Figure 3.5. They fit with the theoretical and empirical literature review and required extensions from Chapter 2 and will form the focus of the empirical work conducted described in the next Chapter. Results relevant to the hypotheses are presented in Chapters 5-8, and they will be used in the discussion in Chapter 9 to assess the applicability of the model, and in Chapter 10 in assessing the contribution of this thesis to the broader literature.

Figure 3.5 : Summary of the hypotheses

Hyp.	Independent variable	Dependent variable	Level	Type	Predicted direction
Aggregated hypotheses					
H1.	Organisational visibility	environmental responsiveness	n/a	n/a	+
H2.	issue visibility	environmental responsiveness	n/a	n/a	+
H16.	organisational slack	environmental responsiveness	n/a	n/a	+
Disaggregated by level of analysis					
H3.	organisational visibility	business unit environmental proactivity	business unit	Strategy	+
H4.	issue visibility	business unit environmental proactivity	business unit	Strategy	+
H13.	corporate organisational slack	business unit environmental proactivity	business unit	Strategy	+
H14.	available organisational slack	business unit environmental proactivity	business unit	Strategy	+
H5.	organisational visibility	implementation of environmental initiatives	operating unit	Implementation	+
H6.	issue visibility	implementation of environmental initiatives	operating unit	Implementation	+
H15.	available organisational slack	implementation of environmental initiatives	operating unit	Implementation	+
Disaggregated by type of environmental initiative					
H7.	visibility	materials-reducing initiatives	operating unit	Implementation	+
H8.	visibility	stakeholder relations initiatives	operating unit	Implementation	+
H9.	visibility	clean technology initiatives	operating unit	Implementation	none
H10.	available organisational slack	materials-reducing initiatives	operating unit	Implementation	-
H11.	available organisational slack	stakeholder relations initiatives	operating unit	Implementation	+
H12.	available organisational slack	clean technology initiatives	operating unit	Implementation	+

Source : see text

Chapter 4 : Study Design, Sampling Strategy and Data Collection Methods

4.1 Introduction [1]

This chapter will describe and justify the methods selected to test the model outlined in the previous chapter. It acts as a foundation for the following four empirical results chapters (Chapters 5 to 8) by illustrating the overall research design for this study and describing specifically how the research problem was investigated and why. It also highlights some important features of the methodology to be considered when interpreting the results in Chapter 9. Its specific aims are :

- To develop an overall research approach based on the extensions identified in Chapter 2 and the model and hypotheses presented in Chapter 3.
- To identify the appropriate population and sampling frame for the study, and to explain the derivation of the samples used.
- To justify the data collection instruments selected and to describe their development and implementation.

The chapter begins by identifying the main challenges of testing the models, and setting the scene for the following study design choices. Having described the study design as a compromise between the requirements of the model to be tested and practical considerations, it proceeds to discuss the details of the research process. Particular prominence is given to the sampling strategy and to the main data collection instruments.

4.2 Study Design

4.2.1 The challenges of study design

The aim of this research is to undertake an investigation of the environmental responsiveness of organisations which focuses on the alternative roles of organisational slack and visibility as explanations for the relationship between organisation size and environmental responsiveness. This is to be undertaken while

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[1] The research in this thesis was conducted in parallel to an EPSRC research project entitled "Environmentally Sound Supply Chain Management" (Grant no. GR/L23253). See Appendix 1 for a description of the project, and for linkages between the project and this thesis work.

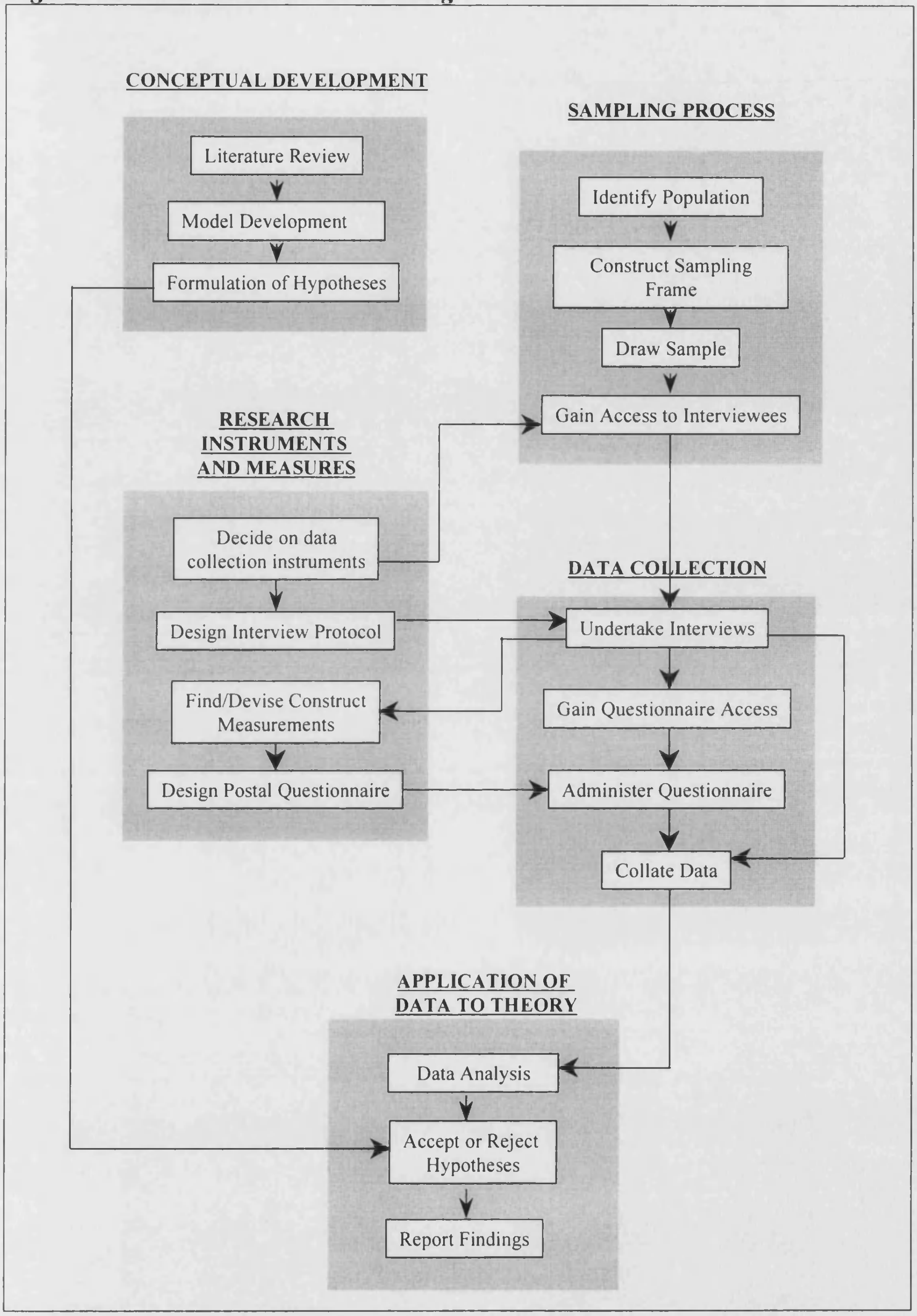
controlling for several organisational characteristics (such as organisation size and industry), and at various levels of analysis (corporate, business unit and operating unit level).

The overall study design as conducted for this research is presented in Figure 4.1. Figure 4.1 is included here as a summary and reference point for the discussion of methods used in this Chapter. Data collection was a two stage process, with interviews in 25 business units followed up by a questionnaire from 95 operating units within those business units. This yielded the multi-level, mixed methods data needed to best assess the model presented in Chapter 3.

The design evolved from the challenges posed by the models to be tested, and it is these challenges this section will address. Multi-level considerations, access difficulties, resource constraints, weak extant operationalisations, types of "testing" and the combination of static and dynamic effects in the model all shaped the final study design. This section will outline how each of these challenges was addressed within the research process.

The first conceptual and modelling challenge was that the model attempted to examine cause and effect, yet time constraints required the employment of cross-sectional methods which could only capture one snapshot of data. In Chapter 3, a causal model was developed which underlay the hypotheses, yet the data collection process needed to be undertaken in a short time period. Data was gained from many different business units and was analysed using cross-sectional, correlation-based techniques. This implied three potential problems with the research design. Firstly, correlations between variables could not provide the causal reasons why those correlations were detected. Secondly, external factors which might have caused the observed correlations needed to be excluded (Blalock 1982; Easterby-Smith, Thorpe et al. 1991). Thirdly, the data on organisational characteristics and environmental decision-making responses were collected in the same time period, yet the hypotheses implied a temporally sequential link between the two.

Figure 4.1 : The Overall Research Design



The only guidance to researchers facing these empirical difficulties is to rely on theory to interpret any correlations found (Kennedy 1985). Theory was used to argue why correlations were not spurious (see Chapter 3), and theory also provided potential external factors which might have affected the focal variables (see section 3.2). For example, some variables in the hypotheses were treated as exogenous (e.g. visibility, organisational slack), but in reality they are all subject to change over time. Chapter 3's theoretical discussion explained that the antecedents of visibility and organisational slack are beyond the scope of this thesis. The two main explanators for the relationship between organisation size and environmental responsiveness were therefore considered fixed at a point in time, with environmental responsiveness dependent upon these fixed constraints.

An additional complication was that some of the exogenous variables were based on levels (e.g. level of environmental visibility), while others were based on the direction of recent changes (e.g. slack gaining or losing over time). Extra care needed to be taken in a cross-sectional framework to avoid confounding levels and changes. Operationalisations of the variables needed to be explicit about whether the variables were based on levels or changes, and inferences from the findings careful to specify whether they were based on stock or flow versions of the core concepts (see 7.3 for an example).

Thus the core problem of collecting snapshot data, but drawing causal and sequential inferences remained. The ideal solution of collecting longitudinal and cross-sectional data was not feasible given the time constraints on the thesis. Difficulties caused by external variables, interaction effects, static and dynamic effects and inferring causation could not be eliminated within the study design, only managed and monitored. Elements of the study design which constrained these difficulties were : relying on theory to provide explanations for correlations identified; including control variables and interaction effects within the models; and explicitly operationalising some variables in a dynamic way. A further strength of the study design in this respect was the incorporation of qualitative data as well as correlation-based quantitative techniques. The interview process allowed some of the issues to be explored in a more complex and holistic way, where perceived causation, interactions and external variables could be explored with respondents (see Appendix 3).

A second challenge was that the models presented were explicitly multi-level. Data was required at the corporate, business unit and operating unit level. Further, this data needed to be matched in the sense that data from operating units should be matched with data from its business unit parent and even its corporate grandparent. This had several implications for the study design. Firstly, access was required to several levels within each organisation. Data from a single operating unit would be useless without data from business unit and/or corporate sources. Secondly, given resource constraints, a balance needed to be found between time and effort spent collecting data at the different levels of analysis. Thirdly, the multi-level nature of the data presented challenges to the data analysis process. Specialist multi-level modelling techniques, such as HLM (Braudenbush, Bryk et al. 1999), needed to be considered as alternatives to standard multiple regression to reflect the structure of the data (see section 9.4.1).

The corporate data required for this study (i.e. financial data) could be mainly gained from Company Annual Reports and other published sources, but business unit and operating unit level data needed to be collected specifically for this study. There was a trade-off between effort spent in collating data at each of these levels of analysis leading to difficult decisions on data priorities. The priority given to data collection at the business unit and operating unit levels was determined by broader pragmatic decisions on access and resource constraints, the types of analyses which were required to test the hypotheses and the data collection methods chosen. The eventual balance was struck where far more of the research time was spent interviewing respondents at the business unit level, whereas many more observations were gained at the operating unit level through a questionnaire. As is discussed elsewhere in this chapter, this allowed both the data requirements and the practical considerations to be met.

A further challenge was access to research sites. Access needed to be gained to many research sites across a range of organisational contexts. Access is known to be particularly difficult where the research design is highly context-bound, requires the participation of the researcher in the research, or requires detailed involvement from the research subjects (Hitchcock and Hughes 1995). Even where the research is context-free, where the researcher is independent, and where the required involvement from the research subjects is limited as in the current research design, access could have provided a major obstacle to completion (Easterby-Smith, Thorpe et al. 1991; Neuman 1994; Hussey and Hussey 1997).

Managers are more likely to grant access it they can see some personal or commercial advantage from taking part in the research (Dillman 1978; Easterby-Smith, Thorpe et al. 1991), if they are interested in the substantive research area (Dillman 1978), if the issue is currently pertinent in their organisation (Hussey and Hussey 1997), or if their organisation has a success story to tell. Previous research on environmental issues has revealed that companies with poor environmental records or who are simply less interested in environmental issues are less likely to respond to requests to participate in environmental issues-based research (Welford 1994).

This presented three main implications for the study design. The first was that while it may be statistically desirable to gain access to many business units and include only one operating unit from each business unit (i.e. equal sample sizes for business units and operating units) (see section 9.4.1), gaining access to and conducting interviews in a large number of business units was likely to be very difficult and time-consuming. Pragmatic considerations suggested that a more efficient option for the researcher was to gain access to a fewer number of business units, and then collect data from a number of operating units within each. This increased the number of business unit and operating unit pairs but expended a smaller amount of effort in gaining access and interviewing business units. It also had the advantage of allowing comparison of results from sister operating units within the same business unit.

The second implication was that the data collection methods chosen had to be selected and undertaken in such a way so as to maximise the likelihood of response. The thesis project was both helped and hindered in this respect by its connection with the broader ESSCMo project (see Appendix 1). The ESSCMo Project ran an industry "club" which representatives from 25 organisations attended on a regular basis for updates on research progress. This provided a pool of managers to discuss and feedback on some of the issues raised in this thesis in the early stages of its development. They were also used to pre-test the data collection instruments (see section 4.4.2). Discussions on data collection requirements were very helpful in refining the research design. Club members assisted on decisions on who to send the requests for interview to, what constitutes a reasonable request for participation (in time), and which elements of the project managers would recognise as potential benefits to their organisation in participating in the research.

However, the managers which attended ESSCMo Project meetings were inappropriate research subjects for the main data collection stage of the research. They had already been exposed to the main hypotheses being tested, and had previously contributed their organisations' perspectives on the key issues. Systematically including their organisations in the data collection would have yielded irreparable bias in the data. Therefore, despite the existence of a pool of willing respondents for the research within the ESSCMo club, they were not used in the main data collection stage.

The third implication was that non-response bias needed to be carefully monitored throughout the sampling and data analysis process. If there was a systematic tendency for only certain types of organisations or respondents to participate in the research, then this tendency needed to be monitored and considered in drawing inferences from the eventual results. During the sampling process, records were kept so that subsequent waves of requests for access were concentrated in industries which had not responded first time. Having gathered the data, the basic characteristics (organisation size, environmental responsiveness and industry group) of the final sample, the non-responders and the intended population were compared to assess for bias in the sample (see section 5.4). Taking these measures added confidence to the eventual inferences drawn from the findings.

A fourth challenge for the research design was that several of the key concepts in the model did not have established operationalisations. The meta-analysis identified a multitude of operationalisations of environmental responsiveness (see section 2.4), for example, and there was no consensus on the measurement of environmental visibility or organisational slack in various parts of the organisation (see sections 2.4, 3.2.3 and 3.2.4). The study design, therefore, needed to incorporate a stage which would allow new operationalisations for these constructs to be developed (and existing ones to be refined). One way to do this was to have a qualitative data-based stage where the concepts were more fully explored and specified followed by a more quantitative stage where the hypotheses were formally tested.

This mixed-methods approach was particularly suitable given that this thesis is effectively undertaking two levels of "testing". The less formal level of testing was attempting to establish the relevance of environmental visibility and organisational slack as stand-alone concepts as distinct from organisation size as explanators in environmental decision-making. The more formal level of testing was undertaking statistical analyses to assess whether to accept or reject hypotheses derived from the model. Establishing the potential relevance of explanatory variables could be achieved through looking for their presence in verbal, qualitative explanations for environmental responsiveness decisions. Testing their impact would be better accomplished based on tests of quantitative data from a large number of observations. In order to address this challenge, the interview data was analysed for evidence of the main variables of interest, and for hints in developing robust operationalisations before the questionnaire design was finalised (see Figure 4.1). The results presented in the main empirical chapters reflect this qualitative then quantitative data analysis sequence (see Chapters 6 and 7).

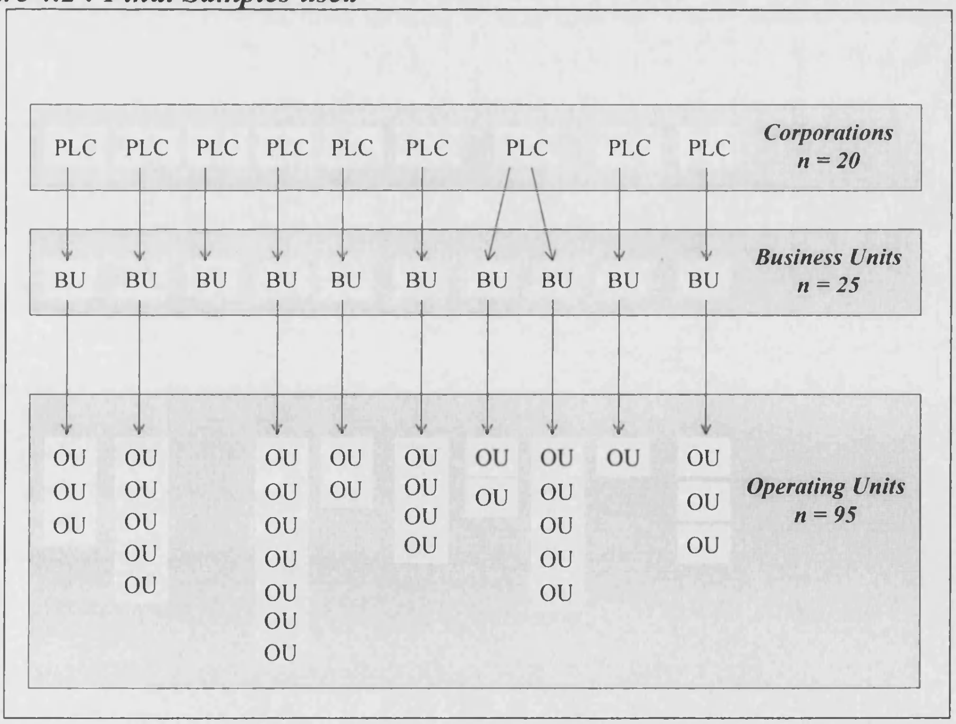
4.2.2 Summary of the overall research design

Thus the overall research process was designed as a compromise between the challenges of the model to be tested and the practical constraints on a project of this size. It retained the multi-level spirit of the model, and incorporated both the richness and exploratory nature of qualitative data from interviews, and the more formal quantitative testing of data from questionnaires. It accomplished the acquisition of adequate data to develop new operationalisations for variables, to "test" for the relevance of some concepts in environmental decision-making, to monitor non-response bias and to undertake the quantitative analysis of the hypotheses. Clearly, the design defined some constraints for the power of inference possible based on the results : the cross-sectional nature of the data and the non-standard sample structure both limited the extent of generalisation possible (see section 9.4.1). However, within the time and financial resources possible, the design evolved to provide an adequate assessment of the models.

4.3 Sampling Strategy

A sampling strategy was required which would allow a credible test of the model presented in Chapter 3. As outlined above, one of the main challenges was that the model required a multi-level sample, with operating units (OU) "matched" with their business unit parents (BU) and corporate grandparents (PLC)[2]. This resulted in an unconventional sample structure, as outlined in Figure 4.2. This section will describe and justify the sampling strategy which resulted in these samples.

Figure 4.2 : Final Samples used



[2] See section 3.2.5 for the definitions of operating unit and business unit used throughout this study.

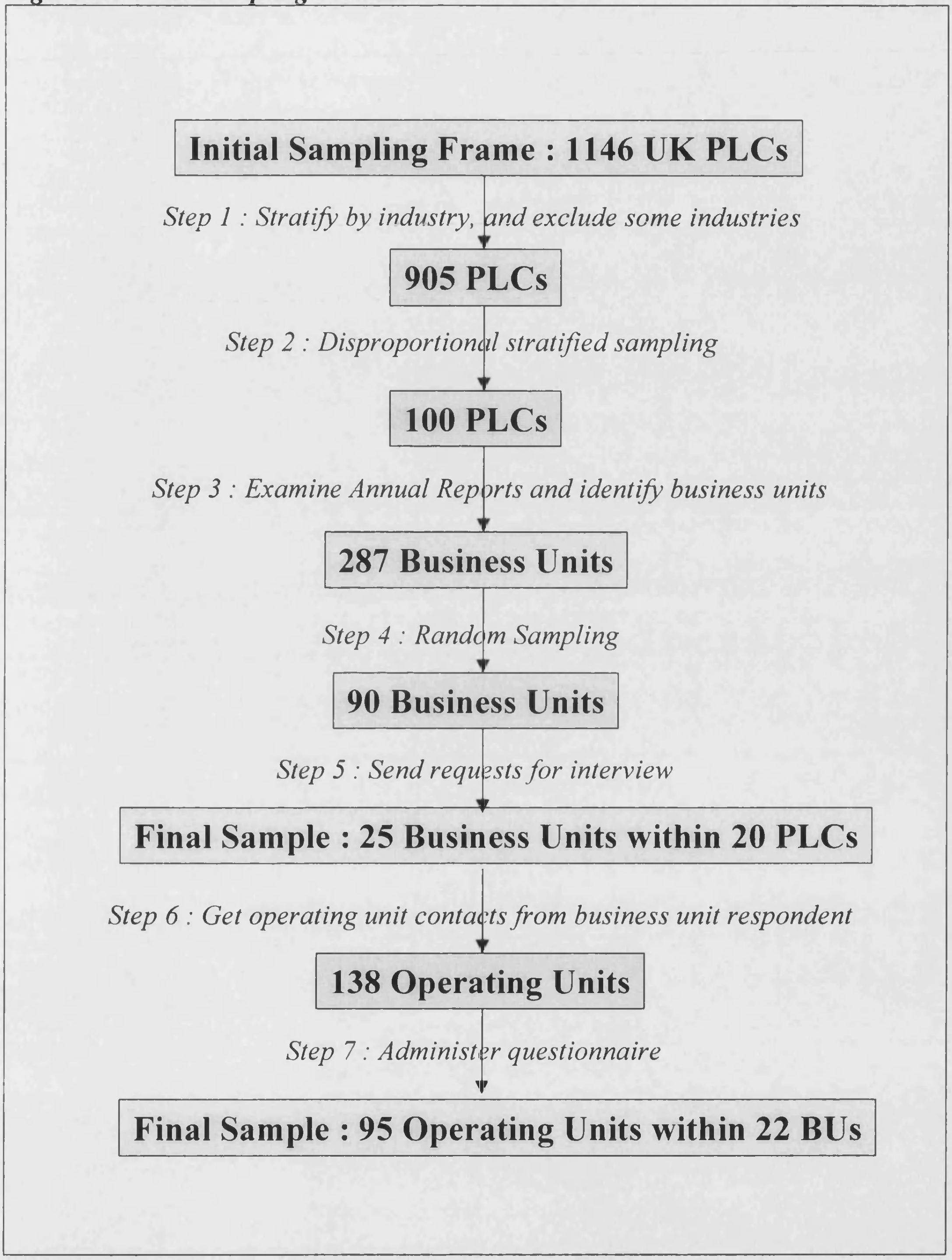
4.3.1 The sampling process

One of the key extensions identified from the literature in Chapter 2 and included in model development in Chapter 3 is the multi-level nature of the size-responsiveness relationship. A key difference between this study and some previous studies is that this variability in environmental response can occur not just in different host countries of a multinational (Gladwin 1977; Rappaport and Flaherty 1992), but in different units within the same country (see sections 2.3.1 and 3.2.5). A population of companies to which this model would apply, therefore, was the population of large multi-unit, multi-level companies within the UK.

Several indices of UK listed companies were investigated as potential sampling frames to capture the population, including the FTSE 100, FTSE 200, FTSE 350, FTSE All Share, FTSE Fledgling and all listed PLCs. The FTSE All Share index, containing 1146 UK PLCs, was selected as the initial sampling frame. It contained a list of large UK companies or UK operating companies of foreign multinationals which were likely to consist of several hierarchical levels and many sub-units. All the companies were subject to the same basic reporting requirements on PLCs, yielding adequate financial data. The list contained 90-95% of the stock exchange total capitalisation at any one time, thus allowing near complete coverage of UK listed PLCs. It is worth noting that this sampling frame does not correspond exactly to the population, due to the exclusion of large, private companies, and the inclusion of a very small number of companies with effectively only one operating unit, but it is considered to be an adequate approximation.

Figure 4.3 outlines the sampling process, showing how this sampling frame eventually provided the samples outlined in Figure 4.2. Two modifications to the FTSE All Share list were required to adapt the main sampling frame to the requirements of this study. The first was to stratify the corporate groups by industry (step 1 in Figure 4.3), the second was to identify business units within the corporate groups to approach to gain access for interview (steps 2 and 3 in Figure 4.3). Each of these will now be considered.

Figure 4.3 : The Sampling Process



Stratified sampling can be used to improve the efficiency of the sampling design (Blalock 1981). Previous research has indicated that certain industry groups are more environmentally engaged than others (Henriques and Sadorsky 1996; Hutchinson

1996), and at the time this sample was drawn, a major focus of this study was to compare the results of testing the model in different industry sub-populations[3]. In order to gain efficient estimates for each industry group, rather than for the sample as a whole, the sampling frame was stratified by industry group.

Figure 4.4 : Broad Industry Groupings by environmental impact

CATEGORY	DESCRIPTION	NACE CODES	FTSE All Share	Business Unit Sample
High impact	Chemical, oil, metal, pulp & paper, energy production/utilities, mining	11000-23999 25000-31299 47000-47999	204 *(17.8%)*	8 *(32.0%)*
Other manufacturing	Manufacture of cement etc., glass, food processing, tobacco, wood processing, rubber & plastic, finished metal products, machinery and equipment, motor vehicles, domestic appliances, textiles, wood products.	24000-24999 40000-42999 46000-46199 48000-48999 31300-39999 43999-45999 46200-46999 49000-49999	366 *(31.9%)*	9 *(36.0%)*
Other	Transport & communications, construction, wholesale & retail, retail banking	50000-59999 70000-79999 60000-65999 81402	335 *(29.2%)*	8 *(32.0%)*
TOTAL			1146 *(99.9%)*	25 *(100.0%)*
(Excl.)	Finance, insurance, business services, leasing, other services	0-10999 66000-67999 81403-99999 80000-81399	241 *(21.0%)*	0

Source : FTSE All Share Companies categorised using 1990 NACE classification (Official Journal of the European Communities 1990).

Several previous environmental management studies had used classifications of industry group to identify differences in environmental responsiveness (Templet and Farber 1994; Business in the Environment 1996; Halme and Huse 1996; Hutchinson 1996). Conceptually, each of these classifications had the same aims as for the

[3] This turned out not to be a particular focus in the final data analysis because the eventual operating

present study – they aimed to divide industrial activities into groups which were similar in one variable (i.e. industrial activity) and to compare the performance across groups in another variable (i.e. environmental performance). These schemes were all considered as a basis for the industry groupings used in this study, and a more detailed description of the derivation of the groups used here is provided in Appendix 2. The classifications turned out to be fairly similar, but the eventual classification used was one based on Halme and Huse's (1996) classification, and adapted slightly for this study (see Appendix 2 for details).

Figure 4.4 compares the final proportion of business units falling into each of the industry groups with the proportion of the FTSE All Share sampling frame. The exact origin of the business units included in the sample will be outlined later. This figure simply serves to show the categories of industry group, and how disproportional random sampling was used in step 2 to gain equal numbers of business units in each of the groups despite their incidence in the overall sampling frame not being equal. Also of note is the exclusion of some types of industrial activity from the study at this stage (step 1). Finance, insurance, business services, leasing, and other business services were all excluded since their level of environmental responsiveness is very low, and their activities are too dissimilar to the other industries to be reliably compared. Retail banking (81402) was still included, however, since this activity has similar environmental impacts to other retail activities.

Strictly speaking, the hypotheses based on the model in this thesis were mostly formulated at the business unit and operating unit level, not at the corporate level (see section 3.3). In order to reflect this characteristic of the model, the sampled units should have been business units, rather than the corporate groups identified in the FTSE All Share sampling frame. As outlined above (see section 3.2.5), business units may consist of entire corporations or of parts of corporations defined by geographical or product areas. Given that a complete list of business units of the FTSE All Share companies was not available, an additional stage in the sampling

unit sample size was smaller than intended, and precluded separate industry analyses.

process was required to identify eligible business units (see step 3 in Figure 4.3).

A pre-sample of 100 corporations was drawn from the 905 eligible companies in the FTSE All Share listing in February 1998 (241 companies excluded on the basis of their industrial activity, see Figure 4.4 and step 1 in Figure 4.3). The companies were each allocated into an industry group and ordered alphabetically within each stratum. Every sixth company in the High Impact group, every eleventh company in the Other Manufacturing group, and every tenth company in the Other Non-manufacturing group was selected in the pre-sample (step 2 in Figure 4.3). Requests were sent to each of the 100 companies for copies of their annual report. Each Annual Report was then examined to identify appropriate business units within the firm (Hofer 1975) (step 3 in Figure 4.3).

The resultant list of 287 UK-based business units of UK PLCs formed a refinement of the sampling frame which was based at the business unit, rather than at the corporate level of analysis. The sampling frame, although unconventional in shape, now matched the requirements of the model better – it was stratified by industry, and consisted of business units rather than corporate groups (see section 3.2).

Several factors discussed elsewhere in this chapter determined the ideal sample size for testing the model within the practical constraints of the project. Resources were available to conduct up to 30 interviews within the UK. Given the purpose of the interviews (initial exploration of issues, providing access for questionnaire, basic statistical tests for core relationships, see section 4.4.1), this number of interviews was deemed adequate. More interviews would clearly have enhanced the richness of the qualitative interview data, and the power of the business unit level quantitative data. However, this would have been accomplished at the cost of time and resources for the operating unit questionnaire. It is the sample size of the operating unit responses paired with their parent business units which primarily determined the statistical power of the main operating unit level analysis required to test the hypotheses (see section 4.4.2 below). Thus a compromise plan was drawn which targeted access in close to 30 business units, and a questionnaire administered to up to 300 operating units (i.e. up to 10 units sampled from each business unit).

Figure 4.5 : Industry Group and Company Size characteristics of the sample

		Company Size			
		30,000+ employees	**5,000 – 30,000 employees**	**less than 5,000 employees**	**TOTAL**
Ind. Group	**High impact**	• BP plc • Unilever HPCE • BOC Gases Europe	• Severn Trent Water • Ellis & Everard (UK) Ltd.	• KCA Drilling UK Ltd. • Body Shop (manufacturing) • Brunner Mond (UK) Ltd.	8
	Other manufa-cturing	• EMI Manufacturing (UK) • Unilever FBE	• Specialists Products Division, Meyer • Pilkington plc • BPB Paperboard (UK) • British Gypsum	• Otford Plastics Group • St. Ives plc • Automotive Products Division, Transtec	9
	Other non-manufa-cturing	• Comet Ltd. • Halfords Ltd. • Nat West UK • Do It All Ltd.	• Slavesen Logistics • Civil Engineering Division, Alfred McAlpine	• Bellway plc • Body Shop (retailing)	8
	TOTAL	9	8	8	25

Note : "Company Size" for the purpose of outlining the sample is determined by number of employees in the financial year ending in 1997 as reported in corporate Annual Reports (see section 5.2.1 for explanation and derivation of the size group cut-off points).

The response rate for requests for interview was expected to be around one third, so 90 business units were randomly selected from the 287 business units (step 5 in Figure 4.3). Random sampling was used at this stage since the earlier stratified sampling had yielded a business unit sample (the 287) which consisted of roughly equal groups of high impact, other manufacturing and non-manufacturing companies. A letter explaining the purpose of the study and requesting an interview was sent to the Managing Director of each of the 90 business units selected. This initial wave of letters generated willingness to be interviewed in 18 business units. Access to a further seven business units was gained by either a second wave of letters, or by recommendation by a senior representative in one business unit to another within the same corporation. Throughout the interview requesting and arranging process, close attention was paid to the overall sampling frame, ensuring a range of principal activities and company sizes. Figure 4.5 shows the corporate size and business unit industrial activity breakdown of business units in the final sample.

One consequence of drawing the sampling frame and gaining access in this way was that several business units within the same corporations were targeted. The final sample included two business units from the same corporate whole in five corporate cases. In two cases (Unilever plc and Transtec plc) respondents from the two business units responded separately to the first wave of letters, and in the further three (The Boots Company plc, Body Shop International plc and BPB plc) access was gained in the second business unit from the first interviewee.

From a statistical point of view, there is less of a problem with bias where access was gained independently in the two business units during the random sampling[4] (step 5). However, where access was gained by recommendation, the principle of strict random sampling from the sampling frame was violated. While recognising this difficulty, it was decided to include these three business units in the sample since the benefits of incorporating an additional three business units, and particularly the potential to compare business unit differences within the same corporation, outweighed the bias problem. The potential bias was monitored by undertaking some of the later analyses with and without the three additional business units to see if there were significant differences in results. No such bias was found.

The eventual business unit sample consisted of 25 business units from 20 different corporations. As the next section will outline, interviews were conducted in these business units. Towards the end of the interview, respondents were asked whether it would be possible to conduct a questionnaire at the operating unit level of their business unit. The details of questionnaire access are discussed later (see section 4.4.2), but comments relating to the structure of the sample are made here.

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[4] Clearly there could be some bias introduced even in this situation. Business units which were part of the same corporation, and which separately agreed to take part in the study, might reflect a higher propensity to respond to research requests in the corporate whole. The corporate attitude to academic studies in general, or studies such as this one in particular might influence non-response bias.

Within the 22 business units which gave permission for the questionnaire, 138 operating unit contacts were provided (step 6 in Figure 4.3). This fell far short of the up to 300 expected in the earlier sample design. Some business units only had very few UK facilities (e.g. Brunner Mond), while others had several hundred (e.g.Halfords). It would have been possible to gain a sample of 300 operating units, but only by including large numbers of other non-manufacturing companies (mostly retailing). This would have given far too much representation in the operating unit sample to one industry group, increasing the efficiency of estimates for that one group, but decreasing it overall. It was therefore decided to limit the maximum sampled operating units to 10 in any given business unit. The actual number of sampled operating units of 138 fell short of the maximum possible 220 (10 in each of 22 business units) for two main reasons. Either the business units only contained fewer than 10 operating unit facilities in the UK, or the business unit respondent only gave fewer than 10 contact addresses. Of the 138 questionnaires sent, 95 usable responses were eventually returned (step 7 in Figure 4.3, and section 4.4.2 for discussion of response rates).

4.3.2 Implications of the sampling process

Two main sets of bias are derived from the sampling process : those which are due to the sampling process itself, and those due to non-response by respondents. One of the main aims of the next chapter (see section 5.4) is to assess non-response bias in this study's results by comparing this sample's organisation size and environmental characteristics with the intended population. Here, bias arising from decisions made during the sampling process will be considered, and implications for data analysis and inferences based on these results discussed.

The final sample addressed many of the challenges posed by the model to the study design. It was a multi-level sample, with matched sets of operating unit, business unit and corporate data. Data from a variety of different business unit and industry contexts was captured. The sampling strategy allowed qualitative and quantitative data to be gathered within the resource constraints of the project and it contained sufficient sample size at the operating unit level for quantitative tests, such as multiple regression to be performed. Despite this, some of the features of the sample designed to be strengths were eventual constraints on inferences possible from the data.

The original intention had been to examine whether the model held in different industry groups. Thus the early stages of the sampling process focused on gaining efficient estimates for each industry group (by disproportional stratified sampling), rather than for the entire population of industries together. Separate industry group models would only have been possible had the operating unit sample size been large enough (i.e. close to the intended 300). In the event, manufacturing business units turned out to have far fewer UK-based operating units than had been expected, yielding a smaller operating unit population within the business unit sample than was assumed. The eventual sample size of 95 was too small for separate models to be used in each industry group.

A second-best solution was followed where industry group dummy variables were included in all the sets of regression models to partially capture differences in levels of environmental responsiveness due to industry. This is conceptually different from the type of test originally intended : whether the study variables impact on environmental responsiveness in different ways in different industries. Nevertheless, it does keep industry group as an important explanatory factor in the models.

Unfortunately, the stratification by industry also has an impact on the efficiency of estimates for the whole population. Strictly, any overall mean population value derived from the data should be weighed according to the proportion of the population in each group (Blalock 1981). This can become a very cumbersome process when there are so many variables consisting of so many individual scale items, and can cloud the data analysis process, making errors more difficult to detect. Therefore, though strictly required, this weighting procedure was not usually undertaken in the data analysis, except when a level of prevalence of a certain practice across the population was estimated. Given that the focus of this work is not to estimate levels in the population of individual variables, but to estimate the relationships between them at representative operating units, this sampling bias, though present, was not expected to damage the inferences possible too severely.

Another feature of the sample intended to strengthen the analysis was that several operating units were selected from within one business unit. The intention was to compare the implementation of environmental initiatives, and the overall level of environmental responsiveness across operating units within the same corporate or business unit context. This could have strengthened arguments that organisational slack or visibility in specific locations within the organisation led to different environmental responses in different sub-units of the organisation.

Again, due to the much smaller operating unit sample than intended, and the uneven numbers of operating units per business unit, such an analysis proved difficult. Only in a very small number of business units was there a large enough number of operating units included to be able to justify any statements on the relationships between the key variables within a single business unit. For this reason, these analyses are not included in this thesis report, which focuses instead on testing the hypotheses derived from the model on the overall sample (i.e. across all business units).

As with the industry group discussion above, the shape of the operating unit sample places constraints on confidence in the results, since some business units are over-represented. This tendency was countered as far as possible by limiting the maximum number of sampled operating units to 10 within each business unit and by establishing that there was sufficient variation in behaviours within business units. However, it does represent a deviation from the usual random sampling assumptions of parametric tests, and will be discussed as a limitation for the results in Chapter 9 (see section 9.4.1).

Thus the sample was unconventional in structure. It enabled data collection from several hierarchical levels within a range of organisations, but had several limitations: the high impact industry group is over-represented in the business unit sample; some business units (especially retailers) are over-represented in the operating unit sample; and, as discussed above (see section 4.3.1), five corporations are over-represented in the business unit sample. Given the problem of over-estimating the number of UK-based operating units per business unit, and the benefit of hindsight, it may have been optimal to limit the sampling frame to a narrower industry group (e.g. manufacturing), and to only sample one business unit per operating unit. However, the sample did provide sufficient data to be able to attempt tests of the models provided caution is exercised in interpreting the results. Difficulties with the sample will be considered when the findings of the data analysis are later assessed and discussed in Chapter 9.

4.4 Data Collection Methods

This section will outline the data collection methods used, addressing the challenges presented above (see section 4.2.1), and drawing on the hypotheses to be tested in the study as presented in Chapter 3 (see section 3.3). As outlined above, the eventual design was a two-stage process : interviews were conducted with personnel at the headquarters of 25 business units, and a follow-up questionnaire was sent to general managers of operating units within most of these business units (number of useable questionnaire responses = 95). Here, the choice of these instruments is justified and their design and validation is described. The main options open to the researcher examining programme implementation within organisations are similar to those of any applied social research - record examination, observations, or self-report measures such as questionnaires or interviews (King, Morris et al. 1987). This project utilised primarily self-report data supported by company documentation and other secondary sources.

Record examination was eliminated as a stand-alone possibility at an early stage because records are not necessarily kept of the variables in the study. Even where they are, the records would be so variable between business units that meaningful comparison would be either impossible or extremely time consuming. Asking subjects to keep records specifically for the research would have been too burdensome for the participants, and allow only events after the initiation of the research to be captured. However, some publicly available records such as Annual Reports and Corporate Environmental Reports were useful in operationalising some variables (see for example section 7.3.1 on the use of Annual Reports to access financial information), and were used to provide supplementary background material.

Observations were similarly excluded at an early stage as impractical. A single researcher could not feasibly observe the process of decision making in enough operating units to allow statistical analyses within a reasonable time frame (King, Morris et al. 1987). Access for detailed observations is often difficult to negotiate, especially across many different firms (Easterby-Smith, et al. 1991; Neuman 1994). Observations may have allowed the hypotheses to be explored in a very small sample (one or two operating units), but such a case study would not allow the type of statistical methods crucial to test the hypotheses and make statistical generalisations as argued above (Yin 1994).

Figure 4.6 : Advantages and disadvantages of self-report instruments

	Advantages	Disadvantages
Question-naires	• can be given to many people, at distant sites, simultaneously • cheap to administer • no interviewer bias • impose uniformity on data obtained by asking all respondents same things • can be answered anonymously, in private, in respondent's own time and at respondent's convenience	• low response rates • do not know who fills it in • inflexible - researcher imposes relevant questions (and answers in closed questions) on respondent; no control over question sequence • people often express themselves better orally than in writing • no visual observation possible • open-ended questions are difficult
Interviews	• many types of data can be collected in the same interview • permit flexibility - rapid and immediate responses, probes possible, can pursue unanticipated lines of inquiry, can alter question sequence, misunderstandings can be checked • open-ended questions are feasible • high response rates • know who is responding to questions • can observe the respondent visually • can gain information from illiterate people or non-native speakers	• time-consuming • expensive to administer • interviewer bias • flexibility in responses can make them difficult to analyse and interpret • responses are not anonymous or private • respondent does not have time to think or look for information they require

source : adapted from Brenner (1985), King, Morris et al. (1987), Neuman (1994), Magione (1998).

Self-report instruments, such as questionnaires and interviews, are more practical options, and were therefore examined in more detail for their appropriateness. Figure 4.6 illustrates the main advantages and disadvantages associated with self-report interviews and questionnaires.

4.4.1 Data collection at the business unit level

Interviews were selected to provide the business unit level data. The interview format allowed a structured discussion on the strategic issues that it would be difficult to capture in a pre-designed questionnaire. A discussion with key informants could provide an initial "test" of the existence of phenomena believed to be important for this research (e.g. the importance of organisational slack in environmental decision-making; the existence of different types of environmental visibility).

On a pragmatic note, comments gathered in a semi-structured discussion could be used as an aid in developing appropriate operationalisations of environmental visibility and organisational slack. Interviews also allowed the possibility of requesting access to operating units from the business unit respondent. Finally, a semi-structured discussion did not preclude the possibility of gathering structured survey data at the same time through a short standardised survey instrument.

The interviews conducted with business unit personnel were semi-structured. Interviews can vary greatly from the highly formalised and structured to a free-ranging discussion (Easterby-Smith, Thorpe et al. 1991). A highly formalised and inflexible interview protocol would have negated much of the reason for undertaking interviews in this study. The flexibility to probe and pursue new and interesting lines of inquiry would have been lost, and it might have been more difficult to build sufficient rapport in the interview to ensure access to operating units. On the other hand, a completely unstructured discussion would have yielded data that might be difficult to analyse and interpret, or insufficient coverage of topics across interviews.

A compromise between the two extremes was struck where sufficient structure was maintained to compare the responses of respondents to some core questions, but where there was latitude in the rest of the discussion to explore other areas of interest. Interviewer bias was countered as far as possible by following accepted guidelines for undertaking research interviews (Brenner 1985; Fowler 1990). Respondents were sent a list of issues to be covered in the interview in advance of the meeting to give them time to prepare, and to look for information they required. A very brief (2 sides of A4) standardised questionnaire was sent to respondents about a week before the interview for them to fill in and return to the researcher during the meeting (see Appendix 6). This had the desirable effect of capturing many standardised scale items from the interviewee at the business unit level without taking up time in the interview by verbally administering a series of repetitive questions. It also allowed the researcher to pursue any obvious unusual answers or ask respondents to expand on their answers in the interview. Most of the interview was guided by an interview protocol (see Appendix 3) which listed several key themes which the researcher checked to ensure similar coverage in each discussion.

A series of interviews was planned with senior managers in business units of UK PLCs. Ideally multiple respondents from each business unit would have been interviewed (Easterby-Smith, Thorpe et al. 1991), to minimise single respondent bias and provide a richer picture of environmental decision-making within its organisational context. However, even interviewing two respondents within each business unit rather than one would have had dramatic resource implications, doubling the time required and potentially travel expenses too. Given this trade-off between increased reliability of multiple interviews in each organisation against the increase in cost, it was decided to limit the number of respondents to just one within each business unit. Sufficient resources were available to undertake up to 30 interviews at the respondents' premises at various locations across the UK.

A total of 27 semi-structured interviews, each lasting at least an hour, were conducted with at least one senior manager in each business unit (see Appendix 7 for details of interviewees). Access to the interviews was gained by approaching the Managing Director or CEO by letter. Most respondents were senior general managers in the business units; others included specialists in HSE, Purchasing or Production/Operations. The original intention had been to interview exclusively general managers rather than HSE or Environmental Management specialists. However, it was common for the senior general manager first contacted to forward the request for an interview to the environmental specialists in their business unit.

This meant that some of the interviews conducted reflected the environmental specialists' view of green issues as they fit with more general business strategy, and not the view according to more general senior management. The danger is that environmental managers may overstate the importance of environmental issues in their business given that their role depends on the firm engaging in environmental issues. Environmental managers are, in a sense, the result of organisational environmental responsiveness, and so may not be in a position to discuss the antecedents of such responsiveness. However, in practice, the environmental specialists often provided a more candid view of the environmental responsiveness of the organisation. They were more aware of the responsiveness of other organisations, and could provide a more balanced view of the firm's 'environmental proactivity than general managers who were clearly less well informed.

Although not ideal, this reliance on environmental specialists as key informants is common in environmental management research (e.g. Aragon-Correa 1998; Bansal and Roth 1999). Further, had environmental managers not been deemed suitable interviewees, access to interview in a cross-section of business units would have been much harder (or even impossible) to negotiate in the time period of this study.

All the interviews were undertaken at the respondent's premises and the opportunity was taken to collect secondary material such as Annual Reports, environmental policies, and internal newsletters to support the interview data. All the interviews were taped and then fully transcribed by a commercial office support company (except for two where permission to tape the conversation was declined, and only the interviewer's notes were typed). The qualitative data transcripts were checked for errors, edited and inputted into NUD*IST Version 4. Organising the data in this systematic way greatly facilitated the later data analysis.

4.4.2 Data collection at the operating unit level

Had it been practically feasible to undertake interviews at each operating unit, then this might have been the most appropriate for testing the hypotheses posed. Questionnaires are notorious for yielding only low response rates, a lack of control over who fills the questions in, and their inflexibility (see Figure 4.6). Given that interviews at operating units were not practical, questionnaires provided a cheap way to capture data from many subjects throughout the UK simultaneously. The response rate among operating units was expected to be comparatively high, and knowledge about who filled out the questionnaires adequate, since access to the names of the desired respondents at operating units was given by the business unit respondent.

The questionnaire aimed to draw structured information from the respondents which was as accurate as possible (see Appendix 5 for a copy of the questionnaire). It was therefore designed according to best practice principles advocated by (amongst others), Hague (1993), Fowler (1998), Dillman (1978) and Magione (1998). The design process had two main stages : the development of appropriate construct operationalisations and the design and layout of the physical questionnaire.

As will be described more fully in the empirical chapters on environmental responsiveness (Chapter 5), environmental visibility (Chapter 6) and organisational slack (Chapter 7), the first step in operationalising the various constructs required in the study was to analyse the interview data. Constructs are adequately measured where there is a strong relationship between the empirically grounded indicators (the observable) and the underlying concepts (unobservable) (Blalock 1982; Lewis-Beck 1994). The eventual validity of the research depends on a good match between the constructs used and the concepts they are trying to capture. This match was aided by analysing the interview data to derive guidelines for construct indicators (see for example section 6.3).

A summary of the construct measurements used is provided in Appendix 4. Given that a substantial element of the contribution of this thesis is the refinement, operationalisation and validation of the environmental visibility and organisational slack constructs, detailed discussion of these developments is left to the later empirical results chapters (see section 6.3 for environmental visibility and section 7.3 for organisational slack).

All construct measurements, whether developed specifically for this research or not, were subjected to standard tests of validity and reliability (Lewis-Beck 1994; DeVellis 1997). The details of the validity and reliability characteristics of the various measures will be described more fully in the empirical chapters (see sections

5.3, 6.3, 7.3 and Appendix 4). Here general steps are described which aimed to influence measurement quality and which impacted on the research process. Several techniques were used to increase the validity of measures used. These included consulting colleagues on the appropriateness of measures (see section 6.3 on visibility and section 5.3.2 on environmental initiative implementation), piloting the questionnaire (see below), determining how the question was interpreted by conducting pre-questionnaire interviews, evaluating a measuring technique by comparing the results of it with some other existing measure (e.g. financial measures for organisational slack, see section 7.3.1), and sharpening up the actual questions (e.g. by avoiding the use of long alternatives; not asking double-barrelled questions; not using language which is unfamiliar to the respondents (Dillman 1978; Belson 1986; Converse and Presser 1994)).

Reliability refers to the ability of a measure to produce the same results each time it is repeated on the same thing or situation (Belson 1986; Carmines and Zeller 1994). The most common quantitative measure of reliability is Cronbach's Alpha (Nunally 1978), and this statistic is reported for each of the scales used throughout the empirical chapters and in Appendix 4. Most of the scales exhibited Cronbach Alpha statistics above the conventional reliability criterion of 0.7 (Nunally 1978) and the specific implications of the low reliability of some of these scales will be later addressed in the empirical discussions (see section 9.4.1). It is important to note that as with validity (Bowen 1997), the reliability of the research process extends beyond the quantitative characteristics of individual measures. The reliability of the research process was enhanced as much as possible by undertaking broader steps such as standardised data collection (see Appendices 3, 5 and 6), careful selection of research subjects from the sampling frame (see section 4.3.1) and checking for errors while collating the data (see section 4.4.2).

Having selected appropriate operationalisations for each of the constructs required, these (and others required for the broader ESSCMo project, see Appendix 1) were organised thematically and listed as the basis of the questionnaire. Themes included : basic facts on the operating unit; the respondent; the operating unit within the broader business unit context; the operating unit's economic performance;

environmental issues affecting the unit; local issues and environmental management implementation. Care was taken to ensure that adequate instructions for respondents and codes to aid later data entry were added to the document. Several basic layouts were suggested to the ESSCMo research team, and the final layout was based on a single folded sheet of A3 (i.e. four A4 sides of questions).

In order to refine the design, layout and clarity of the questionnaire, it was pre-tested on a sample of nineteen managers at a regular progress meeting on the ESSCMo research project at the university. As part of a regular ESSCMo Project industry "club" meeting, where representatives from UK organisations met regularly to discuss research results and other issues relevant to the research (see Appendix 1), members were asked to complete the questionnaire as a club benchmarking exercise. Although the Club Members were not formally included as business units in the main study design, their input in pre-testing and scoping issues was invaluable. Two of the respondents were interviewed in detail on their interpretations of some of the questions (Belson 1981). The other responses were analysed to refine the construct measurements designed based on the interview data (see sections 6.3 and 7.3).

Having incorporated these comments, the questionnaires were then piloted in a further five operating units which had had no previous contact with the research[5]. Some changes made were substantive to the way constructs were measured (see for example section 5.3.2 on the introduction of the "planned" category). However, most of the changes were small alterations to the layout, wording and clarity of the questionnaire.

Access to administer the questionnaire to operating units was granted in 22 of the 25 interviewed business units (declined in two cases; inappropriate unit of analysis in one case, see Figure 4.7). In some cases, the questionnaire was administered by the researcher with business unit headquarters backing, in others it was administered internally by the office of the business unit respondent. In both cases, a cover letter

[5] These operating unit respondents not only provided feedback on the questionnaire, but were also interviewed along similar lines to the business unit respondents (see section 4.4.1), in order to explore differences in responses due to different levels of analysis.

was included assuring confidentiality of responses. Follow-up, reminder phone calls and copies of the questionnaire were sent at two week and four week intervals respectively.

Figure 4.7 : Response rates for operating unit questionnaire across nine sub-samples

		Company Size			
		Over 30,000 employees	**5,000 – 30,000 employees**	**Less than 5,000 employees**	**TOTAL**
Ind. Group	**High impact**	• BP plc • Unilever HPCE • *BOC Gases Europe* 11, 8, 73%	• Severn Trent Water • Ellis & Everard (UK) Ltd. 20, 10, 50%	• *KCA Drilling UK Ltd.* • Body Shop (manufacturing) • Brunner Mond (UK) Ltd. 12, 9, 75%	**43, 27 63%**
	Other manufacturing	• EMI Manufacturing (UK) • Unilever FBE 11, 10, 91%	• Specialists Products Division, Meyer • Pilkington plc • BPB Paperboard (UK) • British Gypsum 31, 16, 52%	• Otford Plastics Group • St. Ives plc • Automotive Products Division, Transtec 14, 11, 79%	**56, 37 66%**
	Other non-manufacturing	• Comet Ltd. • Halfords Ltd. • Nat West UK • Do It All Ltd. 10, 8, 80%	• Slavesen Logistics • *Civil Engineering Division, Alfred McAlpine* 13, 12, 92%	• Bellway plc • Body Shop (retailing) 16, 11, 69%	**39, 31 79%**
	TOTAL	**32, 26, 81%**	**64, 38, 59%**	**42, 31, 74%**	**138, 95 69%**

Note : Business units in italics declined to participate in the operating unit questionnaire. Numbers presented are : questionnaires sent, completed questionnaires returned, response rate.

Of the 138 sets of questionnaires sent out in the 22 business units, 95 useable general manager questionnaires were eventually returned (a response rate of 69%). The response rate within individual business units ranged from 30% (Severn Trent Water) to 100% (Unilever FBE, St. Ives plc). The high overall response rate, which is comparable with other studies using a similar data collection approach (e.g. Gupta 1987), was achieved due to the use of the interviewee to gain correct names and addresses of respondents, and their willingness for their name to be used in the cover letter to potential respondents. Figure 4.7 illustrates the response rates for the questionnaire over a variety of sub-samples and shows that there were no systematic differences in response rates across industry groups or company size. Non-response bias will be examined more closely in the next chapter, where the environmental responsiveness and organisation size of the final sample and intended population will be compared (see section 5.4).

Data from all the returned questionnaires was initially inputted into a spreadsheet program. Ten of the questionnaires were randomly selected, and the original question answers checked against the inputted data by another member of the ESSCMo project team. The inputting error rate on this sample was found to be less than 1%. The operating unit data was matched with the standardised questionnaire data gained at the business unit level, was formatted and exported into SPSS Version 10.0 for Windows. The final data analysis was conducted on two separate databases – one containing only the business unit data (n = 25), and one with the operating unit responses matched with their business unit and / or corporate parent data (n = 95).

4.5 Chapter Summary

This chapter has described and justified the sample and survey methodology employed. The hypotheses were tested in a multi-organisational, multi-level, cross-sectional framework. The final samples consisted of 25 business units and 95 operating units drawn from within those business units. Interviews at business unit level (supplemented by a brief standardised questionnaire), and a mail survey at operating unit level were the main data collection instruments.

Some of the limitations of the study design were highlighted, and will be discussed further in the light of the study's findings in Chapter 9. Non-response bias, however, was left to the next chapter which will examine the basic relationships between organisation size and environmental responsiveness and compare the sampled companies' characteristics in these variables with the intended population.

Chapter 5 : Organisation Size and Environmental Responsiveness : Measurement, Sample Characteristics and Initial Analysis

5.1 Introduction

This chapter will examine the direct relationships between organisation size and environmental responsiveness as revealed in the current sample. It will build on the previous literature as outlined in Chapter 2, and will provide the basis for the more detailed examination of this study's hypotheses on visibility and organisational slack in the following three chapters. The aims of this chapter are threefold :

- To develop appropriate operationalisations for corporate and operating unit size, and environmental responsiveness based on previous literature, the aims of this study and the current sample's characteristics.
- To assess non-response bias in this study by comparing this sample's organisation size and environmental characteristics with the intended broader population.
- To undertake a preliminary investigation of the relationships between the measures of size and environmental responsiveness as a replication of previous studies and to set the scene for the later more detailed empirical analyses.

The chapter addresses each of these aims in order, and begins with assessing alternative operationalisations of the two main sets of variables : size and environmental responsiveness. These are then used to compare the characteristics of the current sample with the intended population, and to assess the extent of any non-response bias in the business unit and operating unit samples. The chapter concludes with some initial analyses which assess the basic relationships between size and environmental responsiveness as a prelude to the more detailed tests of the hypotheses on slack and visibility in the next three chapters.

5.2 Measures of Size in Organisations

The meta-analysis in Chapter 2 listed the operationalisations of size used in previous empirical environmental management studies (see section 2.4). The measures correspond to those used in the broader literature (Pugh, Hickson et al. 1969; Donaldson 1996), and as Figure 5.1 indicates, they included measures both at the corporate and sub-unit level. This section will address which of the measures are most appropriate for this study, and develop operationalisations of size at the corporate and operating unit levels.

Figure 5.1 : Operationalisations of Size used in previous environmental studies

Corporate Level	Operating Unit Level
Number of employees	Number of employees
Number of employees (log)	Number of employees (log)
Annual turnover	Annual turnover
Annual turnover (log)	Annual turnover (log)
Annual sales revenues (3 year average)	Production output
Capital employed / Total assets	Plant capacity
Production output	
Total capacity	

Source : meta-analysis presented in Chapter 2 (see Figure 2.1)

5.2.1 Total organisation size : the corporate level

Measures based on number of employees were chosen to capture organisation size. Measures based on total production output and total capacity were eliminated at an early stage since data was not consistently available across the cases, and since it was difficult to compare production output or capacity levels in business operations as diverse as oil production, printing and retailing. The remaining measures of size were compared by using data from the corporations in the final sample (n = 20), in order to assess whether size appears to be a uni- or multi- dimensional construct in this sample (Donaldson 1996). Data on number of employees, annual sales (in previous three years) and total assets were gathered from corporate annual reports. Figure 5.2 presents the correlations between the six remaining measures in the sampled corporations.

All the measures are significantly correlated at the 0.05 level, and 12 of the 15 correlations are highly significant ($p < 0.01$). The average correlation of 0.68 is consistent with Donaldson's (1996) reinterpretation of Lioukas and Xerokostas' (1982) and Hopkins' (1988) studies : there seems to be a high and consistent level of intercorrelation between the variables, especially given the broad confidence intervals on the coefficients given the low sample size. Given the generality of size and its uni-dimensional nature in this sample, only one indicator of size needed to be selected from among the six remaining candidates.

Figure 5.2 : Correlations between measures of corporate size

	1.	2.	3.	4.	5.	6.
1. Turnover	1.00					
2. Turnover (log)	0.80** (0.00)	1.00				
3. Turnover (3 yr. avg.)	0.79** (0.00)	0.55** (0.00)	1.00			
4. Employees	0.76** (0.00)	0.74** (0.00)	0.58** (0.00)	1.00		
5. Employees (log)	0.67** (0.00)	0.92** (0.00)	0.48* (0.02)	0.79** (0.00)	1.00	
6. Total Assets	0.70** (0.00)	0.54** (0.01)	0.95** (0.00)	0.44* (0.03)	0.45* (0.03)	1.00
Average correlation	*0.74*	*0.71*	*0.67*	*0.66*	*0.66*	*0.62*

Source : data from Company Annual Reports. n = 20.

Even with the overall empirical similarity among the size variables, it may still be preferable to use certain measures from a theoretical point of view. The different measures may be more appropriate for capturing different effects of size on environmental decision-making. Capacity measures, for example, might capture economies of scale in compliance, whereas employment measures reflect a firm's political power (Gray and Deily 1996). Turnover might reflect the increased absolute revenue potential of incorporating environmental demands (Aragon-Correa 1998), and assets might address the lower marginal risk of undertaking environmental investments in large firms.

Given the aims of this study, an employee-based measure was selected as most appropriate. Employee measures best capture the visibility effects of size through the importance and visibility of large employers at both the corporate and local levels. Employee measures might also reflect the organisational slack aspect of size as employment numbers may be more sticky as output alters compared with, say turnover. In slack periods, output may decrease, but employee numbers remain static (at least in the short term), yielding more non-financial slack. Thus employee-based measures best capture the effects of size on environmental responsiveness which are the focus of this study, and when used should provide the best test of whether size, visibility and slack can be empirically separated.

Initial tests showed that the sampled business units were not normally distributed by either using number of employees or its logarithmic transformation. This is not unexpected, given the small number in the sample. Therefore, an alternative approach was taken during the data analysis of separating the business units into three groups according to their number of employees. The nine largest business units (> 30,000 employees) were also members of the FTSE 100 group (see section 5.4.1). Equally dividing the remaining 16 business units entailed a cut-off point of 5,000 employees. The business units were thus allocated into three groups according to the size of the corporate whole :

- Small corporations : Number of employees less than 5,000
- Medium corporations : Number of employees greater than 5,000, but less than 30,000
- Large corporations : Number of employees greater than 30,000

5.2.2 Sub-unit size : the operating unit level

An employee-based measure of size was also used at the operating unit level. The logarithmic transformation of employee numbers was used for three reasons. The first reason is theoretical : while environmental responsiveness may increase with size, this increase may taper off as size increases so that initially large increases become smaller increases. This would suggest a curvilinear relationship between size and environmental responsiveness similar to that exhibited between size and many other organisational phenomena (e.g. Blau and Schoenherr 1971 on administrative intensity). Thus transforming size logarithmically better reflects the underlying phenomenon.

The second reason is empirical : using a logarithmic transformation to represent a curvilinear relationship greatly simplifies data analysis and discussion, because the relationship becomes linear when it is transformed logarithmically. The third reason is pragmatic : the logarithmic transformation of number of employees exhibits the best measurement characteristics of the available options for this research (see Figure 5.3).

Figure 5.3 : Descriptive statistics of Operating unit Size

Statistic	Turnover	Turnover (log)	Employees	Employees (log)
Mean	64,880,875	16.84	406	4.67
Median	24,000,000	17.01	110	4.70
Std. Dev.	103,974,909	1.75	1095	1.66
Skewness	2.50	-0.39	5.22	-0.05
Kurtosis	5.71	-0.40	28.65	-0.16

Source : operating unit questionnaire data, questions Ia and Ib (see Appendix 5). n = 95.

Figure 5.3 indicates that both operating unit turnover and number of employees were substantially positively skewed, with a large difference between the mean and median in each case, and very high skewness and kurtosis statistics. The measure with the distribution closest to normal was the log of number of employees (skewness and kurtosis both close to 0). This measure was highly significantly correlated with all the other measures (all at $p < 0.001$), and is also the sub-unit measure of size most used in the previous empirical studies (see section 2.4). Log of number of employees was therefore accepted as the most appropriate operationalisation of organisation size at the operating unit level.

5.2.3 Summary of measures of size

In summary, business units were allocated to groups according to whether their corporate whole was small (employees < 5,000), medium (employees between 5,000 and 30,000) or large (employees greater than 30,000). The size of operating units was represented by the log transformation of the number of employees at the site.

5.3 Measures of Environmental Responsiveness

The Chapter 2 meta-analysis reviewed the measures of environmental responsiveness used in previous environmental management studies. Three main categories of measures were identified : measures of environmental strategy, measures based on environmental initiative implementation and measures of environmental impact. The latter category of measures were not used in this study. Environmental impacts are notoriously difficult to evaluate and compare even within one industry, requiring large amounts of high quality information and assumptions about appropriate combinations of emissions (King and Lennox 2000; Lankoski 2000). Given the paucity and format of such data in the UK, attempting such a measure in a cross-sectional framework would have been prohibitively costly in research time, and would even then have had dubious validity.

This study focuses instead on measures of corporate environmental strategy and of environmental initiative implementation which are applicable across differing industrial activities. The next two sections will describe the development of environmental strategy and implementation measures at first the business unit and then the operating unit level.

5.3.1 Environmental responsiveness : the business unit level

The meta-analysis identified environmental strategy-based measures which relied on third party rankings and others which were responses to questions on perceived environmental proactivity (see section 2.4). In the early part of this project, much time was spent trying to identify third party sources of environmental information in the UK. This would have allowed measures of environmental responsiveness strategies based on independent rankings of firms' behaviour to be used in this study. Unfortunately, such sources were not well established or developed, and were limited in scope by the companies included, the questions posed of organisations or researcher access.

The two most promising sources were the *Index of Corporate Environmental Engagement* compiled by SustainAbility and published by Business in the Environment (Business in the Environment 1996, 1997) and the Ethical Investment Research Service's database held in London (Ethical Investment Research Service 1998). At the time these indices were investigated, the SustainAbility Index asked ten questions to the FTSE 100 companies on their environmental management activities. They included issues such as whether companies had written corporate environmental policies, had board members with specific environmental management responsibilities, or publicly available corporate environmental objectives. The index would have been a useful source of third party environmental strategy ratings, but was limited to only 72 of the FTSE 100 companies, and at the time was not well established or validated. It did not contain all the appropriate data necessary to rate the corporations or business units in this sample according to their environmental strategy.

The EIRIS database covers around 1,100 UK companies whose activities are measured against a wide range of ethical criteria (Ethical Investment Research Service 1998). Environmental criteria include whether company groups have a public environmental statement, have been accredited under the Energy Efficiency Accreditation Scheme, or have made clear that they have sponsored conservation projects in the UK in the last few years. Given the broader sample of the EIRIS database, it was a more promising source for third party environmental ratings. However, it was not possible to gain access to the database for research purposes during the necessary time period for this project. Despite being appropriate, this source was not available to the researcher.

Given the lack of appropriate and available third party rankings in the UK, perceptual scales of business unit environmental proactivity were investigated. At the time, few such scales had been developed, and so a new measure was designed for this study. The first operational step in scale design was to generate a series of items intended to capture various aspects of the construct (Spector 1994). Conceptual papers such as Hunt and Auster (1990) and Roome (1992) outlined the theoretical characteristics of environmentally responsive organisations and provided some suggested indicators for environmental proactivity. These indicators were then pre-tested on a group of managers attending a research meeting at the university (see section 4.4.2) to establish face and content validity. A list of twenty shortlisted indicators were later administered to the same group as an environmental proactivity benchmarking exercise. The twenty indicators were reduced to five key indicators by analysing correlations between them.

Thus, the final measure of business unit environmental proactivity used in this project was a five item, seven point Likert scale derived from the literature on corporate environmental strategies (see Figure 5.4). The scale had high reliability (α

= 0.84), and acceptable distribution, skewness and kurtosis characteristics. Notably, many of the studies published since the questionnaire was designed have derived scales of environmental proactivity based on similar questions (see for example Ahmed, Montagno et al. 1998; Judge and Douglas 1998; Henriques and Sadorsky 1999; Sharma 2000), indicating that the current study aimed to capture similar environmental responsiveness to those reviewed in the meta-analysis.

Figure 5.4 : List of Items used in the Business Unit Environmental Proactivity scale

Business Unit Environmental Proactivity
We always attempt to go beyond compliance with laws and regulations on environmental issues
Our corporate management gives a high priority to environmental issues
The top managers in our business unit give environmental issues a high priority
We lead our industry on environmental issues
We effectively manage the environmental risks which affect our business

Source : items on business unit and operating unit questionnaire. 7-point Likert scale "strongly agree" to "strongly disagree". All items recoded so a high score reflects higher corporate environmental proactivity.

It had been originally intended to supplement the "business unit environmental proactivity" scale, which is strategic in spirit, with measures of environmental implementation at the corporate level. During the interviews, each business unit respondent was asked whether they had any specific initiatives which were designed to be implemented across the entire group (see interview protocol, Appendix 3). The outcome of this line of enquiry was disappointing. Most interviewees responded with a copy of their corporate environmental policy, while some others outlined some specific initiatives which have been implemented at only some of their plants[1].

Neither of these were useful for operationalising the implementation of environmental initiatives at the corporate level : the environmental policy statement is at best a statement of strategic intent, and not an indicator of implementation (see section 2.3.2); and implementation of initiatives at some operating units cannot be considered as corporate implementation (see sections 2.3.2 and 3.2.6). Therefore,

[1] This may also add support to the view that environmental policies and strategie are designed at the business unit level, whereas initiatives are implemented at operating units.

although a measure of implementation at the corporate level was attempted, no measure was ultimately available in this data.

5.3.2 Environmental responsiveness : the operating unit level

At the operating unit level, measures were required for both proactivity of the corporate environmental approach and for actual implementation of specific environmental initiatives. The first of these was captured by simply replicating the questions asked of the business unit respondents on environmental proactivity (see section 5.3.1 above) on the operating unit questionnaire. This measure would provide the operating unit general manager's perception of the extent to which their business unit surroundings could be considered "environmentally responsive".

Total Implementation of Environmental Initiatives

To complement the more strategic scale, measures were required of implementation of environmental initiatives. As with corporate environmental proactivity above, very few empirical studies which reported implementation measures had been published when this survey was being designed. In order to develop a summary scale of environmental initiative implementation, environmental initiatives listed in Sharma and Vredenburg (1998), Baylis et al. (1997) and Aragon-Correa (1998) were used as a basis for scale development and were subjected to the same procedure as for corporate environmental proactivity (see section 5.3.1). Managers attending the research meetings rated their firm's performance on the various initiatives, and the list was reduced to a more manageable number of items by rejecting redundant items or items which were not potentially applicable to all operating units.

The final scale for total environmental initiative implementation contained a sample of seventeen initiatives derived from previous environmental management studies (e.g. Sharma and Vredenberg, 1998; Bayliss, Connel and Flynn 1997) (see Figure 5.5). For each item, respondents were asked whether they had implemented the item, given the response choices "yes", "planned" or "not planned". Since the focus was on implementation rather than environmental strategy or approach, such a choice presented better face and construct validity than the Likert scales used for similar questions in other studies (see for example Aragon-Correa 1998).

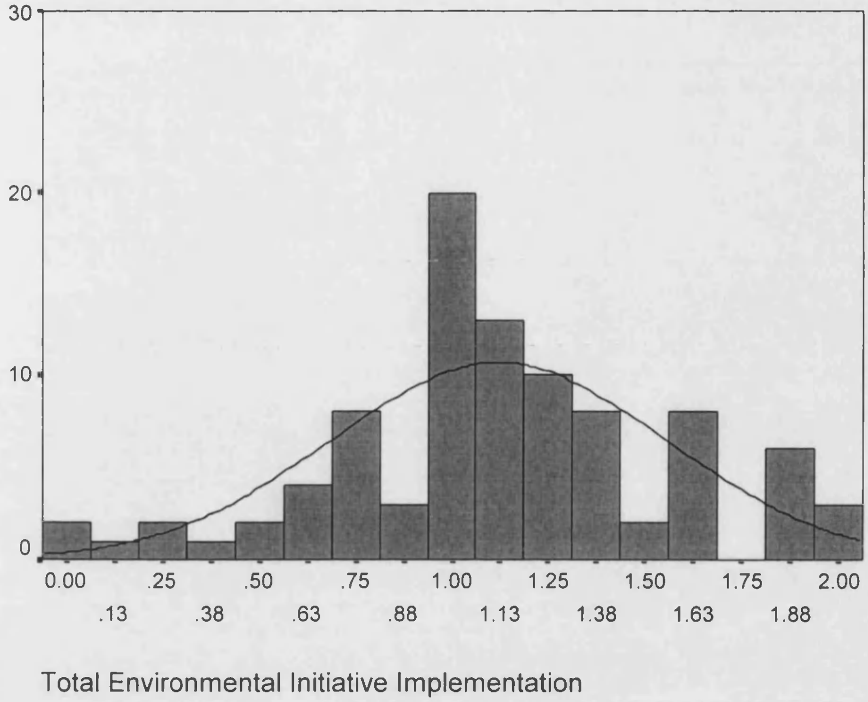
Figure 5.5 : List of Items used in the Environmental Initiative Implementation scale

Have any of the following environmental initiatives been implemented at your site that are NOT required by current laws or regulations?
Improved housekeeping
Waste management and reduction
Recycling programmes
Environmental audits
Reduction in the use of raw materials
Reduction in packaging
Energy efficiency measures
Emission reduction
Employee environmental training programmes
Disclosure of environmental impacts
Certified EMS
Producing / selling less environmentally damaging products
Environment-related supplier initiatives
Research programmes for environmental improvement
Conservation activities in the local area
Stakeholder partnerships for environmental preservation
Use of alternative fuel resources

Source : items on operating unit questionnaire. Categorical answers "yes"(scored 2), "planned"(scored 1) or "not planned"(scored 0). Total environmental initiative implementation score was an average score across all initiatives for each operating unit.

The middle category "planned" was added in response to the pre-test which indicated the pitfalls of socially desirable responding. Pre-test participants revealed that they were inclined to either claim that they had implemented an initiative when they were still only planning it, or to leave the item blank altogether rather than admit that they had not implemented it. The piloting suggested that the "planned" response allowed a compromise answer in both these situations, and improved both the percentage of respondents giving a response to the item, and the likelihood that they answered it truthfully (in the pretest). The final questionnaire responses were distributed across the three categories, indicating that respondents did not treat the question as dichotomous ("planned" and "implemented" only).

Figure 5.6 : Histogram of Total Environmental Initiative Implementation scores



Source : Operating unit questionnaires (n = 95).

The total environmental initiative implementation score for each operating unit was calculated by scoring 2 for each "yes" answer, 1 for "planned" and 0 for "not planned", and averaging across initiatives for each unit. Reliability (α = 0.86), skewness (-0.13) and kurtosis (0.20) of the total implementation variable were within acceptable limits (see Figures 5.6 and 5.8). Thus scoring environmental initiative implementation in this way yielded a measure with sufficient variance, and an appropriate distribution to be used in the later parametric tests.

Implementation of Specific Types of Environmental Initiatives

Due to the potentially different effects of organisational slack and visibility on different types of environmental initiatives (see section 3.2.7), measures were required of sub-sets of environmental initiatives. Specifically, initiatives needed to be identified that could be considered "clean technology initiatives", "materials-reducing initiatives" and "stakeholder relations initiatives". A formal factor analysis could not be conducted as in similar studies (e.g.Aragon-Correa 1998) due to the categorical answers received on each of the initiatives (i.e "yes", "planned" and "not planned"). A trade-off was made between the increased validity of the responses with categorical answers and the ability to formally attribute the initiatives into types based on the underlying structure of variance as in factor analysis.

Instead, two expert judges were asked to allocate each of the initiatives into one of the three categories of initiatives and "other". Both judges were environmental management researchers familiar with the language used by practitioners and academics on environmental issues. As Figure 5.7 indicates, there was a very high level of agreement between the two separate sets of expert allocations and the independently decided upon factors for this study.

Figure 5.7 : Expert Allocation of Initiatives

	Materials-Reducing	Stakeholder relations	Clean Technology	Other
Materials-Reducing				
Improved housekeeping	X			O
Waste management and reduction	O X			
Recycling programmes	O X			
Reduction in the use of raw materials	O X			
Reduction in packaging	O X			
Stakeholder Relations				
Conservation activities in the local area		O X		
Stakeholder partnerships for environmental preservation		O X		
Employee environmental training programmes		X		O
Disclosure of environmental impacts		O X		
Environment-related supplier initiatives		X		O
Clean Technology				
Use of alternative fuel resources			O X	
Research programmes for environmental improvement	X		O	
Other				
Producing / selling less environmentally damaging products	X			O
Energy efficiency measures			X	O
Emission reduction			X	O
Certified EMS		X		O
Environmental audits		X		O

Source : expert allocations of initiatives into types. X and O represent the allocations of the two experts. Initiative titles are grouped by a priori factor allocation by the researcher.

The main area of controversy, followed up in a conversations with the judges, was on the definition of stakeholder relations initiatives. One judge ("X") gave a broader interpretation of stakeholder initiatives than the other, including employees and suppliers as stakeholders as well as the more usual local residents, pressure groups etc. Both of these interpretations are valid, and so both were retained as alternative measures of stakeholder relations initiatives in the next section. The "broad" measure includes all five stakeholder relations indicators, whereas the "narrow" measure includes only the three that both judges agreed upon.

Scores for each of the types of environmental initiatives were individually calculated using the same method as for the total environmental initiative implementation score. In each case, this yielded an ordinal scale score, but each scale was deemed to have sufficient dividing points to be treated as interval[2]. Full descriptive statistics are provided in Figure 5.8. The only measure which exhibited unsatisfactory measurement characteristics (high skewness and kurtosis and low reliability) was the narrow conception of stakeholder relations. For this reason, despite the disagreement among the expert judges in grouping the initiatives, only the broad stakeholder relations measure was used in the main empirical analyses.

Figure 5.8 : Descriptive statistics for the environmental initiative scales

Statistic	Total	Materials -reducing	Stakeholder relations (narrow)	Stakeholder relations (broad)	Clean Technology
Mean	1.12	1.55	0.38	0.76	0.39
Median	1.12	1.67	0.00	0.67	0.00
Std. Dev.	0.43	0.47	0.62	0.57	0.61
Skewness	-0.13	-0.26	1.48	0.72	1.39
Kurtosis	0.20	1.11	1.12	-0.06	0.91
Reliability	0.86	0.72	0.39	0.76	0.71

Source : operating unit questionnaire data. n = 95.

[2] The number of dividing points in a categorical scale required to approximate and treat the scale as interval is essentially arbitrary. However, the decision to do so here was based on pragmatic grounds – had the scales been strictly treated as categorical, there would have been insufficient observations within each group to conduct many of the following analyses (given the total sample size of only 95). Treating the scales as interval, although not strictly statistically correct, broadened the available analyses which could be conducted.

Figure 5.9 : Correlations between measures of environmental initiative implementation

	1.	2.	3.	4.
1. Total Implementation	1.00			
2. Materials-reducing	0.83** (0.00)	1.00		
3. Stakeholder relations (broad)	0.83** (0.00)	0.47** (0.00)	1.00	
4. Clean Technology	0.52** (0.00)	0.45** (0.00)	0.27* (0.01)	1.00
Average correlation	*0.73*	*0.58*	*0.52*	*0.41*

Source : data from operating unit questionnaire. n = 95.

As Figure 5.9 indicates, all the scales for environmental initiative implementation were significantly correlated with each other (all except for one correlation at $p < 0.01$). The correlations, although strong, were not perfect, especially among the types of initiatives (average correlation = 0.50) rather than between individual initiative types and total implementation (average correlation = 0.73). Whether the variation in correlations can be explained by other variables in the model, such as organisational slack and visibility, remains an empirical question, and will be explored in later chapters (see Chapters 6, 7 and 8).

5.3.3 Summary of measures of environmental responsiveness

In summary, measures of environmental responsiveness at the business unit and operating unit level were developed for this study. In the absence of adequate third party ratings, a five-item scale was derived to capture the extent of corporate environmental proactivity at the business unit level. This strategic measure was complemented at the operating unit level by scales indicating the extent of overall environmental initiative implementation and of the implementation of materials-reducing, stakeholder relations and clean technology initiatives. The measurement characteristics of all these variables were illustrated, and they were adopted as appropriate for use in the main empirical sections of this study.

5.4 Comparing Sample and Population Characteristics

The sample of business units selected was stratified by industrial activity in order to ensure efficiency of estimates for individual groups (see section 4.3.1). During this process, much care was taken to compare the industrial activities of business units in the sample compared with the broader population. The sampling strategy did not explicitly monitor the size or environmental characteristics of units included in the sample. Further, some business units were selected from the sampling frame, but declined to take part in this study. This could have the effect of systematically excluding business units with particular characteristics, thus introducing bias into statistical estimates. The aim of this section is to compare the two characteristics of central importance to this study, organisation size and environmental responsiveness, between units included in the final sample and the intended population. The section will lead to a later assessment of non-response bias and broader generalisability of results (see section 5.4.5).

5.4.1 Corporate size

Unfortunately, data on corporate turnover[3] was not readily available for the entire sampling frame of the FTSE All Share Index. The final sample could not therefore be compared with the intended population directly. Comparing the size of responders and non-responders to the request for interview revealed a significant difference in the mean annual turnover between groups (at $p < 0.01$; see Figure 5.10). Given the similar median annual turnover levels and the smaller standard deviation in the non-responder group, it appears that the responding group contained some outlying very large corporations which raised the mean to a very high level (note that the responder group also exhibits higher skewness and kurtosis than the non-responder group).

Figure 5.10 : Descriptive Statistics of Corporate Size in Responders and Non-Responders

Statistic	Responders (£m)	Non-responders (£m)
Mean annual turnover	6,133	2,145
Median annual turnover	1,215	916
Std. Dev. of annual turnover	11,867	9,543
Skewness	2.45	1.15
Kurtosis	4.92	3.57
N	25	65

Source : Company Annual Reports

[3] Although the main data analyses were conducted with measures based on employees, the non-response and initial analyses reported here used turnover-based measures. This was for convenience reasons, where data on turnover is more easily accessible than data on number of employees, and should not affect results since size is a uni-dimensional construct in this sample (see section 5.2.1).

In order to examine the proportion of very large corporations in the sample and population, the proportion of FTSE 100 companies (i.e. the very largest corporations) was compared between the responders, non-responders and FTSE All Share companies. As Figure 5.11 indicates, the final sample of responders had a significantly higher proportion of FTSE 100 members than either the non-responders or the FTSE All Share sampling frame ($p < 0.01$). Even when this calculation is made on a corporate ($n = 20$), rather than a business unit basis ($n = 25$), to take account of the two units from very large corporations (see section 4.3.1), there are still significantly more FTSE 100 members in the sample than in the intended population or the non-response group.

Figure 5.11 : Proportion of FTSE 100 companies in group

Group	Number of group members	Number in FTSE 100	FTSE 100 proportion
Responders	25	9	36.0%
Non-responders	65	2	3.1%
FTSE All Share	1146	100	8.7%

Source : list of FTSE 100 companies in 1996 and group lists.

The sample, then, is significantly biased towards larger corporations. Members of the FTSE 100 group were more likely to respond to the initial request for interview than the smaller, non-members. This is not surprising given this study's perspective that more visible firms are more likely to be responsive on environmental issues (see section 3.2.3). Indeed, FTSE 100 membership turns out to be a good indicator of corporate organisational visibility (see section 6.3). However, this bias needs to be borne in mind when conclusions are later made, and results generalised to a broader population.

5.4.2 Environmental responsiveness

Since environmental engagement has been identified as a main reason for non-response in environmental studies (e.g. Welford 1994), potential business unit non-response bias was examined by comparing the environmental performance or engagement of the response companies with those of the non-response companies.

The ideal method to assess non-response bias would have been to gain access to the Ethical Investment Research and Information Service's (EIRIS) database on the environmental performance of companies outlined above (see section 5.3.1). EIRIS categorises all FTSE All Share company groups according to a few simple environmental criteria as part of its assessment of the ethical performance of companies. If access to the database could have been gained, a complete listing of the environmental performance of all respondents and non-respondents would have been available. They could then have been directly compared to assess non-response bias. Unfortunately, access to the database was not available, so a direct comparison of the environmental performance of the responding and non-responding companies was not possible.

A fallback method was devised to compare the basic environmental engagement of business units which participated in the study with those which did not. All 90 of the business units sampled (whether initially agreeing to the interview or not) were subsequently telephoned and asked two simple questions on their environmental performance (see Figure 5.12). The questions were required to be pertinent to the environmental performance/engagement of the company, and to be quick and easy to ask and respond to on the phone by a non-environmental expert. The two questions were selected from The *Index of Corporate Environmental Engagement* which had the additional benefit of allowing comparison with published results from the FTSE 100 (Business in the Environment 1996) (see section 5.3.1). While the FTSE 100 does not correspond exactly with the sampling frame used (see section 4.3.1), it does provide a useful reference point for assessing non-response bias. The questions were answered variously by representatives from environmental management, HSE, public relations, accounting and personnel departments. Figure 5.12 compares the basic environmental responsiveness of respondents with non-respondents among the business units and with the reported FTSE 100 results.

On first sight, the non-responders seem not to have introduced written corporate policies to the same extent as either the responders or the FTSE 100 companies. However, when the "Don't Know / Declined to answer" category is eliminated these differences turn out to be non-significant ($p > 0.05$). The differences are much more marked for published environmental objectives. Again, eliminating the "Don't know / Declined to Answer" category, the non-responders are significantly less likely to publish environmental objectives than either the FTSE 100 comparison group or the responders ($p < 0.05$).

Figure 5.12 : Environmental responsiveness of the business unit sample

	respondents (n = 25)	non-respondents (n = 65)	FTSE 100 companies (n = 100)
Q1. "Does your company have a written corporate environmental policy?"			
Yes	23 *(92.0%)*	41 *(63.1%)*	64 *(64%)*
No	2 *(8.0%)*	8 *(12.3%)*	9 *(9.0%)*
Don't know / Declined to answer	0 *(0%)*	16 *(24.6%)*	27 *(27.0%)*
TOTAL	25 *(100.0%)*	65 *(100.0%)*	100 *(100.0%)*
Q2. "Does your company have publicly available environmental objectives?"			
Yes	18 *(72.0%)*	20 *(30.8%)*	47 *(47.0%)*
No	7 *(28.0%)*	29 *(44.6%)*	26 *(26.0%)*
Don't know / Declined to answer	0 *(0%)*	16 *(24.6%)*	27 *(27.0%)*
TOTAL	25 *(100.0%)*	65 *(100.0%)*	100 *(100.0%)*

Source : Telephone requests for information (see text). FTSE 100 data is taken from Business in the Environment (1996). Each cell contains number of companies *and (proportion).*

While the non-responders are as likely as the responders to possess a corporate environmental policy, they are less likely to have translated this stated commitment into published actions[4]. The meta-analysis in Chapter 2 highlighted the importance of considering environmental strategy and environmental implementation as separate, though potentially linked, dimensions. Comparisons of the responders, non-responders, and the FTSE 100 reference group made here suggest that there is not a non-response bias problem when assessed with a measure of environmental strategy, but that the depth of commitment as captured by a measure of implementation does vary between responders and non-responders. Care should be taken in generalising the findings on environmental initiative implementation because the business units in the sample are more likely to implement such initiatives than units in the intended population (see section 9.4.1).

5.4.3 Operating unit size

No data was readily available on the organisation size or environmental responsiveness of operating units in the population. Therefore, a series of questions was asked in the operating unit questionnaire to aid in the assessment of non-response bias within the operating unit sample (see questions IIIb1, IIIb2 and IIIa on the operating unit questionnaire, Appendix 5). Operating unit respondents were asked to compare their own unit's size with sister units in the same business unit. Potential answers ranged on a five point scale from "much smaller" (scored 1) to "much larger" (scored 5). If there is no non-response bias in the sample according to size of the units, then the responses to this question should be normally distributed across operating units, with a mean score close to 3 ("about the same size").

[4] It is notable that there is not a significant difference between the propensity of the responders to publish environmental objectives and that of the FTSE 100 group ($p > 0.05$), but there is between both of these and the non-responders ($p < 0.05$). This might imply that the non-responders have a particularly low likelihood of publishing environmental objectives compared with the overall population. Noting that the FTSE 100 was only an approximation to the initial population (the FTSE All Share Index) helps resolve this issue – the FTSE 100 are the largest 100 companies in the FTSE All Share. Given the focus of this thesis, it is not surprising the environmental engagement of the FTSE 100 might be higher than for companies in our sampling frame, which includes all of the 1100 largest publicly listed companies (which are on average smaller, less visible, have fewer resources etc.).

Figure 5.13 : Descriptive statistics of operating unit size, sales performance and profitability

Statistic	Size relative to other units in business unit	Sales performance relative to business unit expectations	Profitability relative to business unit expectations
Mean	3.29	3.75	3.46
Median	3	4	3
Std. Dev.	1.28	1.49	1.49
Skewness	-0.25	0.11	-0.05
Kurtosis	-0.67	-0.71	-0.72

Source : operating unit questionnaire data. n = 95. Relative size is measured on a 5 point scale. Sales performance and profitability measured on a 7 point scale. All scales recoded to show a positive scale (see text).

As Figure 5.13 indicates, the distribution of operating unit relative sizes in the sample was approximately normal (skewness = -0.25, kurtosis = -0.67), with a mean of 3.29 and a median of 3 (i.e. "about the same size"). This would imply that the operating units which responded to the questionnaire represented a cross-section of unit sizes within each of the business units included. There is no evidence of non-response bias according to unit size within the operating unit questionnaire sample. This does not disallow the possibility of a broader bias where the business units themselves have smaller or larger operating units than the average across the business unit population. However, given that there is no theoretical reason to expect such a broader bias, and that the evidence on operating units within the sample is satisfactory, it is concluded that there is no evidence of non-response bias based on operating unit size in this study.

Figure 5.13 also reports the descriptive statistics from two further questions on the questionnaire on the sales and profitability performances of operating units included in the sample. Although not directly related to whether there is non-response bias based on operating unit size, they do give an indication of the variability of sales and profit performance across the operating unit sample. Operating unit respondents were asked to rate their operating unit's sales and profitability performance against their business units' expectations on the scale "much better" (scored 7) to "much worse" (scored 1). As Figure 5.13 indicates, both of these measures showed that the sample included an acceptable degree of variation in these indicators, with means and medians near the centre of the scale. The units were distributed approximately normally, with skewness and kurtosis statistics less than 1. This implies that there is no systematic tendency for only successful units (in sales or profit performance) to respond to the questionnaire.

5.4.4 Operating unit environmental responsiveness

As with operating unit size, no data was available on levels of environmental responsiveness across the intended population of operating units. This made it impossible to compare the environmental responsiveness of the sample with the population to assess non-response bias directly. Therefore, a similar approach to that with organisation size above was followed. The operating unit respondents were asked a similar question on the environmental performance of their unit relative to their business unit's expectations (see question IIIb3 and Figure 5.14). Although the responses show acceptable characteristics (mean and median close to centre of scale, skewness and kurtosis both less than 1), this only shows that a certain distribution of responses was received within the sample, and not that this distribution matched the broader population.

A question from a different section of the questionnaire enables a partial comparison of the operating units which responded to the questionnaire with other units in the same business unit which may not have responded (see question VIIIb4 on the operating unit questionnaire). Operating unit respondents were asked whether they had been required to implement a business unit environmental policy in the last two years (question VIIIb). Those which answered "yes" (n = 63) were then asked whether they agreed that they had implemented the policy more effectively than their sister units ("strongly disagreed" scored 1 to "strongly agreed" scored 7). The responses were approximately normally distributed with a mean score of 3.92 and median of 4. Of the units which were required to implement an environmental policy, then, there was an acceptable variability in the effectiveness of implementation relative to other sister units in the business units sampled.

Figure 5.14 : Descriptive statistics of operating unit environmental responsiveness

Statistic	Environmental performance relative to business unit expectations	Implementation of environmental policy relative to sister units
Mean	4.08	3.95
Median	4	4
Std. Dev.	1.11	1.14
Skewness	0.31	-0.50
Kurtosis	-0.19	-0.72
N	95	63

Source : operating unit questionnaire data. Measured on a 7 point scale and recoded to show a positive scale (see text). Only units which answered "yes" to question VIIb were included in "implementation relative to sister units".

As with organisation size above, it is impossible to draw conclusions based on the total population of all operating units when assessing non-response bias. However, the answers to this question indicate that among the operating units which were asked to implement an environmental policy, a range of implementation effectiveness was encountered when compared with operating units in the same business unit (but not necessarily in the sample). This implies that there is no evidence of systematic non-response bias according to environmental responsiveness across the operating units selected in the questionnaire stage.

5.4.5 Implications of bias identified

Comparison of the organisational size and environmental responsiveness characteristics of units included in the study and the broader population has revealed some non-response bias in the business unit sample, but less in the operating unit sample. Business units included in the final sample were on average larger, were more likely to be members of the FTSE 100 than non-responders, and were more likely to have publicly available environmental objectives than business units in the broader population. However, there was no evidence to suggest that operating units which responded to the questionnaire were either larger or more environmentally responsive than sister units in the same business units which did not respond.

It was not possible to directly compare sampled operating units with operating units in business units not included in the sample. It would be reasonable to expect that on average, the sampled operating units are more environmentally responsive than the broader population because their business unit parents were shown to be more environmentally responsive than the broader population. The extent of such bias, however, is unknown due to lack of data.

Combined with the implications of the sampling process outlined in Chapter 4, it would appear that several sources of bias will need to be taken into account when evaluating the results in Chapter 9. In addition to the non-response bias in the business unit sample, analysis of the sampling process revealed that high impact business units are over-represented, as are business units within some corporations, and operating units (especially retailing) within the business unit sample. This bias need not necessarily fatally damage the quality of the data. They do, however, put constraints on the inference possibilities from the results to the broader population. Account will be taken of the various sources of bias identified in the sampling and response process when the results are discussed in Chapter 9.

5.5 Relationships Between Organisation Size and Environmental Responsiveness

As an initial step in testing the model developed in Chapter 3, and as a replication of the meta-analysis studies, the direct relationships between organisation size and environmental responsiveness will now be explored. These provide a context for the two main empirical chapters (Chapters 6 and 7), and will be revisited in Chapter 8 when the complete model is tested. Here, the aim is to illustrate the main direct relationships, and to reflect on any unusual results which may affect this study's validity.

5.5.1 Corporate size and environmental responsiveness

Figure 5.15 shows results of a one way ANOVA test for significant differences across units belonging to small, medium and large corporations in business unit environmental proactivity and environmental initiative implementation scores. Contrary to the theoretical expectation in Chapter 3 (see section 3.2), the Figure shows no relationship between business unit environmental proactivity and corporate size category ($p = 0.99$). This relationship also holds if corporate size is treated as an interval variable (correlation between log of corporate number of employees and business unit environmental proactivity = 0.08, $p > 0.70$), and indicates that in this sample, business units in larger corporations are not more likely to have a proactive environmental approach than business units in smaller corporations.

Figure 5.15 : Mean levels of environmental responsiveness across corporate sizes

	Small	Medium	Large	Total	sig.
Business unit environmental proactivity*	5.15	5.13	5.16	5.15	0.99
Total Implementation +	1.11	1.06	1.22	1.12	0.32
Clean Technology Initiatives +	0.17	0.61	0.33	0.39	0.01**
Stakeholder relations initiatives (broad) +	0.74	0.71	0.88	0.76	0.49
Materials-reducing Initiatives +	1.60	1.45	1.67	1.55	0.15

*sources : * : data from business unit interview (n = 25) recoded to a 7 point positive scale. + : data from operating unit questionnaire (n = 95) scored 0 to 2 (see section 5.3.2 for derivation of measures).*

An explanation for this surprising result can be made based on sample size. The business unit sample size is rather small (n = 25), and so yields a very wide confidence interval for the true correlation between organisation size and corporate environmental proactivity (95% confidence interval for r is –0.33 to 0.46). Indeed, the meta-analysis suggested that the true correlation coefficient between total organisation size and environmental responsiveness as measured by strategic measures is 0.28 (see section 2.4), which would fall within the range of the confidence interval for the correlation in this sample.

Figure 5.15 also illustrated that there is no systematic difference in mean levels of environmental initiative implementation at operating units across the corporation sizes (operating unit data, n = 95). Only clean technology initiatives differ significantly across the groups, but with "medium" sized corporations apparently implementing these most, and not the "large" corporations as expected. Given this anomaly, it is likely that this is due to a Type I error where false positive relationships will be found in one in twenty tests using a 95% confidence level. There does not appear to be any systematic evidence of a relationship between environmental initiative implementation and corporate size. This echoes the findings of the meta-analysis in Chapter 2, which found a non-significant relationship between organisation size and implementation of environmental initiatives.

5.5.2 Operating unit size and environmental responsiveness

Despite the non-significant relationships between environmental initiative implementation and corporate size, the correlations between implementation and operating unit size were all highly significant (see Figure 5.16, all at $p < 0.01$). Although larger corporations are no more likely to implement environmental initiatives, larger operating units within those corporations are.

Figure 5.16 : Correlations Between Environmental Initiative Implementation and Operating unit Size

	1.	2.	3.	4.	5.
1. Operating unit size	1.00				
2. Total implementation	0.45** (0.00)	1.00			
3. Clean Technology Initiatives	0.48** (0.00)	0.52** (0.00)	1.00		
4. Stakeholder Relations Initiatives	0.34** (0.00)	0.83** (0.00)	0.27* (0.01)	1.00	
5. Materials-reducing Initiatives	0.43** (0.00)	0.83** (0.00)	0.45** (0.00)	0.47** (0.00)	1.00

Source : Operating unit questionnaire. n = 95.

Notably, however, there is no significant relationship between operating unit size and the environmental proactivity of that operating unit (see Figure 5.17), whether corporate environmental proactivity is rated by business unit ($p = 0.07$) or operating unit ($p = 0.90$) respondents. This echoes the findings of the meta-analysis, where a non-significant relationship between size and environmental responsiveness at the sub-unit level was found. However, the highly significant relationship between operating unit size and total implementation ($p = 0.00$) does not fit into the meta-analysis findings (see Figure 2.5), and runs contrary to the theoretical expectation that there is a stronger relationship between operating unit size and environmental proactivity than between operating unit size and environmental initiative implementation.

Figure 5.17 : Correlations Between Environmental Proactivity and Operating Unit Size

	1.	2.	3.	4.
1. Operating unit size	1.00			
2. Operating unit environmental proactivity	-0.01 (0.90)	1.00		
3. Business unit environmental proactivity	-0.19 (0.07)	0.36** (0.00)	1.00	
4. Total implementation	0.45** (0.00)	0.43** (0.00)	0.22* (0.04)	1.00

Source : Operating unit questionnaire. n = 95. Note that the "Business unit environmental proactivity" measure used here is the one scored by operating unit general managers.

Figure 5.17 also indicates significant and positive relationships between business unit and operating unit environmental proactivity and total environmental initiative implementation. This finding provides some initial evidence that there is indeed a link between the proactivity of business environmental approach and environmental initiative implementation at operating units (see "?" in Figure 3.4). The link is not perfect with business unit environmental proactivity only accounting for 22% of the variance in total environmental initiative implementation, and so moderating factors potentially affecting this relationship may still be present. The detailed circumstances where business unit proactivity is imperfectly translated into environmental initiative implementation actions will form a major focus of the next two empirical chapters (Chapters 6 and 7).

5.5.3 Summary of the relationships between organisation size and environmental responsiveness

Initial analysis of the direct relationships between organisation size and environmental responsiveness suggested that this study's findings are broadly in line with previous empirical environmental management studies. No relationship was found between corporate size and environmental initiative implementation. While relationships between organisation size and business unit environmental proactivity were not always as predicted, the confidence interval of the correlation coefficient obtained included the mean correlation value from the meta-analysis. Initial evidence also suggested that while there is a significant relationship between business unit environmental proactivity and environmental initiative implementation, this correlation is not perfect and may be subject to a range of moderating variables such as visibility or organisational slack. The initial analysis provides a strong platform for the later, more detailed empirical analyses.

5.6 Chapter Summary

This chapter has introduced and justified the measures of organisation size and environmental responsiveness used in this study. The measures were then used to compare, as far as possible within the practical constraints of the data, the characteristics of the final sample with the intended population. Some non-response bias was detected at the business unit level, but not at the operating unit level within these business units. Initial analysis of the organisation size and environmental responsiveness characteristics of the sample suggests a pattern broadly in line with previous studies reviewed in the meta-analysis in Chapter 2. These broad patterns will now be examined in more detail through the next three empirical chapters which report results on environmental visibility (Chapter 6) and organisational slack (Chapter 7) first separately, and then together (Chapter 8).

Chapter 6 : Visibility and Environmental Responsiveness[1]

[1] The development of the "Environmental Visibility Typology" was previously reported in Bowen, F. E. (2000), "Environmental Visibility : A Trigger of Green Organisational Responsiveness?", *Business Strategy and the Environment*, vol. 9, no. 2, pp. 92-107

6.1 Introduction

This chapter will explore the relationships between visibility and the environmental responsiveness of organisations. Its aims are :

- to establish the importance of visibility in environmental responsiveness by analysing the qualitative evidence
- to adequately operationalise environmental visibility based on the theoretical discussions in Chapter 3 and the qualitative data
- to test the hypotheses on environmental visibility derived in Chapter 3

As a starting point, it will build on the theoretical discussion on types of visibility in Chapter 3 (see section 3.2.3) and will derive a typology of environmental visibility[2] from the qualitative interview data. Empirical examples of visibility are given both as a characteristic of an organisation and as a characteristic of an issue, and at both the corporate and operating unit levels. This provides preliminary evidence of the importance of visibility for environmental responsiveness. The resultant environmental visibility typology is used as a basis for operationalising four types of visibility. Quantitative data is used to test the validity and reliability of the typology, and to assess the relationship between the four types of environmental visibility and both organisation size and industry group. Quantitative tests of the hypotheses are then conducted first at the business unit and operating unit levels separately, and later together. The Chapter concludes by assessing the hypotheses on environmental visibility and green organisational response.

6.2 A Typology of Environmental Visibility

Previous research has not given much prominence to the robust operationalisation of visibility (see section 3.2.3 for discussion), preferring instead corporate level proxies such as corporate size or number of newspaper articles mentioning the corporate name. Before the hypotheses could be tested the main types of visibility needed to be identified in practice so that the later quantitative analyses could operationalise the

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[2] The phrase "environmental visibility" is used throughout this chapter as an abbreviation for

dimensions of visibility appropriately. Theory provided a guide to the types of visibility that might be encountered in an environmental context (i.e. organisational v. issue-based; corporate v. operating unit, see 3.2.3), and was used as a basis for the initial qualitative analysis. The interview transcripts were analysed in order to generate examples of environmental visibility, and to categorise them according to the types of visibility found in organisational theory. This typology of environmental visibility could then be used as an organising framework for conceptual discussion and testing of the hypotheses on the links between visibility and green organisational responsiveness.

All the interview transcripts were examined to find examples of environmental visibility. As the interview protocol included in Appendix 3 indicates, interview respondents were not directly asked questions on visibility. However, the interview began with a warm-up discussion on environmental pressures and risks, and with an exploration of why the organisation is engaged in environmental issues to the extent that it is. The interview protocol allowed plenty of discussion on the triggers of green organisational responses, and any examples of environmental visibility generated were spontaneous, unprompted comments by interviewees on environmental threats, opportunities and green response triggers in their business.

In the first round of coding, all comments falling within the predetermined working definition of environmental visibility were extracted - any comments relating to "whether the firm, the site, its activities or its environmental impacts can be seen or noticed" (see section 3.2.3) were retained for the second round. The visibility comments were then coded according to the theoretical categories outlined above - whether the visibility was organisational or issue-based, and whether the relevant level of analysis was corporate or operating unit.

The output from the coding process was a list of comments which addressed visibility in an environmental context, each assigned to either the corporate or operating unit level, and whether it was the organisation or issue which was visible.

"organisational or issue visibility in an environmental context".

The illustrative comments were organised into a two-dimensional matrix, which has been simplified and is presented as Figure 6.1. Each type of environmental visibility is discussed in more detail in the next section.

Figure 6.1 : Illustrative Examples in a Typology of Environmental Visibility

Visibility Type / Relevant Level	Organisational Visibility	Issue Visibility
Corporate Level	**TYPE 1 (VISBUORG)** • Size of corporation • Consumer name recognition • Frequency in national/financial media • Advertising expenditure • Prominent logo • Number of customers • on FTSE 100 list	**TYPE 2 (VISBUISS)** • recent environmental incident • corporate citizenship reputation • environmental reporting
Operating Unit Level	**TYPE 3 (VISOUORG)** • size of unit • major local employer • high profile in local area • frequency in local media • same name as parent company	**TYPE 4 (VISOUISS)** • sensory visibility of activities (sight, smell, sound, touch) • visibility of environmental improvements

Source : Interview transcripts. See text for derivation. The 8 letter codes in parentheses are the variable names used throughout the empirical work. They are in the format VIS (for visibility), then either BU (for business unit) or OU (for operating unit), and then either ORG (for organisational) or ISS (for issue).

6.2.1 Type 1 : Organisational visibility at the corporate level (VISBUORG)

Even in this sample of large companies, size seemed to play an important role in the perceived corporate visibility of firms. Several FTSE 100 firms mentioned their visibility because of their size. In contrast, the Director of a chemical distributor with a turnover of around £650m claimed :

> *"I mean we are a big boy in our little sector, but we're not even in the 250 firms in the UK. We're not big enough for Joe Public to be interested."*
>
> *Transcript #12*

Despite this, there were at least two business units from very large corporations (turnover in excess of £10bn per year) who claimed that their corporate whole was not particularly visible. One Senior Vice-President put it like this :

> *"People don't see [corporate name]. They do if they're interested in the financial side, but otherwise they only see our brands. Our brands are our biggest asset - we've got to protect them. The company name itself isn't that important... at least if something goes wrong on the image side it usually only affects one brand, not the whole company."*
>
> *Transcript #8*

The interviews tended to confirm that contrary to recent empirical treatments of the concept, there is more to environmental visibility than firm size. Bansal (1996) and Rappaport and Flaherty (1992) suggested that firms with greater consumer name recognition, who appear frequently in the media, who have a high advertising spend, or who have a prominent logo can be considered visible even if they are relatively small. The interviews yielded examples of all these elements of visibility, with the exception of level of advertising. Exposure to media interest was the most common aspect of corporate organisational visibility, and was mentioned by most respondents.

Reconsidering the Senior Vice-President's comment above provides an explanation for the apparent missing link between advertising and visibility. The level of advertising spending is highest in consumer goods industries, but in the particular consumer goods industries interviewed, the brands were visible rather than the corporation. In cases in the current sample, the advertised brand names and the corporate name were different. The link between advertising and visibility might be stronger where the brand and the corporate name is the same. Advertising may still be an aspect of corporate organisational visibility even though it did not appear in these interviews[3].

The transcript analysis revealed an element of organisational visibility at the corporate level not considered in previous visibility research. There are many ways in which the firm gains consumer name recognition other than by overtly advertising its products. One of these is simply possessing a large number of customers by virtue of the product or service produced. The examples provided by respondents indicated

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[3] This logic may provide an explanation for the contradictory empirical results on advertising intensity and environmental responsiveness (see Lyon and Maxwell (1999)).

that firms can be visible without dedicating much specific advertising expenditure. A typical comment was made by the Environment Manager of an industrial chemicals manufacturer :

> *"The trouble is we're good targets. We're high profile... we've got lots of lorries on the road with the brand and company name on. We've got thousands and thousands of customers who will all know the name - not just big companies but lots of one man bands as well... And we're FTSE 100, so we're monitored by, well, anyone who wants to really."*
>
> *Transcript #17*

6.2.2 Type 2 : Issue visibility at the corporate level (VISBUISS)

Many examples of environmental issues at the corporate level being visible to interested constituents outside the firm were encountered in the interviews. The interviews added support to Bansal's (1996) argument that environmental issues are more visible in firms which have had a recent high profile environmental incident. Such an incident highlighted the potential effects of environmental issues on the ordinary running of the business, and raised the visibility of environmental issues both inside the organisation and among external constituents. Environmental issues were also visible at the corporate level where the firm had a long tradition of corporate social responsibility.

Environmental issue visibility was high both outside and inside the corporate whole where the firm publishes an environmental report. As the Group Environment Manager of a Water company describes :

> *"One of the things I think we've succeeded in doing is getting our profile outside the company understood very well... We produce this report annually and each year we launch it in some form or another, and we invite all of the local NGOs and pressure groups to that launch, without exception...And they come to our report launch, and then we tell them what we've been doing and we listen to their questions and their concerns."*
>
> *Transcript #5*

Such active display of environmental effects challenges the basic treatment of environmental issue visibility as a trigger of green organisational response in the environmental management research outlined in Chapter 2. Here, the publicity surrounding an issue is not creating an exposure to environmental pressures, but is pre-empting such pressure from interested constituents. Dutton et al. (1990) identify the potential for issues to be perceived as threats or opportunities, but treatments of "transparency of activities" in an environmental context have focused more on issue visibility as a threat (Bansal, 1996).

6.2.3 Type 3 : Organisational visibility at the operating unit level (VISOUORG)

Several respondents mentioned that the size of the operating unit contributes to its visibility in the local area. Also, if the company is a major local employer or appears often in the local media it may be visible despite being small. Notably, the interviews illustrated that operating units are not only visible in their local area. They can be visible by virtue of their position in a larger corporate whole. Two interviewees stated that a unit which is a subsidiary of a large, high profile corporation, and is recognised as such because it has the same name as its parent company might be more visible than an otherwise similar unit in the same local area. Also, some units can be visible nationally because of their corporate connections, and not just in their local area. The Group Environmental Manager of a large retailing group describes the difficulty of having some units which are more visible by name than others :

> *"One of our big problems is that when you talk externally about [the Group], most people think about [the largest business unit]. They just think of the high street stores...The practical reality is that not all businesses are at the same level - what we need to be sure of is that they're all pulling in the same direction, and that company's not likely to be embarrassed by the public thinking that the company is doing something, when in fact it's only parts of the group; or where they think the company's doing something, whereas in fact we're doing something completely different in some of the businesses."*
>
> *Transcript #26*

6.2.4 Type 4 : Issue visibility at the operating unit level (VISOUISS)

It is not only the visibility of the organisation which can affect the amount of pressure it experiences from external constituents at the operating unit level, but also the visibility of its environmental issues. Some operating units may generate particularly visible environmental effects such as large amounts of dust, vibration, noise or obvious emissions. Environmental issues may even be unique in the extent to which the sensory visibility of the issues affects the amount of constituent interest. The sight, sound or smell of a unit's activities, for example, may bring it under the scrutiny of local constituents, and can cause localised institutional pressure for environmental improvements even where there is a negligible bio-physical impact.

The Plant Manager of a wood treatment plant, interviewed during the questionnaire design phase of the study, provides an example :

> *"We had a slight problem with fumes and about a year ago a couple of people in the local village complained of an acrid smell. They took their complaint to the District Council which investigated it... We started to divert the fumes into an old vessel we're not using any more - it's half full of water and acts as a condenser...Then we invited the people involved in the complaint to tour the plant and explained what went on at the site, and it's been all right ever since...There are still fumes, of course, but they're not complaining."*
>
> *Transcript #30*

The interviews also illustrated that firms can harness the environmental issue visibility on their sites to mitigate the environmental pressure on them. Actively considering the visibility of environmental issues, rather than pure bio-physical impacts, helped at least one operating unit manage its local stakeholders. In a small manufacturing plant, the Quality Manager described an investment the operating unit has made in bio-remediation for the pond that contains the runoff water from the plant :

> *"It's a small investment, but it's made a visually significant improvement...It's not there yet, but I dream of showing the locals complaining about contaminated land our pond full of fish!"*
>
> *Transcript #29*

If an operating unit is renowned locally for its good social reputation, then it may have a position to protect on environmental issues independent of the particular policy direction from a higher hierarchical level. The interviews indicated that environmental issues were more visible within the organisation for operating units with a tradition of engaging in social or community issues. Some operating units which are high profile in their area purposely cultivate their local visibility on environmental issues as this comment from the Quality Director of a large manufacturing plant illustrates :

> *"we've had local companies 'phone us up saying, "we hear that you've got a really good waste system, can we come and have a look please?". And yeah, that's great, you know, that's what we like and we hope that we don't disappoint. It keeps us moving forward."*
>
> *Transcript #28*

6.2.5 Usefulness of the environmental visibility typology

The transcript analysis revealed that managers in operating units and their headquarter parents constructed some environmental actions as responses to either their visibility as an organisation or the transparency of their activities. This is notable given the lack of direct questioning on visibility in the interview protocol. Further, their comments could be allocated to four theory driven, and intuitively appealing types of environmental visibility. The conceptual typology is useful as an organising framework for examining organisational and issue visibility in an environmental context.

The typology cannot be used directly in this study, however, because of its focus on the corporate rather than the business unit level of analysis (see section 3.2.3). Throughout the remainder of this chapter, close attention will be paid to any potential conceptual divergences between business unit and corporate level visibility. Only when absolutely necessary given the limitations of the data will corporate level visibility be used as a proxy measure for visibility at the business unit level.

6.3 Operationalising the Environmental Visibility Typology

This section will use the typology of environmental visibility derived above (see section 6.2) to develop new quantitative measures of environmental visibility. Of crucial importance here is whether the visibility measures proposed are indeed capturing organisational characteristics other than firm size (see section 3.2.3), and in particular, whether the different types of visibility can be empirically separated as different dimensions of an underlying visibility construct. Each type of visibility was given an 8-letter code. Each code begins with VIS (for visibility), and is followed by either BU (for business unit) or OU (for operating unit), and ends with either ORG (for organisational visibility) or ISS (for issue visibility). For example, VISBUORG stands for organisational visibility at the business unit level (i.e. Type 1, VISBUORG).

As outlined above, having defined the construct, the next stage in scale design was to generate a series of items intended to capture various aspects of the construct (Spector 1994) (see section 4.4.2). The environmental visibility typology was used to generate indicators (see Figure 6.2). Face validity of the items as indicators of the visibility scales was assessed by discussion with managers at a regular progress meeting of the research project at the university. The managers generally agreed that at a basic level the questions "made sense" to someone not an expert on the issues.

Content validity, a more informed, but not quantitative assessment of validity, was assessed by consulting three colleagues who acted as "judges" on the appropriateness of the operationalisations. At this stage, some concern was expressed about whether some of the indicators could lie on more than one theoretical dimension. For example, "we publicise our environmental achievements to external groups" was asked at the operating unit level as a measure of issue visibility. On the other hand, this might reflect efforts by operating units to contribute to corporate environmental reports, since it is very rare for individual operating units to report their environmental performance. Alternatively, "we get involved in local and community issues in our local area" was designed to reflect the local embeddedness of operating units (organisational visibility), but might also reflect an operating unit's propensity to get involved in local environmental issues (issue visibility). Despite these potential difficulties with content validity, the initial classification was retained, data was gathered for all the indicators, and the exact allocation of indicators to types of visibility was left to be confirmed empirically later.

Figure 6.2 : Indicators of types of environmental visibility

Type	Interview Examples	Selected Indicators
Type 1 : VISBUORG **Organisational Visibility at the Business Unit Level**	• Size of corporation • Consumer name recognition • Frequency in national/financial media • Advertising expenditure • Prominent logo • Number of customers • on FTSE 100 list	• Our company's name is not widely recognised outside the immediate circle of our customers and suppliers *(rev.)* • Our activities are closely monitored by the media • Member of FTSE 100 *(from secondary sources)*
Type 2 : VISBUISS **Issue Visibility at the Business Unit Level**	• recent environmental incident • corporate citizenship reputation • environmental reporting	• Our most relevant competitors place a greater marketing emphasis on environmental issues than us *(rev.)* • Published environmental report in 1997 *(from interview data)*
Type 3 : VISOUORG **Organisational Visibility at the Operating Unit Level**	• size of unit • major local employer • high profile in local area • frequency in local media • same name as parent company	• We are easily recognised by outsiders as part of {corporate name} • We have a good local reputation on social and environmental issues • Our activities are closely monitored by the local media • We are a major local employer • We get involved in local and community issues in our area
Type 4 : VISOUISS **Issue Visibility at the Operating Unit Level**	• sensory visibility of activities (sight, smell, sound, touch) • visibility of environmental improvements	• Community representatives and other local groups visit our site often • Our environmental impacts are obviously visible in the local area • We publicise our environmental achievements to external groups • We report our environmental weaknesses as well as our strengths to interested parties

notes : (rev.) indicates that the item was reverse coded so a high score always indicated high visibility. All indicators were measured on a Likert scale unless otherwise stated.

Once the data on the relevant indicators was collected, further tests of the reliability and validity of the scales were undertaken. At the business unit level, such tests were limited by the sample size (n=25) and the very small number of indicators used. The inter-item correlations for indicators at the business unit level were mostly only marginally significant at best (see Figures 6.3a and 6.3b below). This, combined with the very small number of items used resulted in low reliability for the business unit indicators (α = 0.63 for VISBUISS; α = 0.33 for VISBUORG).

Figure 6.3a : Inter-item correlations for the Type 1 (VISBUORG) scale

	Marketing emphasis	**Environmental report**
Marketing emphasis	1.00	
Environmental report	0.33 (0.12)	1.00

Figure 6.3b : Inter-item correlations for the Type 2 (VISBUISS) scale

	Company name	**Media monitoring**	**FTSE 100**
Company name	1.00		
Media monitoring	0.42* (0.04)	1.00	
FTSE 100	0.33 (0.11)	0.35 (0.09)	1.00

Note : numbers in parentheses are p-values. Correlations reported are Spearman's rho. n=25.

More rigorous testing of construct validity was possible at the operating unit level because of the much larger sample size (n=95). A Confirmatory Factor Analysis (CFA) was undertaken to test the factor structure of the operating unit visibility measures. CFA was selected rather than Exploratory Factor Analysis (EFA) because a dimensional structure was hypothesised a priori (i.e. organisational and issue visibility are different factors) (Joreskog and Sorbom 1993). CFA allows a series of embedded models of the underlying factor structure to be compared to see which provides the best fit to the empirical data. Specifically, tests were undertaken to see if a two-factor model fit the data better than a one-factor solution. Figures 6.4a, 6.4b and 6.4c illustrate the three alternative models proposed.

Figure 6.4a : Two Factor Oblique Model

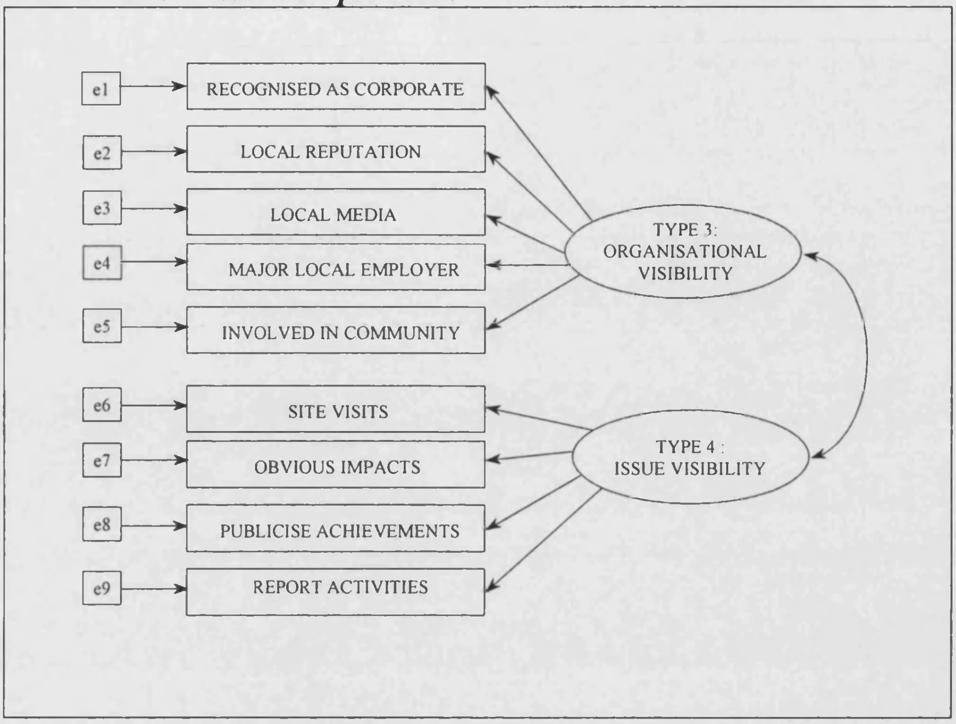


Figure 6.4b : Two Factor Orthogonal Model

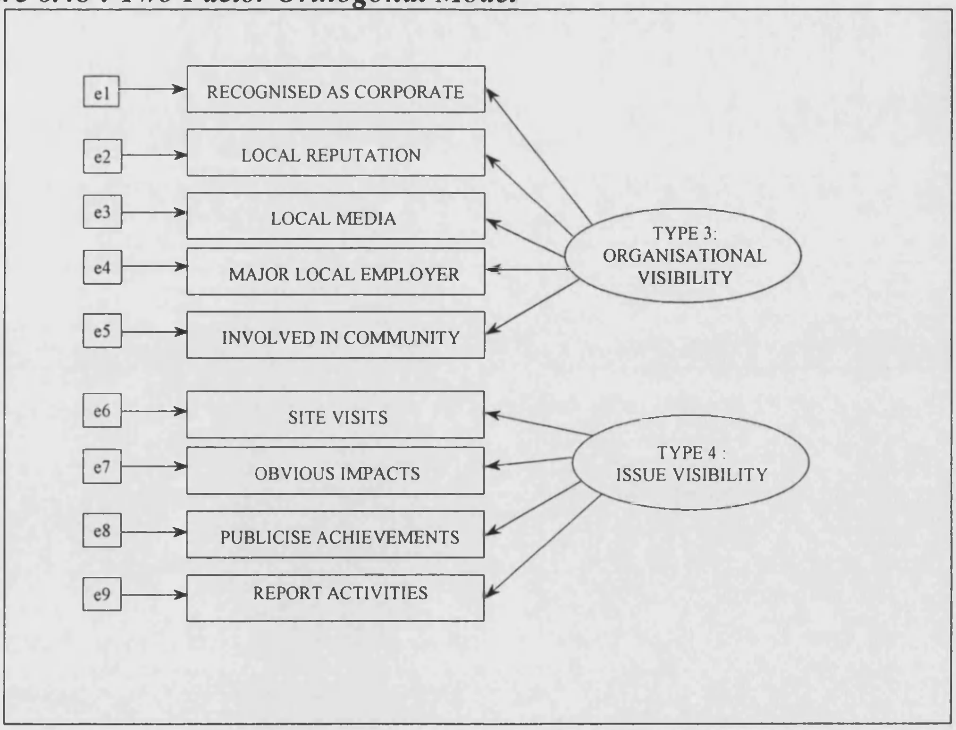
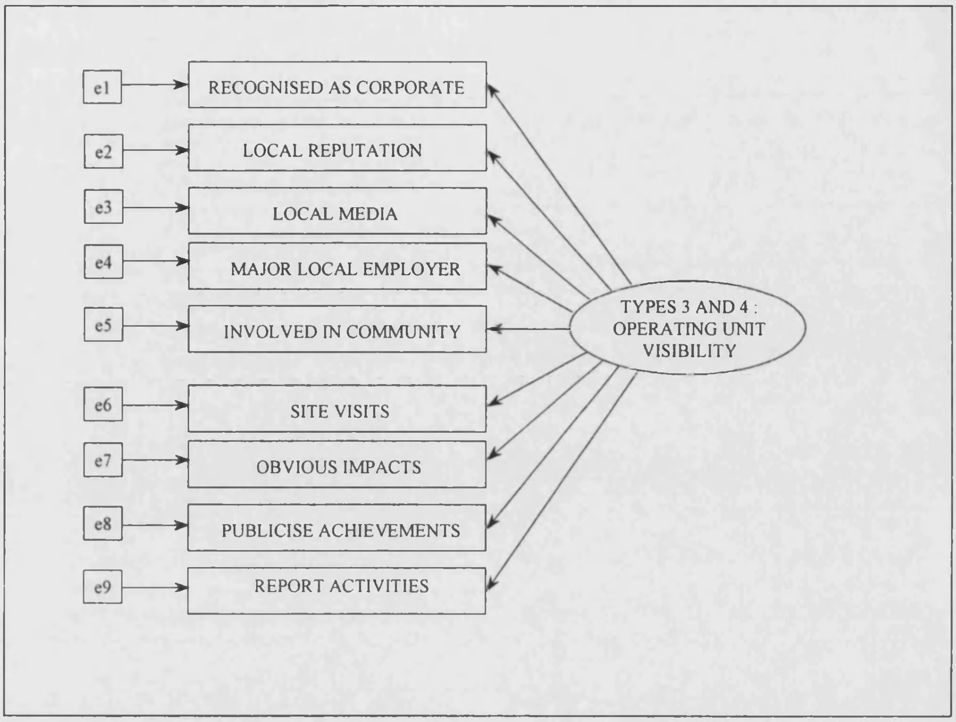


Figure 6.4c : One Factor Model



All models were based on the covariance matrix and used maximum likelihood estimation as implemented in LISREL VIII (Joreskog and Sorbom 1993; Joreskog and Sorbom 1996). Fit indices for the three alternative models are presented in Figure 6.5. The two-factor orthogonal model can be rejected immediately since it does not score best on any of the indicators, and is inferior to both the one-factor model (χ^2 difference = 26.5) and the two-factor oblique model (χ^2 difference (1) = 32.9, $p < 0.01$). However, the indices do not converge on suggesting which of the other two models indicate best fit - the RMSEA, AGFI and PGFI prefer the one factor solution, the NFI and CFI indicate the superiority of the two-factor oblique solution, and the RMR, GFI and PNFI do not distinguish between the two[4]. It is likely that the mixed fit results are due to the small sample size used in this analysis ($n < 100$) (Kelloway 1998).

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[4] note that although the indices are used to compare the fit of the models, the model itself does not provide a very good fit to the data. This is common in CFA (Kelloway 1998), and implies that the most that can be concluded from the results is that the two-factor oblique solution provides a better fit

Figure 6.5 : Fit Indices for the three alternative models

Model	χ^2	d.f.	RMR	RMSEA	GFI	AGFI	NFI	CFI	PNFI	PGFI
2 factor, oblique	151.6	26	**0.11**	0.19	**0.79**	0.63	**0.58**	**0.61**	**0.42**	0.46
2 factor, orthogonal	184.5	27	0.24	0.21	0.75	0.59	0.49	0.51	0.36	0.45
1 factor	158.0	27	**0.11**	**0.18**	**0.79**	**0.65**	0.56	0.59	**0.42**	**0.47**

note : numbers in bold indicate the model with best fit on that index.

Figure 6.6 : Standardised Parameter Estimates for the Two-factor Model

Item	VISOUORG : Organisational Visibility (operating unit)	VISOUISS : Issue Visibility (operating unit)	R^2
Recognised as part of corporate	0.41		0.17
Local reputation	0.77		0.59
Local media	0.46		0.21
Major local employer	0.50		0.25
Involved in community	0.69		0.47
Site visits		0.43	0.19
Obvious impacts		0.39	0.15
Publicise achievements		0.76	0.58
Report activities		0.86	0.74

Source : questionnaire data. See text for details of confirmatory factor analysis.

Two further assessments of the models were made to supplement the standard fit indices. Firstly, a χ^2 difference test indicated that the two-factor oblique solution provides a significantly improved fit with the data (χ^2 difference (1) = 6.4, $p < 0.05$). Secondly, a confidence interval was drawn around the correlation between the two oblique factors to see if it included the perfect positive correlation value of r = 1. If it did, then the one-factor solution should be accepted, since this the equivalent model to the two-factor model where both factors are perfectly correlated. The confidence interval for the inter-factor variance was 0.67 to 0.94. Both these additional tests suggest that despite the mixed results of the fit indices, the two-factor oblique model should be preferred to the one factor solution.

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than do the plausible rival specifications.

Standardised parameter estimates for the two-factor oblique model are shown in Figure 6.6. As shown, model parameters were all significant ($p < 0.01$) and explained reasonable amounts of item variance (R^2 ranged from 0.15 to 0.59). The two factors were significantly correlated ($r = 0.81$, $p < 0.01$). The reliability of the two separate factors was acceptable given the conventional reliability criterion of Cronbach's Alpha exceeding 0.7 (VISOUORG $\alpha = 0.75$; VISOUISS $\alpha = 0.71$).

6.4 Assessing the Usefulness of the Environmental Visibility Typology

Testing the hypotheses separately for each type of environmental visibility is only justified if the empirical data is compatible with the distinctions drawn between the four types of environmental visibility identified in the typology. The correlations between the summary scales of the four types of visibility were used to assess the usefulness of the environmental visibility typology (see Figure 6.7).

The pattern of correlations supports the argument that visibility at different levels of the organisation are conceptually distinct. There is not a significant correlation between organisational visibility at the business unit level (VISBUORG) and organisational visibility at the operating unit level (VISOUORG) ($r = 0.04$, $p = 0.73$). This is an important result which corroborates the usefulness of the environmental visibility typology - the extent to which the business unit is visible in society is not related to the extent to which the operating unit is visible in the local area. Therefore, it is expected that operating units and their business unit counterparts will come under different kinds of pressures for change from their external institutional surroundings. This adds confidence to the distinction made in the environmental visibility typology between the corporate and operating unit levels of analysis.

Figure 6.7 : Correlations between visibility measures

	VISBUORG	VISBUISS	VISOUORG	VISOUISS
VISBUORG	1.00			
VISBUISS	0.67** (0.00)	1.00		
VISOUORG	0.04 (0.73)	0.18 (0.09)	1.00	
VISOUISS	-0.15 (0.15)	-0.23* (0.03)	0.42** (0.00)	1.00

Source : Business unit level data is from interview respondents, and operating unit data is from operating unit questionnaire. Where business unit level data is correlated only with business unit data, n = 25. Otherwise, each operating unit is given its business unit respondent's score for VISBUORG and VISBUISS, so that n = 95. Numbers in parentheses are p-values.

Notably, there is a significant correlation between issue visibility at the business unit level (VISBUISS) and at the operating unit level (VISOUISS) ($r = -0.23$, $p < 0.05$), but this is in the opposite direction to that which might be expected. The more visible environmental issues are at the business unit level, the less they are at the operating unit. It is possible that this is a spurious result given the very low reliability of the business unit issue visibility measure ($\alpha = 0.33$) and the low sample size of the business unit sample ($n = 25$). This is especially likely given the concern about content validity outlined above (see section 6.3), where items such as "we publicise our environmental achievements to external groups" might have been included in both VISBUISS and VISOUISS measurements, thus implying a positive correlation between the types.

Excluding measurement and other errors, the significant negative correlation suggests that the distinction made between levels of analysis in the environmental visibility typology is useful. Issue visibility at the business unit and operating unit levels should be treated separately as they may have different effects on organisational responsiveness. It is even conceivable that business units with high environmental issue visibility develop environmental policies and practices which actively decrease issue visibility at the operating unit level (thus implying the negative correlation observed).

The *prima facie* pattern of correlations does not seem to show such a clear-cut distinction between organisational and issue visibility. The correlations between issue visibility and organisational visibility are highly significant both at the business unit ($r = 0.67$, $p < 0.01$) and the operating unit ($r = 0.42$, $p < 0.01$) level. Such a correlation does not on its own indicate that the division of environmental visibility into organisation- and issue-based is flawed. The CFA undertaken above on the operating unit level data indicated that a two-factor solution better explained the data than a one-factor solution - that is, issue visibility and organisational visibility at the operating unit are conceptually distinct. A similar argument might have been possible at the business unit level, but the sample size of 25 was too small to undertake a CFA of this sort. No firm conclusions can be drawn from this data, therefore on the underlying dimensionality of environmental visibility at the business unit level.

In summary, the correlations between the environmental visibility scales indicate that the typology outlined above is useful to distinguish different types of visibility in an environmental context. The evidence is particularly strong for a distinction to be made between different levels of analysis, but the correlations are not inconsistent with the typology's focus on differentiating between organisational- and issue- based visibility. For these reasons, the operationalisations of the four types of visibility will all be used in the following analyses and tests of the hypotheses.

6.5 Environmental Visibility and Organisational Characteristics

6.5.1 Environmental visibility and total organisation size

Figure 6.8 shows the mean environmental visibility scores for small, medium and large corporations in the sample. Business units in large corporations reported organisational visibility (VISBUORG) significantly higher than those in smaller corporations. This adds credence to the conventional use of organisation size as a proxy for organisational visibility at the corporate level. However, Figure 6.8 also reveals a more complex relationship between organisation size and environmental visibility. At the operating unit level, units which are part of large corporations reported significantly lower levels of organisational visibility than their small counterparts (VISOUORG). This indicates that at the operating unit level, the conventional association of visibility with organisation size is inappropriate. Factors such as local media exposure, being easily recognised as part of a larger corporate whole, or the embeddedness of operating units in the local surroundings are not related to overall organisation size.

The relationships between issue visibility and total organisation size are less clear cut. There was not a significant relationship in this sample between organisation size and issue visibility at the operating unit level (VISOUISS, at the 5% level); and although there was a significant association between size and business unit issue visibility (VISBUISS), there is not a clear theoretical reason why business units from medium sized companies should have scored so low on this measure. This anomalous finding is likely to be due to either the characteristics of the sample, where units from medium sized corporations have unusually high issue visibility, or to the very low reliability of the VISBUISS measure mentioned earlier.

Figure 6.8 : Environmental Visibility and Corporate Size

	Small (less than 5,000 emp.)	**Medium (5,000 – 30,000 emp.)**	**Large (30,000+)**	**Total**	**Sig.**
VISBUORG	3.54	3.02	6.68	4.19	0.00**
VISBUISS	5.35	3.24	5.98	4.68	0.00**
VISOUORG	3.73	3.17	3.25	3.38	0.02*
VISOUISS	3.14	3.32	2.74	3.10	0.06

Source : Business unit level data is from interview respondents (n = 25). Operating unit data is from questionnaire (n = 95). "Size" was determined by turnover in the financial year ending in 1997 as reported in corporate Annual Reports (see Section 5.2). Significance level was calculated using one way ANOVA. All scales recoded to provide a 1-7 scale.

6.5.2 Environmental visibility and industry group

Figure 6.9 shows a comparison of the reported levels of environmental visibility across the three industry groups. As might be expected, operating units in "high impact" industries scored most highly on the operating unit visibility measures. This relationship was highly significant for organisational visibility (VISOUORG), but not significant for issue visibility (VISOUISS). The "high impact" group in the sample included chemical, oil, and utility companies which have large plants, often prominent in the local area. They are also the industries most associated in the public's mind with visible potential environmental problems such as accidental spillage, visible emissions and unpleasant odours.

Figure 6.9 : Environmental Visibility and Industry Group

	High Impact	Other Manufacturing	Other Non-Manufacturing	Total	Sig.
VISBUORG	2.97	2.81	5.14	4.19	0.00**
VISBUISS	4.50	4.11	5.31	4.67	0.01*
VISOUORG	4.09	3.27	3.13	3.38	0.00**
VISOUISS	3.40	3.11	2.96	3.10	0.26

Source : Business unit level data is from interview respondents (n = 25). Operating unit data is from questionnaire (n = 95). "Industry group" was determined as outlined in section 4.3.1. Significance level was calculated using one way ANOVA. All scales recoded to provide a 1-7 scale.

At the business unit level, the "non-manufacturing" companies reported significantly higher organisational visibility than the other two groups (VISBUORG). This is due to a higher proportion of these companies belonging to the FTSE 100 list, and to the high proportion of retailers and their immediate consumer name recognition in the "non-manufacturing" group. "Other manufacturing" business units reported significantly lower scores on issue visibility (VISBUISS), reflecting the fact that they do not have the same level of obvious impact as the "high impact" companies, or the potential marketing emphasis on environmental issues of the "non-manufacturing" group.

In summary, the relationships between environmental visibility and organisational characteristics of the sample are broadly as expected. Business units which are part of a large corporations have high organisational visibility, though their operating units are no more visible than their counterparts from smaller corporations. "High impact" operating units are highly visible, though their business unit parents are less visible than "non-manufacturing" (especially retailing) corporations. This examination of the relationships between organisational characteristics and environmental visibility enhances the construct validity of the environmental visibility typology.

6.6 Testing the Hypotheses : Environmental Visibility and Environmental Responsiveness

Several hypotheses were proposed in Chapter 3 on the relationships between visibility and environmental responsiveness. These included aggregated hypotheses :

H1 : There is a positive relationship between the visibility of the organisation and environmental responsiveness

H2 : There is a positive relationship between the visibility of environmental impacts and environmental responsiveness

These were later broken down firstly by level of analysis :

H3 : There is a positive relationship between the organisational visibility of the business unit and the proactivity of the business unit environmental approach

H4 : There is a positive relationship between the visibility of environmental issues at the business unit level and the proactivity of the business unit environmental approach

H5 : There is a positive relationship between the organisational visibility of the operating unit and its implementation of environmental initiatives

H6 : There is a positive relationship between the visibility of environmental issues at the operating unit level and its implementation of environmental initiatives

Secondly, they were broken down by type of environmental initiative :

H7 : There is a positive relationship between environmental visibility and materials-reducing initiatives

H8 : There is a positive relationship between environmental visibility and stakeholder relations initiatives

H9 : There is no relationship between environmental visibility and clean technology initiatives

Initial support was found for H1 and H2 in the qualitative data analysis. This section will present an initial assessment of the other hypotheses in more detail using the quantitative data. Final acceptance or rejection of the hypotheses in Chapter 9 will depend not just on the effects of visibility alone, but also on the joint effects of visibility and slack. The findings on visibility only are presented here to facilitate the later, fuller, analysis in Chapter 8.

6.6.1 Environmental visibility and environmental proactivity at the business unit level

Figures 6.10a and 6.10b illustrate the correlations between organisational- and issue-based visibility at the business unit level, and business unit environmental proactivity. Whether the business unit respondent's perception of corporate environmental proactivity (Figure 6.10a), or the operating unit manager's perception (Figure 6.10b) is considered, the correlation between either type of visibility and corporate environmental proactivity is not significant. No aggregate relationship can be identified between business unit visibility and environmental proactivity, and this is consistent across two measures of environmental proactivity. This might lead us to reject H3 and H4 on the relationships between environmental visibility at the business unit level and proactivity of environmental approach.

Figure 6.10a : Correlation between business unit visibility and environmental proactivity (business unit level data)

	Business Unit Environmental Proactivity	**VISBUORG : Organisational Visibility**	**VISBUISS : Issue Visibility**
Business Unit Environmental Proactivity	1.00		
VISBUORG : Organisational Visibility	0.26 (0.21)	1.00	
VISBUISS : Issue Visibility	0.35 (0.10)	0.53** (0.01)	1.00

Source : interview respondents (n = 25). numbers in parentheses are p-values.

Figure 6.10b : Correlation between business unit visibility and environmental proactivity (operating unit level data)

	Business Unit Environmental Proactivity	VISBUORG : Organisational Visibility	VISBUISS : Issue Visibility
Business Unit Environmental Proactivity	1.00		
VISBUORG : Organisational Visibility	0.08 (0.43)	1.00	
VISBUISS : Issue Visibility	0.17+ (0.10)	0.67** (0.00)	1.00

Source : questionnaire data (n = 95). Numbers in parentheses are p-values.

A more detailed examination of the pattern of correlations between the individual components of business unit environmental visibility reveals some notable relationships (see Figure 6.11). Business unit visibility is significantly correlated with attempts to go beyond compliance with environmental laws and regulations, and with leading the industry on environmental issues (positive and significant at $p < 0.05$ for both VISBUORG and VISBUISS visibility). However, it is not correlated with internal measures of business unit environmental proactivity such as managerial commitment to environmental priorities and effective environmental risk management systems (not significant at $p < 0.1$ for either VISBUORG or VISBUISS visibility).

Figure 6.11 : Correlations between business unit visibility and the individual components of business unit environmental proactivity

	1.	2.	3.	4.	5.	6.	7.
1.Attempt to go beyond compliance	1.00						
2.Corporate management give high priority	0.30 (0.17)	1.00					
3.Business unit management give high priority	0.44* (0.03)	0.87** (0.00)	1.00				
4.Lead industry on environmental issues	0.64** (0.00)	0.13 (0.56)	0.26 (0.21)	1.00			
5.Effectively manage environmental risks	0.51** (0.00)	-0.05 (0.83)	0.16 (0.45)	0.39+ (0.05)	1.00		
6.VISBUORG : organisational visibility	0.44* (0.03)	0.06 (0.79)	0.03 (0.90)	0.48* (0.02)	0.033 (0.88)	1.00	
7.VISBUISS : issue visibility	0.54** (0.01)	0.02 (0.92)	-0.6 (0.79)	0.52* (0.01)	0.14 (0.51)	0.53** (0.04)	1.00

Source : Interview respondents (n = 95). Numbers in parentheses are p-values.

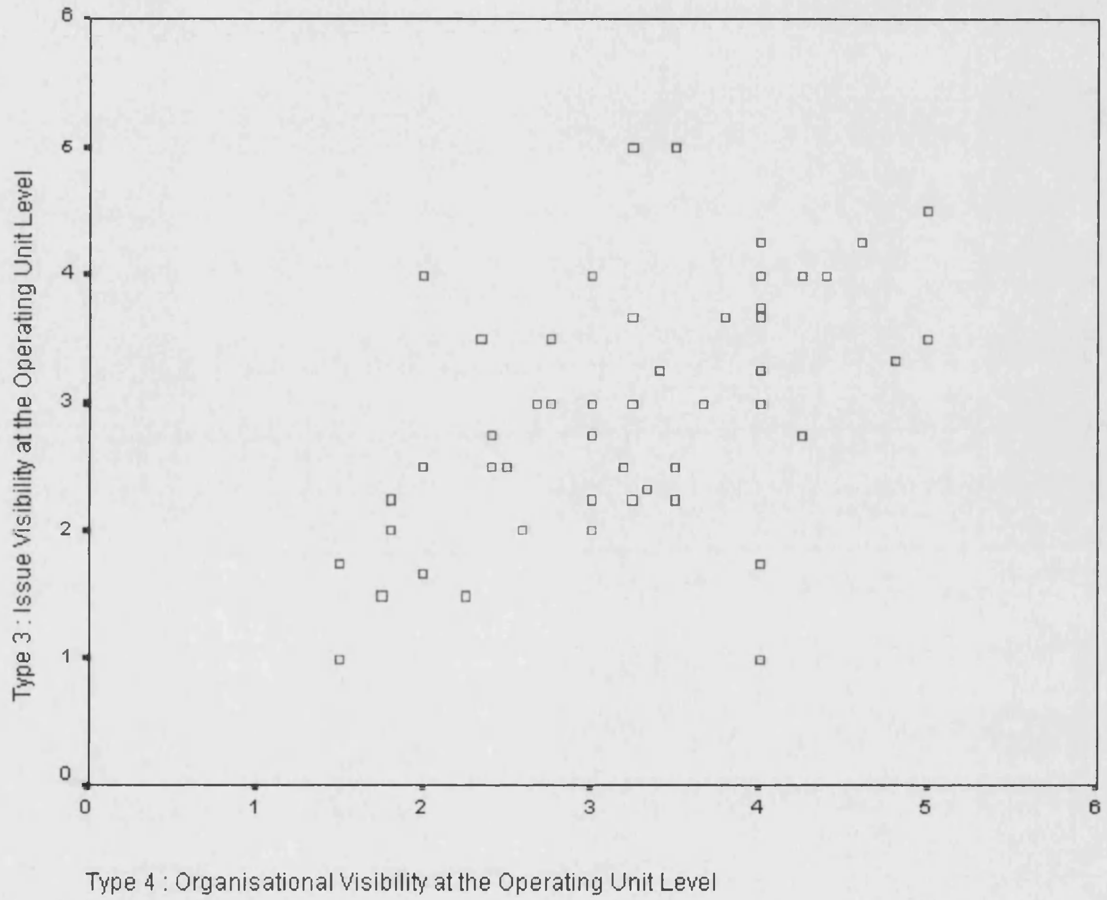
The aggregate correlations between business unit visibility and environmental responsiveness do not show significant relationships. Disaggregating the business unit environmental proactivity measure indicates that there is a positive correlation between business unit visibility and measures capturing claims of environmental responsiveness, but not between visibility and more concrete internal priorities. Hence at the business unit level, the data is consistent with a line of argument put forward in the meta-analysis (see section 2.4). Highly visible business units will claim that they are environmentally responsive to accommodate the institutional pressure for environmental improvement, but that this does not always translate into concrete managerial priorities and actions in the form of implementation. H3 and H4 cannot be rejected if "proactivity of the business unit environmental approach" is interpreted as "the business unit respondent's claim of proactivity of environmental approach as portrayed externally". H3 and H4 are rejected on this data, for concrete managerial actions exhibiting "proactivity of the business unit environmental approach".

6.6.2 Environmental visibility and the implementation of environmental initiatives at the operating unit level

Figure 6.12 illustrates a scatter diagram of issue visibility against organisational visibility at the operating unit level. The overall pattern illustrates the positive correlation between VISOUORG and VISOUISS visibility discussed above ($r = 0.81$, $p < 0.01$). Of interest here are the operating units which do not lie on the upward sloping diagonal. There are units which are visible in their local area, or as part of a larger corporate whole which do not have highly visible environmental impacts (in bottom right corner of Figure 6.12); conversely, some operating units with obviously visible environmental impacts are not particularly visible as an organisation (in top left corner of Figure 6.12).

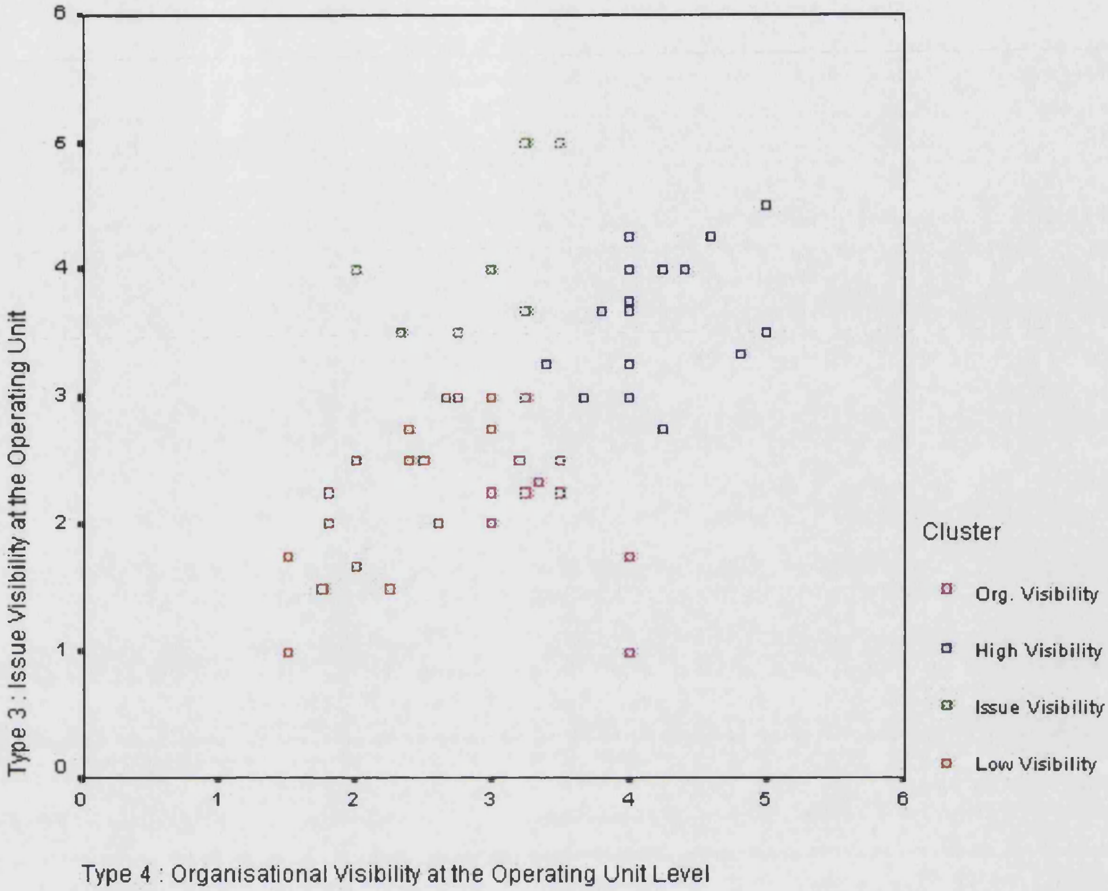
Dividing the operating units into groups based on their environmental visibility profiles will allow comparisons of the environmental initiatives implemented by units with differing environmental visibility characteristics. A formal method to achieve the division of the operating units into groups based on their visibility characteristics is cluster analysis (Kaufman and Rousseeuw 1990). The VISOUORG and VISOUISS visibility scores were used in a cluster analysis using the K-means method as outlined in Kaufman and Rousseuw (1990) and implemented in SPSS. The four factor solution was retained as it fitted best with the theoretical discussion which follows (see Figure 6.13).

Figure 6.12 : Scatter plot of Organisational and Issue Visibility at the Operating Unit Level



The cluster analysis revealed the four main groups outlined above. "High Visibility" units (n = 36, top right) and "Low Visibility" (n = 22, bottom left) scored high and low respectively on both organisational and issue visibility. The two groups of units not conforming to the generally positive relationship between VISOUORG visibility and VISOUISS visibility were termed "Issue Visibility" (n = 17, top left) and "Organisational Visibility" (n = 20, bottom right) respectively to describe which type of visibility was dominant. In using these labels, there is no implication that units in the clusters have the characteristic in the labels exclusively, merely that the labelled characteristic is dominant in the scatter plot (see Figure 6.13).

Figure 6.13 : Operating units clustered into groups by visibility characteristics



As a check on the content validity of these groups, the mean level of VISOUORG and VISOUISS for each of the clusters was examined (see Figure 6.14). As would be expected, the "High Visibility" cluster exhibited a high mean score for both types of visibility, "Issue Visibility" dominant clusters scored highly on VISOUISS visibility, and "Organisational Visibility" dominant clusters scored highly on VISOUORG visibility (all at p , 0.01).

Figure 6.14 : Mean Operating unit visibility scores across clusters

Cluster	VISOUORG Organisational Visibility	VISOUISS Issue Visibility	Cluster Size (n)
High Visibility	4.18	3.70	36
Issue Visibility	2.92	4.04	17
Organisational Visibility	3.45	2.08	20
Low Visibility	2.35	2.33	22
Total	3.38	3.10	95
Sig.	0.00**	0.00**	

Source : Operating unit questionnaire (n = 95). Significance level was calculated using one way ANOVA.

Figure 6.15 : Comparison of Environmental Initiative Implementation Across Environmental Visibility Clusters

	High Visibility Cluster	Issue Visibility Cluster	Organis-ational Visibility Cluster	Low Visibility Cluster	Total	Sig.
Improved housekeeping	1.88	1.88	2.00	1.54	1.82	0.02*
Waste management and reduction	1.80	1.76	1.57	1.59	1.70	0.43
Recycling programmes	1.89	1.29	1.88	1.36	1.64	0.00**
Environmental audits	1.71	1.88	1.56	1.36	1.63	0.12
Reduction in the use of raw materials	1.48	1.76	1.69	1.23	1.51	0.15
Reduction in packaging	1.88	1.53	1.79	0.68	1.51	0.00**
Energy efficiency measures	1.49	1.47	1.26	1.14	1.36	0.31
Emission reduction	1.69	1.45	1.22	1.76	1.32	0.00**
Employee environmental training programmes	1.34	1.18	1.56	1.09	1.30	0.32
Disclosure of environmental impacts	1.21	0.82	0.69	0.71	0.92	0.16
Certified EMS	1.03	1.07	0.44	0.48	0.78	0.01*
Producing / selling less environmentally damaging products	1.03	0.67	0.81	0.41	0.76	0.12
Environment-related supplier initiatives	0.94	0.94	0.13	0.52	0.68	0.01*
Research programmes for environmental improvement	0.65	0.59	0.78	0.48	0.62	0.76
Conservation activities in the local area	0.40	0.82	0.13	0.43	0.44	0.08+
Stakeholder partnerships for environmental preservation	0.45	0.18	0.00	0.14	0.25	0.06+
Use of alternative fuel resources	0.15	0.24	0.22	0.01	0.17	0.82

Source : Operating unit questionnaire (n = 95). Scores reported are means where "yes" = 2, "planned" = 1 and "not planned" = 0. Similar analyses were conducted with simple proportions of "yes" and of "yes" and "planned" together. Results were similar. Significance level was calculated using one way ANOVA.

Given that the visibility scores were used in the clustering exercise, it is not surprising that there are striking differences in the pattern of visibility scores across the clusters (Kaufman and Rousseuw 1990). In order to verify that meaningful groups of units have been uncovered, the differences in environmental visibility profile should be corroborated with other unit characteristics (Kaufman and Rousseuw 1990). Here, the differences in environmental visibility will be compared with differences in the pattern of environmental initiative implementation, and will be discussed in the light of the hypotheses on environmental visibility and the implementation of environmental initiatives (H7, H8 and H9).

Figure 6.15 shows the results of a comparison of environmental initiative implementation across the four clusters of operating units. Overall, the pattern is consistent with that proposed in the hypotheses. The "Low Visibility" cluster showed the lowest level of implementation of ten of the 17 initiatives, and second lowest in a further five. Conversely, the "High Visibility" cluster implemented eight of the 17 environmental initiatives to the highest extent, and to the second highest extent in a further six. This general pattern implies that units with higher environmental visibility at the operating unit level, whether organisational- or issue- based, exhibit a higher level of implementation across a range of environmental initiatives than do units with low levels of visibility. This finding adds support to H5 and H6, and also reflects favourably on the criterion validity of the clusters[5].

Examination of the differences across groups for each specific environmental initiative sheds light on the types of initiatives implemented by units which are dominated by different types of visibility. For example, conservation activities in the local area are more common in units belonging to the "Issue Visibility" cluster (only marginally significant, $p = 0.08$). Units in this group are visible as a result of their environmental impacts, rather than as a large local employer or their corporate connections. They respond to institutional pressures arising from their issue visibility

[5] The notable exception to this trend is the implementation of emission reduction measures, where "Low Visibility" units score highest. This finding is in line with recent research which has constructed such "end-of-pipe" solutions as reactive, and less environmentally responsive than proactive measures such as use of alternative fuel sources or reduction in the use of raw materials (Russo and Fouts 1997; Klassen and Whybark 1999).

by directly addressing visual impacts in their local area. "Issue Visibility" units are also more likely to implement a certified EMS to signal to external constituents that they are addressing their (obvious) environmental impacts ($p = 0.01$).

Units in the "Organisational Visibility" cluster were significantly more likely to implement initiatives such as recycling programmes in order to signal their awareness of environmental initiatives at the local level ($p < 0.01$), but without addressing particular visible environmental impacts. It is possible that the high incidence of recycling and of reductions in packaging ($p < 0.01$) in this group is due to the "Organisational Visibility" cluster consisting of many retailing outlets with their characteristic high level of VISOUORG environmental visibility.

These findings together suggest that highly visible units are more likely to implement initiatives resulting in obvious environmental improvements than less visible operating units. Dividing the operating unit sample into clusters based on their environmental visibility profiles led to useful insights on the relationships between both organisation- and issue- based visibility at the operating unit level and the implementation of environmental initiatives. Across all the environmental initiatives included in this study, implementation seems to be more widespread in visible operating units (weak support for H5 and H6). The implementation of certain types of visible environmental initiatives, such as conservation activities in the local area (H8), and some signalling activities such as recycling schemes (H7) are also more common in high visibility situations.

6.6.3 Bringing operating unit and business unit environmental visibility together

A series of regression analyses were conducted in order to assess the relative impacts of the types of visibility on the dependent variables. All regression procedures were carried out using the operating unit as the main unit of analysis ($n = 95$). Where a variable relates to the business unit level, the business unit score was used for all the operating units within that business unit. The exception is where a business unit-level variable was the dependent variable (i.e. for business unit environmental proactivity). In this case, the operating unit respondent's perception of business unit environmental proactivity was used, rather than the interview respondent's score, so the sample size remained 95.

Given the model in Figure 3.4, these sets of regressions are "underfitted", because they exclude the effects of some of the variables deemed to be important to the model (i.e. the slack variables). Therefore, strictly speaking the coefficients are biased, and somewhat unreliable. Despite this shortcoming, the regressions are presented here to provide some initial results on the role of slack in environmental responsiveness. A fuller discussion of the econometric characteristics of the models is left until the slack and visibility variables are discussed together in Chapter 8 (see Section 8.3.1).

Also recall that the visibility variable names are in the format : VIS (for visibility), then BU (for business unit) or OU (for operating unit), and finally ORG (for organisational) or ISS (for issue).

Figure 6.16 reports the results of a series of six regression models with proactivity of the business unit environmental approach as the dependent variable. The inclusion of the four types of visibility greatly enhances the explanatory power of the models (R^2 much higher for Models 2-6 than for Model 1). All of the types of visibility exhibit significant relationships in the expected direction with business unit environmental proactivity except for VISBUORG (organisational visibility at the business unit level). The effect is particularly strong from VISOUISS visibility (issue visibility at the operating unit level), where there is a highly significant, positive effect in every model ($p < 0.01$). Among the control variables, organisation size, whether measured at the operating unit or the whole corporation level, does not exhibit a significant relationship with business unit environmental proactivity (see section 5.4.1). Non-manufacturing units are less likely to be proactive on environmental issues than high impact companies, but this effect is much less significant when the visibility variables are included (cf. Models 1, 4 and 6). Taken as a whole, this set of models shows how visibility accounts for much of the variance in business unit environmental proactivity. The marginally significant coefficient on medium sized corporations becomes non-significant when the visibility variables are included.

Thus when visibility is included, size becomes non-significant, and visibility accounts for much of the variation in environmental proactivity which would previously have been attributed to size.

Figure 6.16 : Regression on Proactivity of Business Unit Environmental Approach

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	6.018**	1.66**	1.520*	2.073**	1.758*	2.32**
	(0.00)	(0.00)	(0.02)	(0.01)	(0.02)	(0.01)
Environmental Visibility						
VISBUORG		-0.002	-0.003	0.005	-0.164	-0.001
		(0.81)	*(0.69)*	*(0.56)*	*(0.24)*	*(0.94)*
VISBUISS		0.393**	0.172+	0.158+	0.196+	0.154
		(0.01)	*(0.06)*	*(0.07)*	*(0.06)*	*(0.15)*
VISOUORG		0.498**	0.388**	0.513+	0.380*	0.254
		(0.00)	*(0.01)*	*(0.08)*	*(0.01)*	*(0.12)*
VISOUISS		0.156*	0.498**	0.513**	0.537**	0.536**
		(0.04)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Unit Size						
Number of employees (log)	0.000		0.003	0.006	0.003	0.008
	(0.97)		*(0.67)*	*(0.93)*	*(0.68)*	*(0.91)*
Industry Group						
Other Manufacturing	-0.640+			-0.21		-0.236
	(0.06)			*(0.49)*		*(0.46)*
Other non-manufacturing	-1.08**			-0.695*		-0.672+
	(0.00)			*(0.04)*		*(0.07)*
Corporate Size						
Medium Corporation	-0.489+				-0.008	-0.144
	(0.09)				*(0.80)*	*(0.63)*
Large Corporation	0.007				0.537	0.218
	(0.83)				*(0.27)*	*(0.67)*
Adjusted R squared	0.14	0.37	0.34	0.40	0.40	0.41

Notes : "Proactivity of Business Unit Environmental Approach" is derived from the 95 operating unit general managers' perceptions as captured on the questionnaire (see Section 5.3.1 for derivation). All other business unit level data is from interviews, and operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values.

Figure 6.16 indicates a further linkage between operating unit visibility and green organisational responsiveness. Visible operating units are more likely to be a part of an organisation with a proactive business unit environmental approach (see Types 3 VISOUORG, and 4 VISOUISS in Figure 6.16). This could reflect either a tendency for business units with visible operating units to adopt a proactive environmental stance which later results in high environmental initiative implementation, or for visible operating units to address their local institutional pressures by implementing environmental initiatives and later interpret their corporate surroundings as supportive of their own proactive approach (recall that the dependent variable here is the operating unit general manager's interpretation of business unit environmental proactivity, and not the interview respondent's).

Similar regression analyses were performed on total environmental initiative implementation. Figure 6.17 reports the results of a series of models regressing the four types of visibility and the control variables on total environmental initiative implementation.

Again, the inclusion of the environmental visibility variables greatly enhanced the explanatory power of the models (R^2 Model 6 is much higher than R^2 Model 1). The operating unit level measures of visibility were significant and in the predicted direction as in the previous set of regressions. The pattern for the business unit level differed from the regressions on business unit environmental approach. In the models regressing on total environmental initiative implementation, the effect of VISBUISS visibility was weakened (not significant in any model at $p < 0.05$), whereas VISBUORG visibility became more significant, especially in the models not including industry group (Models 3 and 5).

A striking difference between the models reported in Figures 6.16 and 6.17 is the effect of operating unit size. Larger operating units are consistently more likely to implement environmental initiatives than their smaller counterparts, but are not any more likely to exhibit a more proactive business unit environmental approach. This is contrary to the findings in the meta-analysis of no significant relationship between size and implementation (see section 2.4). In order to assess the finding's generality, individual sets of regressions were undertaken on each of the types of environmental initiatives (see H7, H8 and H9).

Figure 6.17 : Regression on Total Environmental Initiative Implementation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.564**	0.130	-0.48*	-0.682*	-0.413	-0.620*
	(0.00)	(0.52)	(0.03)	(0.01)	(0.11)	(0.04)
Environmental Visibility						
VISBUORG		-0.010**	0.005+	0.003	0.010*	-0.008
		(0.00)	*(0.06)*	*(0.30)*	*(0.03)*	*(0.14)*
VISBUISS		-0.004	0.001	0.002	-0.136	0.000
		(0.17)	*(0.76)*	*(0.59)*	*(0.70)*	*(0.94)*
VISOUORG		0.105*	0.105*	0.143**	0.010+	0.131*
		(0.05)	*(0.03)*	*(0.01)*	*(0.05)*	*(0.02)*
VISOUISS		0.14**	0.14**	0.136**	0.131**	0.127**
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Unit Size						
Number of employees (log)	0.124**		0.114**	0.113**	0.113**	0.11**
	(0.00)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Industry Group						
Other Manufacturing	0.003			0.175		0.165
	(0.77)			*(0.10)*		*(0.22)*
Other non-manufacturing	0.006			0.187		0.151
	(0.63)			*(0.12)*		*(0.22)*
Corporate Size						
Medium Corporation	-0.15				-0.008	-0.006
	(0.13)				*(0.42)*	*(0.59)*
Large Corporation	-0.374				-0.219	-0.19
	(0.74)				*(0.19)*	*(0.27)*
Adjusted R squared	0.228	0.277	0.446	0.466	0.458	0.474

Source : All business unit data is from the interviews, and all operating unit data is from the questionnaire. "Environmental Initiative Implementation" was calculated as the average implementation level across all the environmental initiatives reported above in section 5.3.2 (potential scores from 0 to 2, actual range, 0.06 to 2.00). Sample size = 95. Numbers in parentheses are p-values.

Analysing the same set of models on clean technology initiative implementation reveals that larger operating units are also more likely to implement clean technology initiatives (see Figure 6.18). Indeed, operating unit size is the only consistent predictor of clean technology initiatives across the models, with medium sized corporations and other non-manufacturing industries showing some significance. As expected in H9, there are no significant relationships between any of the visibility types and clean technology initiative implementation. Clean technology initiatives are not particularly prevalent in visible firms, since the payoff from implementing the initiatives does not depend on a firm's visibility. Slack is expected to have more of a role in clean technology initiatives, and the impact of slack will be assessed separately in the next chapter (see section 7.5.4).

Figure 6.18 : Regression on Clean Technology Initiative Implementation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-0.75**	0.434	-0.41*	-0.846*	-0.885*	-1.46**
	(0.00)	(0.19)	(0.26)	(0.04)	(0.04)	(0.00)
Environmental Visibility						
VISBUORG		0.053	-0.007	-0.065	-0.022	-0.141
		(0.25)	*(0.87)*	*(0.18)*	*(0.77)*	*(0.09)*
VISBUISS		-0.111*	-0.031	-0.015	0.020	0.061
		(0.03)	*(0.53)*	*(0.76)*	*(0.73)*	*(0.28)*
VISOUORG		-0.009	-0.033	0.059	0.005	0.122
		(0.91)	*(0.68)*	*(0.50)*	*(0.95)*	*(0.16)*
VISOUISS		0.091	0.094	0.084	0.081	0.079
		(0.23)	*(0.18)*	*(0.21)*	*(0.25)*	*(0.24)*
Unit Size						
Number of employees (log)	0.172**		0.167**	0.173**	0.171**	0.18**
	(0.00)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Industry Group						
Other Manufacturing	0.172			0.256		0.326+
	(0.27)			*(0.14)*		*(0.06)*
Other non-manufacturing	0.322+			0.495*		0.592**
	(0.05)			*(0.01)*		*(0.00)*
Corporate Size						
Medium Corporation	0.328				0.362*	0.427**
	(0.15)				*(0.03)*	*(0.01)*
Large Corporation	-0.004				0.154	0.380
	(0.81)				*(0.58)*	*(0.18)*
Adjusted R squared	0.328	0.103	0.266	0.323	0.309	0.382

Source : All business unit data is from the interviews, and all operating unit data is from the questionnaire. "Clean Technology Initiative Implementation" was calculated as the average implementation level across all the clean technology initiatives reported above in section 5.3.2 (potential scores from 0 to 2, actual range, 0.00 to 2.00). Sample size = 95. Numbers in parentheses are p-values.

In contrast with the clean technology initiatives, there does seem to be a positive and significant relationship between environmental visibility and stakeholder relations initiatives (see Figure 6.19). Adding the stakeholder relations initiatives greatly improves the explanatory power of the models (r^2 = 0.35 in Model 6, compared with r^2 = 0.14 in Model 1). Organisational visibility at the business unit level (VISBUORG) shows the most consistent relationship with stakeholder relations initiatives (supports H8). If a business unit's activities are closely monitored by the media, or the company name is widely recognised, operating units within that business unit are more likely to undertake conservation activities in the local area or maintain stakeholder partnerships for environmental preservation.

Figure 6.19 : Regression on Stakeholder Relations Initiative Implementation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.163	-0.203	-0.743*	-0.857*	-0.680+	-0.73**
	(0.45)	(0.47)	(0.03)	(0.03)	(0.08)	(0.10)
Environmental Visibility						
VISBUORG		0.152**	0.118**	0.108*	0.249**	0.267**
		(0.00)	*(0.00)*	*(0.02)*	*(0.00)*	*(0.00)*
VISBUISS		-0.099*	-0.054	-0.050	-0.106*	-0.107+
		(0.02)	*(0.23)*	*(0.28)*	*(0.04)*	*(0.05)*
VISOUORG		0.133+	0.132+	0.153+	0.120	0.122
		(0.07)	*(0.07)*	*(0.06)*	*(0.10)*	*(0.15)*
VISOUISS		0.110+	0.114+	0.112	0.084	0.081
		(0.09)	*(0.08)*	*(0.08)*	*(0.19)*	*(0.21)*
Unit Size						
Number of employees (log)	0.128**		0.096**	0.095*	0.091*	0.085*
	(0.00)		*(0.01)*	*(0.01)*	*(0.01)*	*(0.02)*
Industry Group						
Other Manufacturing	0.032			0.112		0.091
	(0.84)			*(0.50)*		*(0.57)*
Other non-manufacturing	0.071			0.095		-0.023
	(0.67)			*(0.61)*		*(0.90)*
Corporate Size						
Medium Corporation	-0.119				-0.129	-0.122
	(0.40)				*(0.38)*	*(0.43)*
Large Corporation	0.026				-0.58*	-0.641*
	(0.88)				*(0.02)*	*(0.02)*
Adjusted R squared	0.135	0.228	0.296	0.300	0.340	0.347

Source : All business unit data is from the interviews, and all operating unit data is from the questionnaire. "Stakeholder Relations Initiative Implementation" was calculated as the average implementation level across all the stakeholder relations initiatives reported above in section 5.3.2 (potential scores from 0 to 2, actual range, 0.00 to 2.00). Sample size = 95. Numbers in parentheses are p-values.

Notably, it is organisational visibility at the business unit level (VISBUORG), rather than at the operating unit level (VISOUORG) which best predicts stakeholder relations initiative implementation. This may indicate that stakeholder relations initiatives are directed more by the business unit headquarters than by autonomous operating units. This is early evidence that decisions to undertake different types of environmental initiatives are taken at different organisational locations. Also of interest are the negative and significant coefficients on the large corporations dummy variables in Models 5 and 6 ($p < 0.05$). This suggests that when visibility is controlled for, business units in the largest corporations are less likely to implement stakeholder relations initiatives than the smallest corporations. If this is an enduring effect when the slack variables are also included (see section 8.3.2), this is an anomalous result which needs further exploration.

Figure 6.20 shows the final set of regression analyses in this chapter, on materials-reducing initiative implementation. As with stakeholder relations initiatives, and as predicted in H7, there are positive and significant coefficients for several of the environmental visibility variables. The addition of the visibility variables greatly enhances the explanatory power of the models ($r^2 = 0.49$ in Model 6 compared with $r^2 = 0.25$ in Model 1).

Figure 6.20 : Regression on Materials-reducing Initiative Implementation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	1.033**	0.394+	-0.372	-0.585*	-0.214	-0.463
	(0.00)	(0.08)	(0.12)	(0.03)	(0.45)	(0.15)
Environmental Visibility						
VISBUORG		0.065*	0.015	-0.002	0.001	-0.017
		(0.04)	*(0.61)*	*(0.96)*	*(0.98)*	*(0.77)*
VISBUISS		0.001	0.069*	0.078*	0.059	0.071+
		(0.97)	*(0.04)*	*(0.02)*	*(0.12)*	*(0.07)*
VISOUORG		0.105+	0.092+	0.129*	0.081	0.121*
		(0.07)	*(0.08)*	*(0.03)*	*(0.13)*	*(0.05)*
VISOUISS		0.170**	0.178**	0.175**	0.187**	0.121**
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Unit Size						
Number of employees (log)	0.131**		0.141**	0.136**	0.140**	0.136**
	(0.00)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Industry Group						
Other Manufacturing	0.037			0.225+		0.213+
	(0.77)			*(0.05)*		*(0.07)*
Other non-manufacturing	-0.017			0.162		0.162
	(0.90)			*(0.21)*		*(0.23)*
Corporate Size						
Medium Corporation	-0.247*				-0.107	-0.075
	(0.02)				*(0.33)*	*(0.49)*
Large Corporation	-0.038				0.033	0.046
	(0.76)				*(0.86)*	*(0.81)*
Adjusted R squared	0.245	0.262	0.461	0.486	0.469	0.490

Source : All business unit data is from the interviews, and all operating unit data is from the questionnaire. "Materials-reducing Initiative Implementation" was calculated as the average implementation level across all the materials reducing initiatives reported above in section 5.3.2 (potential scores from 0 to 2, actual range, 0.00 to 2.00). Sample size = 95. Numbers in parentheses are p-values.

The effect of visibility on materials-reducing initiatives differs in two main ways from the effect on stakeholder relations initiatives. Firstly, the most enduring correlates with materials-reducing initiatives are environmental visibility types at the operating unit level (VISOUORG and VISOUISS). This suggests that the decision to introduce materials-reducing initiatives may be taken at the operating level, depending on local visibility conditions rather than at the business unit level as with stakeholder relations initiatives. Secondly, it is issue visibility (VISOUISS), and not organisational visibility (VISOUORG), which best predicts materials-reducing initiatives (as opposed to organisational visibility for stakeholder relations initiatives). Operating units with obviously visible impacts have a clearer focus for their materials-reducing activities compared with organisationally visible units which prefer more general stakeholder relations initiatives.

Taken together the regression analyses allow an assessment of the operating unit level hypotheses on environmental visibility and green organisational responsiveness. At the operating unit level, the data indicate a positive relationship between both organisational- and issue- based visibility, and the implementation of environmental initiatives (supporting H5 and H6). Operating units whose premises, activities or presence in the local community is obvious do seem to implement more environmental initiatives than less visible units.

There is less support for the hypotheses on responsiveness at the business unit level (H3 and H4). H3 is not supported at all in Figure 6.16, as there are no significant relationships between organisational visibility at the business unit level and environmental proactivity in any of the models. Notably, Figure 6.17 shows that this type of visibility (VISBUORG) is significantly associated with environmental initiative implementation. Although not addressed directly in the hypotheses, this is an interesting finding suggesting which runs contrary to the theoretical discussion in Chapter 3. Highly visible organisations are more likely to implement environmental changes, even though they are no more likely to claim environmental proactivity than less visible ones.

A marginally significant relationship was found between issue visibility at the business unit level and environmental proactivity (see VISBUISS in Figure 6.16). This gives weak support to H4, but may be better explained by measurement characteristics than by the theoretical discussion driving the hypotheses. The two indicators measuring VISBUISS visibility were based on marketing emphasis given to environmental issues and on the publication of an environmental report (see section 6.3). It could be argued that both of these measures are really a reflection of a corporate environmental approach, and not a cause of one. If this perspective is taken, then the causal direction between the independent and dependent variables is reversed (see section 4.2.1), and it is unsurprising that VISBUISS visibility and corporate environmental proactivity are positively related.

Broad support was found for all the hypotheses on visibility and types of environmental initiatives (H7 – H9). Aspects of visibility were positively related with both materials-reducing (supporting H7) and stakeholder relations (supporting H8) initiatives. No significant relationships were found between visibility and clean technology initiatives (supporting H9). Further, initial evidence was gathered which suggested that decisions to implement different types of initiatives are made at different levels of analysis.

6.7 Chapter Summary

This chapter has tested the hypotheses on the relationship between visibility and the environmental responsiveness of organisations. A typology identifying four main types of environmental visibility was derived from the interview data, and later operationalised and validated using quantitative data. Relationships between the four types of visibility and organisation size, industry group, corporate environmental proactivity, and specific and aggregate environmental initiative implementation were examined.

The chapter has argued that visibility is an important factor in environmental decision-making. It accounts for much of the variation in business unit environmental proactivity, and for the implementation of different types of environmental initiative. However, the analyses revealed that organisation size is still a significant predictor of implementation of environmental initiatives, even when the effect of visibility is controlled for. Whether slack accounts for this effect is the focus of the next chapter.

Chapter 7 : Organisational Slack and Environmental Responsiveness[1]

[1] The operating unit level empirical results were previously reported in Bowen, F. E. (1999), "Does Organisational Slack Stimulate the Implementation of Environmental Initiatives?", in Donna Wood and Duane Windsor (eds.), *Proceedings of the Tenth Annual Meeting of the International Association for Business and Society*, pp. 229-234

7.1 Introduction

This chapter will examine the relationships between organisational slack and the environmental responsiveness of organisations. Chapter 3 listed the many roles that slack plays in organisations, and eventually posited an ambiguous aggregate relationship between slack and responsiveness. This chapter will explore these roles in more detail, and test their implications for various types of environmental responsiveness. The chapter's aims are :

- to find evidence of each of the roles of slack in environmental responsiveness by analysing the qualitative data
- to operationalise slack at both the business unit and operating unit levels
- to test the hypotheses on organisational slack derived in Chapter 3

The chapter begins by applying Bourgeois' (1981) discussion of the functions of organisational slack in an environmental context (see section 3.2.4). Qualitative data from the interviews suggest that slack can perform all the functions he outlined in an organisation's response to environmental demands. These were inducement, conflict resolution, buffering, innovation, satisficing and politics. Examples of all these roles encountered in the interviews are provided as an indication of the overall relevance of organisational slack to environmental management researchers. The appropriate operationalisation of organisational slack, at the corporate, business unit and operating unit level is then discussed. Quantitative data on organisational slack, both in performing different functions and at different levels of analysis, is then presented. The Chapter concludes by assessing the relationships between organisational slack and green organisational response.

7.2 Functions of Organisational Slack in an Environmental Context

7.2.1 The organisational slack comments coding process

Given the lack of explicit consideration of the types of organisational slack in an environmental context in the extant literature (see section 3.2.4), the first step in analysing the role of organisational slack was to search for any examples of slack's role in environmental decision-making. As with environmental visibility, theory provided a guide to the types of organisational slack that might be encountered in an environmental context (see section 3.2.4). The interview transcripts were examined to generate examples of the roles of slack. The aims of this exercise were to assess whether slack does indeed play a role in environmental decision-making, and to establish guidelines for appropriate operationalisations of slack as a basis for the later quantitative tests.

The interview transcripts were read and any examples of the role of slack were coded using NUD*IST to organise and develop the categories. As the interview protocol in Appendix 3 suggests, respondents were not asked directly of their opinion on any relationship between slack and environmental responsiveness. Comments from the interviews which were later interpreted as examples of the role of slack usually arose in discussions on why the company is engaged in environmental issues to the extent that it is, and on the sort of capabilities required by a business in their industry to respond to environmental demands.

A direct question on how much slack the respondent thought was in the business at that time was asked towards the end of the interview. This question was aimed as much at gathering the respondents' interpretation of what slack is, as at any substantive estimate of the amount of slack. These comments proved invaluable in developing the operationalisations of slack later in this chapter (see section 7.3). Asking such a question directly could have led to a concern about hypothesis guessing by the respondent as they are guided by the questions to what the researcher thinks is important. However, this is less of a concern here, since the slack question was usually asked at the very end of the interview after the main discussion on environmental risks, opportunities and actions had already taken place.

During the first round of coding, any comments that seemed to be related to organisational slack such as excess resources, excess performance, resource requirements of environmental initiatives, managerial time or cost-benefit considerations were retained for the second round. These comments were then further sorted into either one of the six types of organisational slack operations as identified by Bourgeois (1981) (see section 3.2.4), or into a general category of "other relevant comments". Output from the second round of coding is used in this section to illustrate the importance of organisational slack in environmental decision-making. Each of the operations of organisational slack are discussed in more detail in the next six sections.

7.2.2 Slack as an inducement to maintain the coalition

In Cyert and March's (1963) original formulation, organisational slack allowed payments to organisational actors in excess of those strictly required as an inducement for them to remain involved in the organisation. Excess income and prestige induces organisational members, both top managers and other workers, to contribute to the organisation. A strong theme running through the interviews was the importance of a firm's environmental reputation in retaining co-operation from organisational actors, with eight of the 25 business units making comments on this theme. In over half of these cases, it was general managers which mentioned environmental reputation as a reward for working for the firm, indicating this view was held more widely than simply among environmental specialists. A typical comment on inducement of organisational actors is provided by a general manager in a high impact manufacturer :

> *"So I mean if you're down the pub and somebody comes in and says "You work for a dirty old business that doesn't care about the environment". I mean actually if you work for [us] you know that's not so, and you feel good about it because you know that we are OK. But otherwise, you might not work for us."*
>
> *Transcript # 15*

Such comments also related specifically to top management commitment. The Managing Director of a chemicals company went so far as to place a value (in terms of salary) on the importance of environmental reputation as a personal inducement to stay in the industry :

> *"I'm definitely glad I'm in Chemicals. I'm not sure I'd work in an irresponsible industry. Even if they paid me 10 times what I'm earning. There's no question in my mind whatsoever of the basic intrinsic good of chemicals, and I think I've never met anybody in this industry who's not taken the responsibilities of working in the industry seriously"*
>
> *Transcript #12*

The interviews also revealed, however, that environmental considerations are not always part of a positive inducement to remain in the coalition. Indeed, individuals' motivations to be in a particular industry may preclude good environmental performance. A respondent in the construction industry expressed concern that the primary driver for people to be involved in that industry was being outside and seeing something being built, not doing paperwork on site. This made formal monitoring of environmental performance difficult because employees resisted the paperwork. This contrasts with a view from a respondent in a utility company that they employ many scientists and engineers who have a natural affinity for the environment, and all they have to do is align the corporate strategy with that to mobilise the enthusiasm for environmental issues. The most extreme example of inducements precluding environmental performance was given by the Managing Director of a manufacturer :

> *A good chunk of our salary is paid so if we don't make the profits we lose a lot of money. And so a lot of pressure is on making profits, and so when you talk to anyone in this group, hopefully, then people would be interested in profits. And we all know what the share price is, and that's the ethos we have... and so all the environmental things have to be sold - either on the basis of you have no choice this is legislation, it's the law so you have no choice but to do this, or we can save some dosh and do this."*
>
> *Transcript #3*

The interviews yielded examples of how good environmental performance can be an inducement for organisational actors, both top management and other employees, to remain in the coalition. Prestige in the form of high environmental performance can provide an element of reward to individuals. The transcripts also showed how the motivations of different groups to contribute to the organisation can help or hinder environmental responsiveness. Non-environmental inducements (such as profit-related pay, or the inducement of being outdoors in the construction industry) can create slack for the individuals concerned, but can limit the potential to implement environmentally responsible actions. Conversely, employees with an affinity for environmental activities may gain personal excess "payments" from being involved in an environmentally sound company, and may facilitate environmental initiatives.

7.2.3 Slack as a means for conflict resolution

Slack can play a role in conflict resolution. It can mute the problems of scarcity in the allocation of resources to organisational sub-units, and allow the allocation of resources to "pet projects" or loosen constraints on environmental expenditures (Cyert and March 1963). Eight business units provided examples of the role of slack resources in responses to requests for environmental investments. A retailer which had been loss-making for seven of the eight previous financial years commented :

> *"And if I went to the directors and said "Look, I want fifty grand to go and certify a forest in Indonesia" you know, I think I'm sure they would say "On your bike". [Our main competitor] have put in a hell of a lot of money, I did see a figure quoted somewhere, but we're talking about £2 million or something. A lot of money. So we're not able to stump up that sort of money in terms of our internal resources... at the moment because of the resources that we've got available, you know, we're balancing the plates all the time, and you feel that you can't dedicate as much to the issue as you would like to."*
>
> *Transcript #10*

This contrasts sharply with a much larger, and much more commercially successful, manufacturer :

> *"You can do hobbies, like the Clean Lake Initiative in the UK where a few companies get together and clean up the lake. Your people go fishing on the weekends etc. It doesn't cost much - a couple of hundred thousand pounds - but it makes people feel good and it's good to do it as a hobby. The really big things we do when either we have to secure supply or where the customers will pay... There are lots of local initiatives which we at the centre know nothing about."*
>
> *Transcript #21*

Every respondent who talked about the environmental investment approval process agreed that they use the same criteria for environmental investments as for any other capital or project investment. Indeed, some environmental investments were deemed to have a high return, and might be undertaken regardless of slack position. At the margin, however, resource conflicts between sub-units could be resolved more easily with the existence of slack. Environmental "pet projects" with a low, or even negative rate of return, were supported where resource slack allowed them to be pursued. These marginal projects were rejected where there was insufficient slack for them to be implemented without adverse resource implications elsewhere.

7.2.4 Slack as a workflow buffer

Slack can serve as a buffer for the technical core of the organisation (Thompson 1967). Analysis of the interview transcripts suggested that there are two types of buffer relevant in the environmental context - internal buffers and external buffers. Internal buffers are resource buffers between parts of the organisation in the form of excess resources to ensure the smooth running of the internal operation even when there is an external shock to the system. Examples in the interviews included over-resourcing the supplier environmental certification process to secure early environmental improvement in input quality to mitigate later potential changes in environmental product requirements. Other companies bought more expensive production equipment than strictly required, which yielded better environmental performance such as lower emissions or fuel optimisation. Some respondents claimed that their firms were paying excess prices for inputs to maintain higher environmental standards. One company mentioned having more people trained in environmental issues than required for day-to-day running of the business to cope with emerging environmental crises.

Examples were also encountered of slack acting as an external buffer in an environmental context. Excess managerial time and effort was required to maintain relationships with external constituents which could indirectly influence the technical core, such as regulators, legislators or local residents. A retailer describes their dealings with legislators :

> *"[We] make sure that when there's some new legislation coming along that we are contributing to the sort of lobbying process to make sure that we don't get what we don't want. So we're sort of up front. Proactive in making sure that the new legislation coming along we're aware of, we're contributing to, and we're making sure that we're planning for the implementation of that legislation within the business."*
>
> *Transcript #10*

Thus, the interviews supported the view that slack managerial time in the form of a larger environmental group supported by a larger corporate overhead, can buffer the production process from changes in the external environment (King and Shaver 1999). A notable extension of this argument is provided by the Group Environmental Manager of a struggling chemicals company :

> *"We had 80% of one guy's time at a site dealing with complaints. So we're now putting in some investment into the boilers to see if we can stop it once and for all"*
>
> *Transcript #20*

Here the external resource buffer, in the form of 80% of a manager's time dealing with local residents' complaints, is seen as slack which is a cost to the business. In this case, an environmental improvement to the boilers was undertaken to reclaim that slack back to the business. In a low slack situation, an environmental initiative was undertaken to reclaim slack.

7.2.5 Slack and innovation

The majority of business unit respondents supported the view of slack facilitating innovative behaviour (Cyert and March 1963; Levinthal and March 1981). Slack allowed market research through environmental surveys and the testing of eco-labelling products. It encouraged process development by experimenting with more environmentally sound processes and product innovation by facilitating the development of greener products. An example is provided by a utility company :

> *"They're developing solar panels to power the sites. We saw them some years ago, and we thought, "we could do this". So all we have to do is sort out the technology. So it's just a case of devoting someone's time to it, and I think we can handle that."*
>
> *Transcript #5*

Slack resources (in the form of higher corporate overheads) also allowed larger central environmental management groups. These groups acted as search teams not only for environmental technological developments as suggested by the slack and innovation literature, but also for environmental legislation and media interest in an issue. A retailer commented :

> *"We do spend time on keeping track of emerging environmental issues and technologies. We're actively involved in consultation on it, and if anything, we haven't been as cost-benefit analysis focused as we should be."*
>
> *Transcript #14*

Conversely, several respondents attributed their frustration with being unable to implement environmental improvements to a lack of available time and technical or financial resources for experimenting with solutions. The Technical Director of a construction company which barely engages with environmental issues, and has no central environmental specialists, comments on the difficulties of environmental search in a low slack situation :

> *"... I haven't got the time to go through it. And I've got to be honest and say that I don't always understand the references to chemical agencies and obviously they're giving one side of the story. It there was some regulatory independent approval system that would [suggest the best environmental options], that would solve the problem... Rather than us wasting our time at the minute the way we do."*
>
> *Transcript #6*

7.2.6 Slack and satisficing

Despite most respondents presenting a picture of slack facilitating wider searches for feasible options and experimentation with environmental solutions, a few examples were found to support the opposing view on satisficing behaviour. According to this view, slack allows a more limited search for options due to the less urgent need for solutions (Simon 1957; Cyert and March 1963). The respondent from a utility company, which had achieved outstanding profit performance in the decade since privatisation, expressed frustration at the lack of R & D spending that could have improved environmental performance :

> *"And I really feel that there's probably a whole new radical way of treating sewerage, for instance, but we've never bothered to look at or find it because we never felt we had to... We know [the current system] works, and that it's the latest technology... but we don't know whether there's a Concorde out there undiscovered...we still need to have been spending that amount on R & D, and we haven't."*
>
> *Transcript #5*

In this case, good financial performance bred slack which could have enabled environmental investments, but did not because it instead allowed managers to satisfice with sub-optimal, less advanced technological searches. The converse situation, where low slack initiates a much more intensive search for optimal solutions was also encountered. Several low slack organisations claimed that they would only implement win-win environmental initiatives, and focused their search for environmental solutions on situations where there could be both an environmental and a cost or revenue improvement. Thus evidence was found in the environmental context of slack allowing satisficing decisions on environmental responsiveness.

7.2.7 Slack as a promoter of political activity

The interviews provided examples of two alternative formulations on slack and political activity. Examples presented above on slack and conflict resolution could be interpreted as support for the argument that slack would lead to less political activity because it mutes the problems of scarcity (Bourgeois 1981). Conversely, slack resources can lead to more political behaviour because they provided an opportunity for managers to engage in political behaviours to capture more of the new resources (Bourgeois 1981; Astley 1978). What follows here is an example provided by an Environmental Manager at a Retailer of this alternative view :

> *"We've recently had a PR manager join us... We used to have an agency and thought, if we're spending money on a PR agency, we only want to spend money on things that we really have to. So they spend all their time on marketing us as a company, and not any time spending, you know, covering the small environmental news items. Now that we have a PR manager in place, I hope to be able to pass a lot of that on to her. She's the PR specialist. And I've been trying to convince the Health and Safety people to come in with me and get a piece of her time."*
>
> *Transcript #9*

Thus slack not only facilitated conflict resolution (see Section 7.2.3), it also promoted increased political activity to capture the excess resources. Despite comparatively few examples of such politicking in an environmental context internal to the organisation, many examples were found of internal slack resources allowing more external political activity in an environmental context. Interviewees gave examples of spending (slack) time on committee or membership work with trade associations, environmental associations, governmental bodies, select committees etc. These are not outlined here because they are not strictly "political activities" as intended by the organisational slack literature in the sense of internal bargaining over resources or conflict resolution between coalitions. However, it is worth noting that, in an environmental context, an important function of slack is to enable participation in external politics and other external buffering or bridging activities.

7.2.8 Implications of the qualitative evidence on slack

The qualitative evidence suggests that slack plays an important role in environmental decision-making in organisations. Examples of all the functions of slack identified by Bourgeois (1981) were found in an environmental context, and an extension was made to include internal and external aspects of some of the functions (such as buffering). It is worth noting, however, that the types of operation of slack are not wholly independent and the divisions between the types can be blurred. As an example, the pursuit of pet projects in conflict resolution is linked with innovation to the extent that it was difficult to separate comments into the different categories. For the purposes of this exercise this is not too much of a concern since one of the aims was merely to establish the importance of slack as a phenomenon of environmental management researchers to consider using the Bourgeois (1981) framework as a convenient organising device.

The second aim of this section was to establish guidelines for appropriate operationalisations of slack as a basis for the later quantitative tests. Several lessons can be drawn from the above analysis. Firstly, the appropriate level of analysis varies by type of slack. Slack as inducement to maintain the coalition is captured at the level of the individual manager. Slack as a vehicle for conflict resolution is captured at the sub-unit (including operating unit) level. Slack as a workflow buffer, or promoter or brake on innovation is at either the sub-unit or total organisation level. Since the focus of the current study is on operating units and business units (see section 3.2.5), slack should be operationalised at these levels. An implication of this choice is that the role of slack as inducement to maintain the coalition for individuals will be excluded.

Secondly, slack manifests itself in both financial and non-financial forms. The interviews indicated a role for past and current profit performance in predicting the existence of slack. They also highlighted the importance of levels of cash, size of the corporate overhead in funding central environmental specialists, availability of "spare" managerial time and effort, the number of central environmental specialists available to support environmental programmes, and not being up against capital or labour capacity constraints in the transformation process. An operational measure of slack should reflect this diversity.

Core to this distinction between financial and non-financial measures of slack are the differences in the functions of slack in an environmental context. Some of the functions, such as inducement to maintain the coalition, politicking and conflict resolution rely on the existence of "managerial" slack. Managerial slack is present where there are sufficient side-payments which are derived from good financial performance. Other functions, such as internal and external buffering rely on the existence of "operational" slack, where there is enough slack in productive capacity for slack to play its buffering role. Thus a measure needs to capture not only managerial slack, but also slack in productive capacity.

Thirdly, slack is time and location specific. Slack is present in certain organisational processes or sub-units at various times, and not universally spread throughout the organisation. An operational measure should be specific about the time period, and be asked at different organisational locations. Fourthly, slack can be static or dynamic. Some environmental decisions were affected by the existence or not of a stock of slack resources. Others were affected by the acquisition or loss of slack by the flow of slack types over time. A measure should be careful to distinguish the stock and flow aspects of slack (Marino and Lange 1983).

The qualitative evidence suggests that slack is an important phenomenon in the environmental decision-making process. Any operational test of the role of slack should consider : appropriate levels of analysis; financial and non-financial forms; time and location specificity; and static or dynamic aspects of slack.

7.3 Operationalising Organisational Slack

7.3.1 Financial measures of organisational slack

Most previous studies have used measures of organisational slack based on corporate financial performance (e.g. Bourgeois and Singh, 1983; Singh, 1986; Damanpour, 1987; Subramanian and Nilakanta, 1996). Some used only a single financial indicator, such as net income (Damanpour 1987; Subramanian and Nilakanta 1996), while others developed compound indices to capture a variety of aspects of organisational slack (Bourgeois 1981; Bourgeois and Singh 1983; Riahi-Belkaoui 1998). The most sophisticated of these is the measure proposed by Bourgeois and colleagues, which uses eight financial indicators to capture three broad types of slack (see Figure 7.1).

Figure 7.1 : Measures of Organisational Slack

Slack Category	Bourgeois (1981) indicator	Measure and Sign Used
Available Slack	Retained Earnings Dividend Payout Working Capital	+ (net profit – dividends) / sales - dividends / net worth + (cash & securities – current liabilities) / sales
Recoverable Slack	Working Capital Working Capital G & A	+ accounts receivable / sales + inventory / sales + (general & administrative expenses) / sales
Potential Slack	Debt/Equity ratio Price/Earnings ratio	- long-term debt / net worth + price / earnings ratio

Source : adapted from Bourgeois and Singh (1983). All measures are expressed as a percentage change from the previous financial period. The measure for each category of slack is the arithmetic sum of the two or three indicators, using the signs reported.

This set of measures exhibits several desirable characteristics not common in other measures of financial slack. The measures are explicitly relative in that they measure changes in slack compared with the previous year. This highlights the theoretical importance of impacts of slack gaining or losing over time, not the possession of a certain level of organisational slack (Cyert and March 1963; Bourgeois 1981; Marino and Lange 1983). The measures are also relative in that they control for changes due to increases or decreases in the overall level of organisational activity by dividing each indicator by sales (Bourgeois and Singh 1983). They are also attractive because they are unobtrusive, since measuring the phenomenon does not have any substantive effect on it, and standardised, so can be collected across a sample of firms.

Unfortunately, no financial measures of slack are completely without deficiencies (Marino and Lange 1983). Financial measures were designed for accounting and reporting procedures, and not with research use in mind. They are notoriously fraught with measurement errors. More specifically, each of the individual measures in Bourgeois's (1981) framework can be individually criticised for not capturing slack. A decrease in dividend payout, for example, does not necessarily mean that managers have more easy access to slack resources generated within the firm. The validity of incorporating two dividend-based measures can also be questioned, as can the compounding of managerial (e.g. retained earnings) and operational (e.g. inventory-based) measures of slack. However, as Bourgeois (1981), and others (e.g. Marino and Lange 1983) have argued, the measures are designed as a composite index, and as a surrogate for more direct measures of organisational slack. It is in this surrogate role, given the lack of direct measures of slack at the corporate level, that the financial measures are used here.

There are at least two further specific advantages of the measures as reported in Figure 7.1 for this study. Firstly, the measures could be used to classify the sample of firms into slack gainers or losers (Bourgeois and Singh 1983). Comparing the corporate environmental proactivity of these two groups would yield a direct test of H13. Secondly, the measures were all based on Bourgeois' (1981) discussion on the functions of slack which were used in section 7.2 above and illustrated in an environmental context. Using measures designed with the same theoretical focus as this study should enhance the content validity and reliability of the operationalisations.

Figure 7.2 : Inter-correlations between categories of slack using Bourgeois and Singh (1983) measures

	Available Slack	**Recoverable Slack**	**Potential Slack**	**Total Slack**
Available Slack	1.00			
Recoverable Slack	-0.38+ (0.06)	1.00		
Potential Slack	0.51* (0.01)	0.17 (0.41)	1.00	
Total Slack	0.83** (0.00)	0.00 (1.00)	0.89** (0.00)	1.00

Note : numbers in parentheses are p-values. n=25.

Figure 7.2 presents the inter-correlations between changes over the previous year in the three separate categories of organisational slack, and a total slack measure calculated by summing across all three categories. As the figure indicates, both available and potential slack are highly correlated with the total level of organisational slack ($p < 0.01$), and to a lesser extent, with each other ($p < 0.05$). Recoverable slack exhibits a surprising pattern, being marginally negatively associated with available slack ($p = 0.06$) and perfectly unrelated to total slack changes. This is most likely due to the very low standard deviation of this measure, and hence the limited variation for other variables to correlate with[2]. The pattern of correlations suggest that recoverable slack is conceptually distinct from the other two types of slack. The different categories of slack were therefore retained through the following analyses.

Despite the advantages of Bourgeois and colleagues' measures, there are several weaknesses of financial measures as a measure of business unit organisational slack which needed to be overcome in this project. Financial measures are governed by accounting conventions, and as such are not always good indicators of behaviour in organisations, especially at the sub-organisational level. Even if the financial measures are good proxies for the types of slack in an organisation, financial data is usually reported at the corporate level, while the focus of this study is at the business unit and operating unit levels. While scoping this study, initial conversations with

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[2] The mean changes in all three categories of slack were very close to zero. However, the standard deviation of changes was much higher for available (0.24) and potential (0.23) than for recoverable (0.005) slack.

managers made clear that obtaining detailed financial data at the business unit level for all units in the study would be very difficult due to confidentiality issues.

For this reason, the measures of financial slack at the corporate level outlined above were supplemented by questionnaire-based measures asked of both the operating unit and business unit respondents (see Appendix 5 and 6).

7.3.2 Questionnaire-based measures of organisational slack

Questionnaire-based measures of organisational slack, were designed to capture the extent of recent gain or loss of organisational slack in sub-organisational units. Existing measures were supplemented by new measures of profit-related and time-capacity available slack.

The only measure of organisational slack at the sub-organisational level encountered in the literature review was that used by Nohria and Gulati (1996; 1997). Their measure attempted to capture slack by asking respondents hypothetical questions on the estimated effect on their business of taking away a proportion of the time of the unit's personnel, or of the operating unit's budget (see questions IVb and IVc in the business unit questionnaire, Appendix 6). The time-based and budget-based items were combined to form a static scale of organisational slack at the operating unit level (reported $\alpha = 0.79$ in their study).

While Nohria and Gulati's measure yields a static scale of the current estimated level of slack, slack is not a static concept. Indeed, as outlined above, slack may be at its most potent when it is either being gained or depleted over time (Bourgeois, 1981). This makes self-report measurements more difficult in a cross-sectional research design. Further conceptual difficulties with Nohria and Gulati's measure are that it requires estimates based on hypothetical questions, and compounds both time-based and monetary measures of slack. It is also not unobtrusive, because managers filling in the questionnaire may suspect that their answers might lead to slack resources they admit to possessing being taken away from them in future budget rounds.

These shortcomings were overcome in the current study by augmenting Nohria and Gulati's measures with new operationalisations of slack at the sub-organisational level. Inspired by Bourgeois' (1981) discussion of the dimensions of slack, "profit-related slack" was measured by a three item, seven point Likert scale ranging from "strongly agree" to "strongly disagree". The items asked about the unit's profitability compared with its most relevant competitors, the unit's profitability compared with this time last year, and the likelihood of the unit meeting its business unit targets compared with this time last year. "Time-capacity slack" was captured with similar scales based on two items assessing the unit's proximity to full capacity compared with this time last year, and assessing how busy the unit is compared with this time last year (see Appendix 5). The measures are intended to correspond with the managerial and operational functions of slack identified in the qualitative data analysis (see section 7.2).

The new measures retained the dynamic spirit of Nohria and Gulati's suggestion, but kept the two main dimensions of organisational slack separate, and avoided the use of hypothetical questions. They were asked at both the business unit and operating unit levels of analysis. This enabled some assessment of convergent validity by comparing the correlations between the various organisational slack measures. Corporate financial data could be compared with questionnaire responses at the business unit level. At the operating unit level, Nohria and Gulati's measures could be compared with the new slack scales.

Figure 7.3 presents the inter-item correlations for the seven items designed to capture organisational slack at the operating unit level. All the items within each of the three alternative measures of slack are highly correlated (all at the $p < 0.01$ level except between items 1 and 2). Also notable is the correlation between the profit-related slack measures and Nohria and Gulati's budgetary dimension (two of the three measures at $p < 0.05$), and the significant negative correlations between profit-related slack and proximity to full capacity (two measures at $p < 0.01$, the other at $p < 0.05$).

Figure 7.3 : Inter-item correlations at the operating unit level

	1.	2.	3.	4.	5.	6.	7.
Profit-related slack							
1. More profitable than competitors	1.00						
2. More profitable than last year	0.25* (0.02)	1.00					
3. More likely to meet business unit targets than last year	0.38** (0.00)	0.70** (0.00)	1.00				
Time Capacity Slack							
4. More busy day-to-day than last year	-0.20+ (0.06)	-0.16 (0.13)	-0.14 (0.20)	1.00			
5. Closer to full capacity than last year	-0.21* (0.04)	-0.52** (0.00)	-0.44** (0.00)	0.74** (0.00)	1.00		
Nohria & Gulati Measure							
6. Nohira & Gulati – time dimension	-0.04 (0.70)	0.14 (0.19)	0.20+ (0.07)	0.10 (0.37)	0.03 (0.76)	1.00	
7. Nohria & Gulati – budgetary dimension	0.15 (0.16)	0.23* (0.03)	0.23* (0.03)	-0.03 (0.78)	-0.07 (0.50)	0.49** (0.00)	1.00

Source : Operating unit questionnaire. n = 95. Upper figure in each cell is Spearman's rho. Numbers in parentheses are p-values.

Figure 7.4 : Reliability and Inter-correlations of Slack Measures at the Operating unit level

	α	**Profit-related**	**Time-Capacity**	**Nohria & Gulati**
Profit-related Slack	0.71	1.00		
Time-capacity Slack	0.74	-0.46** (0.00)	1.00	
Nohria & Gulati Slack	0.49	0.13 (0.23)	0.01 (0.90)	1.00

Source : Operating unit questionnaire. N = 95. Upper figure in each cell is Pearson correlation coefficient. Numbers in parentheses are p-values.

The pattern aggregated to the multi-item scale level reveals a similar pattern (see Figure 7.4). There is no aggregate correlation between Nohria and Gulati's slack measure and the measures designed for this study ($p > 0.05$). The two specially designed measures - time-capacity slack and profit-related slack - are inversely correlated ($p < 0.01$), supporting the conjecture that highly efficient units yield higher profits (hence high profit-related slack), but less spare time and capacity (hence low time-capacity slack). This observation supports maintaining the separation between monetary and time-capacity measures of slack. It may also help explain the low reliability of Nohria and Gulati's measure in this sample which combines both time-based and monetary-based measures (α = 0.49). The Cronbach's alpha of the two new organisational slack scales is above the conventional reliability criterion of 0.7 (Nunally, 1978).

Similar analyses were conducted at the business unit level (see Figure 7.5). The pattern of correlations is very similar to those at the operating unit level. Time-capacity and profit-related slack are inversely correlated with each other ($p < 0.05$), but not correlated with the financial measures of slack. The lack of correlation with corporate slack is not surprising given that the financial measures capture data at the corporate level, whereas the questionnaire questions were asked with reference to the business unit. This supports maintaining the separation between H13 (on corporate levels of slack) and H14 (on business unit levels of slack). The reliability of all three of the measures is very low. In the case of the new organisational slack measures, this is mostly likely a result of the low sample size (n = 25), and should not be too critical because of the acceptable reliability of the same scales at the operating unit level (see Appendix 4). The extremely low Cronbach's alpha for the total slack measure (α = 0.05) is a reflection of the multi-dimensional nature of the slack measure (Bourgeois and Singh, 1983)[3]. Although this is a concern for the quality of measurement, the measure will still be used due to its high validity as outlined above compared with other financial measures.

Figure 7.5 : Reliability and Inter-correlations of Slack Measures at the Business unit level

	α	**Profit-related**	**Time-Capacity**	**Total Slack**
Profit-related Slack	0.48	1.00		
Time-capacity Slack	0.53	-0.40* (0.04)	1.00	
Total Slack (Bourgeois & Singh (1983))	0.05	-0.18 (0.39)	0.28 (0.17)	1.00

Source : Business unit interviews. N = 25. Upper figure in each cell is Pearson correlation coefficient. Numbers in parentheses are p-values.

[3] It is notable that Bourgeois and Singh (1983) do not report the reliability of their organisational slack scales. This reflects their multi-dimensional discussion, and makes it difficult to assess whether the low reliability in this study is a distinctive difficulty.

In summary, organisational slack was operationalised at the corporate, business unit and operating unit levels using both established measures and a newly developed multi-item scale. The new scales were built upon two dimensions of available slack, profit and time-capacity. They exhibited greater content and construct validity than the extant alternatives, and at the operating unit level, exhibited acceptable reliability. The relationships between the three sets of measures of organisational slack were explored.

7.4 Organisational Slack and Other Organisational Characteristics

7.4.1 Organisational slack and organisation size

Figure 7.6 shows the mean organisational slack scores for small, medium and large corporations in the sample. Previous environmental management studies have tended to use overall organisation size as a proxy for organisational slack, especially using financial measures of slack (see section 2.4). Levels of profit-related slack across the organisation sizes show this overall pattern, with business and operating units in small corporations claiming the least profit-related slack and units in large corporations claiming the most. Although this pattern is not significant at the business unit level ($p = 0.27$), and is only marginally significant at the operating unit level ($p = 0.06$), observing this pattern over a larger sample size would support the use of overall organisation size as a first-cut proxy for profit-related organisational slack at the business unit level.

There is a significant difference in the average level of time-capacity slack across the corporation sizes, but this is not in the direction expected. This indicates that for non-financial oriented measures of slack, the conventional association of slack with organisation size is inappropriate. Larger corporations do not necessarily possess excess time or spare capacity. Indeed, it is units in small corporations which exhibit the highest levels of time-capacity slack ($p = 0.06$ for business units, $p = 0.01$ for operating units).

Figure 7.6 : Organisational Slack and Overall Organisation Size

	Small (<5,000 emp.)	**Med. (5,000–30,000 emp.)**	**Large (30,000+)**	**Total**	**Sig.**
Business Unit Level *(n=25)*					
Profit-related Slack	4.03	4.72	5.05	4.62	0.27
Time-capacity Slack	3.93	3.15	3.26	3.44	0.06+
Total Financial Slack	0.05	-0.21	-0.14	-0.10	0.45
Available Financial Slack	-0.04	-0.14	-0.12	-0.09	0.71
Operating Unit Level *(n=95)*					
Profit-related Slack	4.70	5.34	5.39	5.14	0.06+
Time-capacity Slack	3.45	2.50	3.33	3.03	0.01*
Nohria & Gulati (1996) slack	5.52	5.78	5.19	5.53	0.06+

*Source : All data at the business unit level was from the interviews (n = 25), and all data at the operating unit level was from the questionnaire (n = 95). Size was determined by number of employees in the financial year ending in 1997 as reported in corporate Annual Reports (see section 5.2.1). Significance level was calculated using one way ANOVA. All scales recoded to provide a 1-7 scale except the financial slack measures which are expressed as a proportion change in the previous financial year. + : p < 0.1; * : p < 0.05; ** : p < 0.01.*

There was no significant variation in the financial measures of either "Total Slack" or "Available Slack". This reflects the theoretical arguments above that organisation size and organisational slack are entirely separate phenomena despite the common use of the former as a proxy for the latter (see sections 2.4 and 3.2.4). When financial measures are used to capture organisational slack which are more sophisticated than simply net income, which are properly relative to organisational activity and which reflect the dynamic effects of slack, they do not correlate with overall organisation size.

7.4.2 Organisational slack and industry group

In the interests of completeness (cf. Section 6.5.2), Figure 7.7 presents the mean levels of the various organisational slack measures across the three broad industry groupings. No significant relationships were found. The evidence from this sample suggests that organisational slack is independent of industry group. This result is unsurprising given the nature of the organisational slack concept, and adds to the discriminant validity of the organisational slack measures.

Figure 7.7 : Organisational Slack and Industry Group

	High Impact	**Other Manuf.**	**Other non-manuf.**	**Total**	**Sig.**
Business Unit Level *(n=25)*					
Profit-related Slack	4.38	4.99	4.46	4.62	0.61
Time-capacity Slack	3.41	3.34	3.58	3.44	0.80
Total Financial Slack	-0.02	-0.01	-0.30	-0.10	0.27
Available Financial Slack	-0.03	-0.05	-0.23	-0.10	0.18
Operating Unit Level *(n=95)*					
Profit-related Slack	4.89	5.32	5.08	5.14	0.46
Time-capacity Slack	3.42	2.82	3.04	3.03	0.35
Nohria & Gulati (1996) slack	5.74	5.66	5.28	5.53	0.15

*Source : All data at the business unit level was from the interviews (n = 25), and all data at the operating unit level was from the questionnaire (n = 95). See Figure 4.4 for definition of industry groups. Significance level was calculated using one way ANOVA. All scales recoded to provide a 1-7 scale except the financial slack measures which are expressed as a proportion change in the previous financial year. + : $p < 0.1$; * : $p < 0.05$; ** : $p < 0.01$.*

7.5 Testing the Hypotheses : Organisational Slack and Environmental Responsiveness

This section will provide data required to evaluate the set of hypotheses on organisational slack and environmental responsiveness presented in Chapter 3:

H16 : ***There is a positive relationship between organisational slack and environmental responsiveness***

H13 : ***Business units in corporations which have been slack gainers over the previous period are more likely to have a proactive business unit environmental approach***

H14 : ***There is a positive relationship between available slack resources at the business unit level and the proactivity of business unit environmental approach***

H15 : ***There is a positive relationship between available organisational slack at the operating unit level and the implementation of environmental initiatives***

H10 : ***There is a negative relationship between available organisational slack at the operating unit level and the implementation of materials-reducing initiatives***

H11 : ***There is a positive relationship between available organisational slack at the operating unit level and the implementation of stakeholder relations initiatives***

H12 : ***There is a positive relationship between available organisational slack at the operating unit level and the implementation of clean technology initiatives***

H16, which posited a positive relationship between slack and environmental responsiveness in aggregate, was not supported by the qualitative data. Several instances of satisficing (see section 7.2.6) and regaining slack through environmental initiatives (see section 7.2.6) were found. The other six hypotheses will be examined quantitatively in this section. As with the treatment of visibility in Chapter 6, the results here are only preliminary, in the sense that the consider only the effect of slack and the control variables, and not visibility too. Testing the impact of size, slack and visibility together is the focus of the next chapter.

7.5.1 Corporate organisational slack and environmental proactivity

Business units within corporations which have been slack gainers over the previous time period are expected to exhibit higher levels of environmental proactivity than business units within slack losing corporations (H13). In order to test this hypothesis, Bourgeois and Singh's (1983) suggestion of using financial data to identify slack gainers and losers was followed, and the environmental proactivity of business units within the corporations was compared.

Figure 7.8 shows the results of an independent samples t-test for differences in mean level of business unit environmental proactivity across slack gainers and losers in the different categories of slack. For all categories of slack, the slack gainers exhibited a higher corporate engagement with environmental issues than the slack losers. The figure illustrates no significant relationship between corporate gain or loss of overall slack and environmental proactivity (see "Total Slack" in Figure 7.8). However, there is a highly significant difference in the level of business unit environmental proactivity between business units in corporations which gained *available* slack resources and those which lost them (see "Available Slack" in Figure 7.8). Business units in corporations which have experienced a recent increase in retained earnings, decrease in dividend payouts and increase in cash reserves are on average more proactive on environmental issues.

Figure 7.8 : Corporate organisational slack and environmental proactivity

	Group	Number in group	Mean business unit environmental proactivity	Significance (p-value)
Total Slack	Losers	14	5.03	0.59
	Gainers	11	5.24	
Available Slack	Losers	12	4.63	0.01**
	Gainers	13	5.62	
Recoverable Slack	Losers	14	4.95	0.38
	Gainers	11	5.30	
Potential Slack	Losers	16	4.98	0.52
	Gainers	9	5.24	

*Source : Slack calculated from Corporate Annual Reports (see Figure 7.1 for definitions). "Business Unit Environmental Proactivity" was calculated from interview data and recoded to a 7-point scale (see 5.3.1 for derivation). Significance level reported with equal variances not assumed. N = 25. ** : p < 0.01.*

Figure 7.9 further disaggregates the business unit environmental proactivity measure to its constituent components and compares business units in available slack gaining corporations with those in available slack losers. Again, the slack gainers scored higher on all items than did the slack losers. In this sample of business units, the only significant difference between the two groups is in "corporate management priority". This is the only one of the business unit environmental proactivity measures which explicitly asks about the corporate environmental approach (rather than the general "business" or "business unit" level, see section 5.3.1). Figure 7.9, therefore, shows a relationship between corporate level gains or losses in available organisational slack and corporate environmental priority. The relationships between corporate level available organisational slack and the other business unit environmental proactivity items are less significant. Although it would be reasonable to assume that these differences would be significant if observed in a larger sample, no firm conclusions on the business unit level proactivity items can be drawn from this sample of business units.

Figure 7.9 : Available Organisational Slack and Environmental Proactivity at the Business Unit Level

	Group	Number in group	Mean business unit score	Significance (p-value)
Business unit environmental Proactivity scale	Losers Gainers	12 13	4.63 5.62	0.01**
Attempt to go beyond Compliance	Losers Gainers	12 13	4.50 5.23	0.06+
Corporate management Priority	Losers Gainers	12 13	4.20 5.15	0.03*
Business unit management Priority	Losers Gainers	12 13	4.17 4.92	0.07+
Lead industry on Environmental issues	Losers Gainers	12 13	4.17 4.77	0.12
Effectively manage Environmental risks	Losers Gainers	12 13	4.58 5.00	0.14

*Source : Available slack calculated from Corporate Annual Reports (see Figure 7.1 for definition). Individual business unit environmental proactivity scales calculated from interview data and recoded to a 7-point scale (see 5.3.1 for item statements). Significance level reported with equal variances not assumed. $N = 25$. + : $p < 0.1$; * : $p < 0.05$; ** : $p < 0.01$.*

In summary, the relationships between corporate organisational slack and environmental proactivity are broadly as expected. Although H13 cannot be accepted based on the evidence in Figure 7.8 for "Total Slack", a slightly modified hypothesis can be supported. Figure 7.9 showed that business units in corporations which have been available slack gainers over the previous period are more likely to have a proactive environmental approach. Moreover, this relationship is strongest for environmental proactivity as measured by corporate environmental priority.

Two main conclusions are taken forward on the basis of these results. Firstly, the level of analysis is important. As expected from the theoretical discussion (see section 3.2.4), corporate slack measures related most strongly with environmental proactivity measures at the corporate level. This supports the connection between level of measurement of slack (see section 7.2.8) and of environmental responsiveness (see section 3.2.5) in this study's empirical approach. Secondly, it is available slack which most affects environmental proactivity, not total slack levels. This concurs with the theoretical discussion of the relationships presented in Chapter

3, and supports the emphasis on available slack through the remaining hypotheses in this Chapter (H14, H15 and H10-H12).

7.5.2 Business unit organisational slack and environmental proactivity

A positive relationship between available slack resources at the business unit level and business unit environmental proactivity was expected (H14). However, as Figure 7.10 illustrates, simply correlating the time-capacity and profit-related slack measures with the environmental proactivity scale at the business unit level did not show any significant associations. There was insufficient direct evidence to accept H14.

Figure 7.10 : Correlations between business unit available slack measures and environmental proactivity

	Profit-related slack	Time-capacity slack	Business unit enviro. proactivity	Experiment-ation
Profit-related Slack	1.00			
Time-capacity slack	-0.40* (0.04)	1.00		
Business unit enviro. Proactivity	-0.04 (0.85)	0.03 (0.88)	1.00	
Experimentation	0.27 (0.19)	-0.12 (0.56)	0.46* (0.02)	1.00

Source : Interviews. Upper number in each cell is Pearson correlation coefficient. Numbers in parentheses are p-values. n=25.

Figure 7.10 also shows correlations with an additional "experimentation" variable. This variable, inspired by Nohria and Gulati's discussion of an inverse U-shaped relationship between slack and innovation (see section 3.2.4), is made up of two further scale items asked of the business unit respondents. One captures the extent to which environmental initiatives are always subject to analysis of their potential costs and benefits, and the other addresses the extent to which operating units are encouraged to experiment with different types of environmental innovations (see questions 25 and 30 on the business unit questionnaire, Appendix 6; $\alpha = 0.72$).

When there are available slack resources, experimentation with new organisational innovations is expected to be high, and so breed a high level of environmental proactivity. Figure 7.10 partially supports this line of argument, with a significant and positive relationship between experimentation and environmental proactivity at the business unit level ($p < 0.05$). However, in this sample, there is no evidence to suggest that experimentation is itself derived from high levels of available organisational slack (at $p < 0.05$). Further, due to the small sample size of the business unit sample (n=25), it is not possible to formally test these relationships using structural equation modelling techniques such as LISREL (see section 9.4.1).

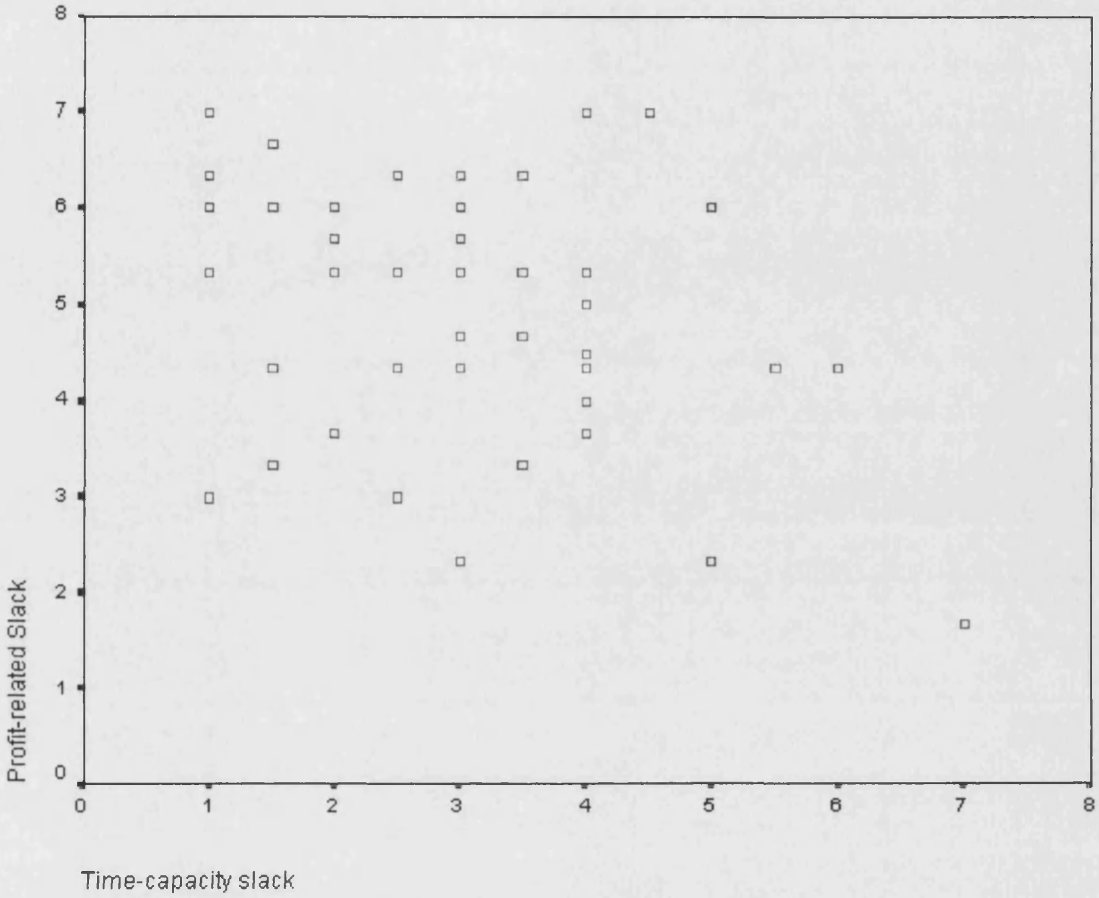
Therefore, not only is there no direct evidence to support H14, the indirect evidence, through the potentially mediating effect of experimentation, is also inconclusive. This is a disappointing result, but is not surprising given the very low reliability of the business unit measures (see Appendix 4), and the small sample size. Despite qualitative evidence at the business unit level supporting H14 (see section 7.2), the hypothesis cannot be accepted based on the quantitative evidence.

7.5.3 Operating unit organisational slack and the implementation of environmental initiatives

The theoretical discussion in Chapter 3 outlined a series of relationships between available organisational slack at the operating unit level and the implementation of environmental initiatives (H15 and H10 – H12). Before formally testing the hypotheses, the general patterns of environmental initiative implementation and types and levels of slack at the operating unit level were explored. The same broad methods were employed as with environmental visibility in Chapter 6 (see section 6.6.2).

Figure 7.11 shows a scatter diagram of time-capacity against profit-related slack at the operating unit level. There are comparatively few data points due to the existence of more tied scores on the organisational slack scales compared with the environmental visibility scales (which were made up of more items). The overall pattern exhibits the negative correlation between time-capacity slack and profit-related slack outlined above ($r = -0.46$, $p = 0.00$). This reflects the interaction effect of efficiency – highly efficient units are expected to exhibit low levels of time-capacity slack, but be rewarded with higher profit-related slack (see section 3.2.4).

Figure 7.11 : Scatter plot of Organisational Slack Types at the Operating unit level



On first inspection, this correlation may appear to be due to one or two extreme outlyers. However, further examination of the raw data indicates that several operating units have identical scores which lie on the outlying points (e.g. four separate operating units have a time-capacity slack score of 7, and a profit-related slack score of 1.67). There are more operating units lying on the downward sloping diagonal than may be obvious from casual inspection of the scatter plot.

As with environmental visibility, many operating units do not lie on the diagonal predicted by the negative correlation. There are units which score highly on both profit-related and time-capacity slack (top right of Figure 7.11), and some which exhibit low levels both of slack measured in financial and time-based terms (bottom left of Figure 7.11). These two groups of units run contrary to the negative correlation explained by the mediating role of efficiency. Indeed, when the operating units are clustered into groups in the same way as for environmental visibility (see section 6.6.2), four groups of units, defined by their efficiency and slack characteristics can be identified (see Figure 7.12).

"High Slack" units (n = 35) and "Low Slack" units (n = 19) scored high and low respectively on both profit-related and time-capacity slack. The two groups of units conforming to the generally negative relationship between the two types of slack were labelled to reflect the role of efficiency. "Low Efficiency" units (n = 13) had a high degree of time-capacity slack, but did not perform well in the previous period on financial measures. Conversely, "High Efficiency" units (n = 28) had relatively little excess time or capacity, and performed well financially over the previous year.

Figure 7.12 : Operating units clustered into groups by organisational slack characteristics

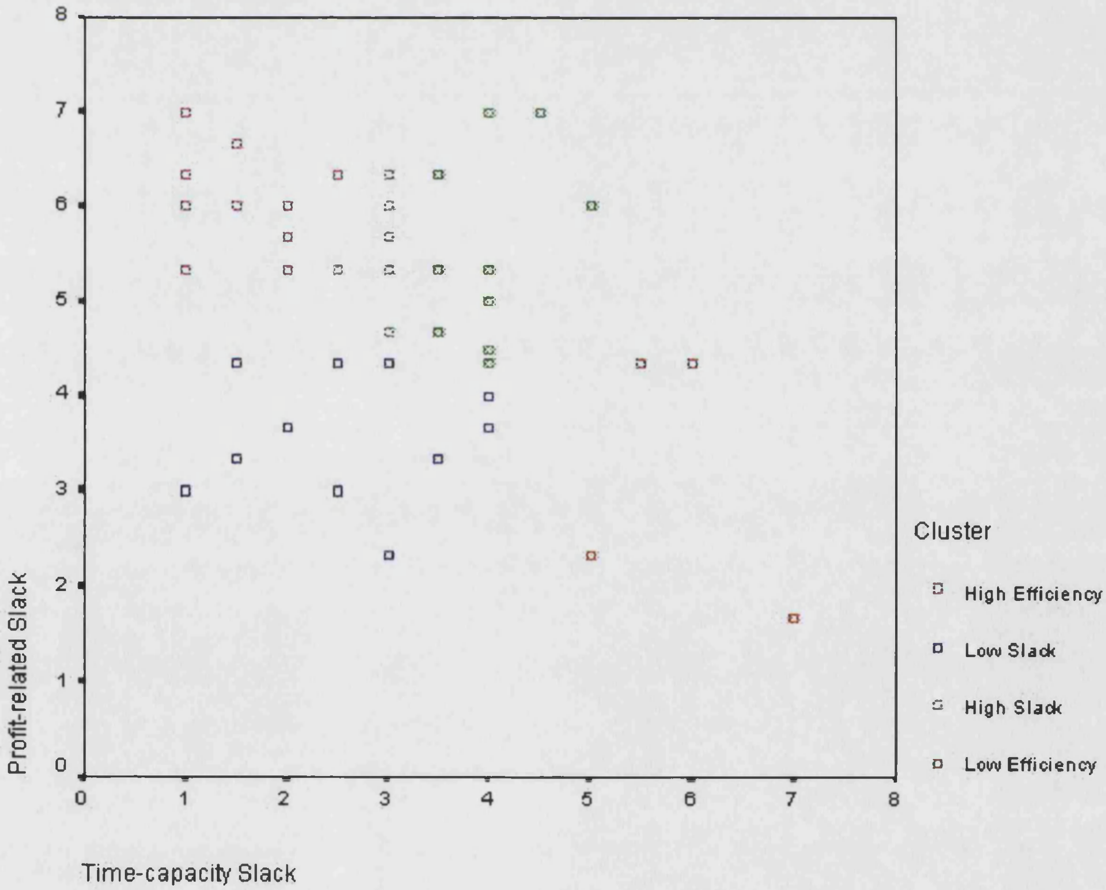


Figure 7.13 : Mean organisational slack scores across clusters

Cluster	Profit-related Slack	Time-capacity slack	Efficiency	Cluster Size (n)
High Slack	5.37	3.65	4.50	35
Low Slack	3.57	2.87	4.11	19
High Efficiency	6.29	1.52	5.28	28
Low Efficiency	3.81	5.78	4.11	13
Total	5.14	3.03	4.63	95
Sig.	0.00**	0.00**	0.00**	

Source : Questionnaire data. Significance level was calculated using one way ANOVA. Efficiency score was recoded so that a high score indicated more efficient than last year. N = 95.

As a check on the content validity of these groups, the mean level of the types of slack for each of the clusters was examined (see Figure 7.13). As expected, members of the "Low Slack" and "Low Efficiency" clusters scored significantly lower on profit-related slack than members of the other clusters, and "Low Slack" and "High Efficiency" units scored significantly lower on time-capacity slack (both at $p < 0.01$). As a further check of the convergent validity of the groups, the mean level of a single indicator of efficiency from the operating unit level questionnaire was also compared across the groups. This item asked respondents to agree or disagree with the statement "Compared with this time last year, we are more efficient" (see question IV 5 in Appendix 5). Although the reliability of a single measure such as this cannot be guaranteed, the ANOVA did reveal that units allocated to the "High Efficiency" cluster were significantly more likely to have agreed that their units had become more efficient over the previous year ($p < 0.01$). This adds strength to the distinction between slack and efficiency made in both the theoretical discussion in Chapter 3 and the cluster analysis reported here.

Figure 7.14 shows the results of a comparison of environmental initiative implementation across the four clusters of operating units. Despite a higher number of initiatives which exhibit significant differences across groups than that reported for environmental visibility (see section 6.6.2), the patterns of implementation are more complex. Overall, the "Low Efficiency" group scored the highest mean level of implementation of most initiatives (scored highest on 6 of the 17 initiatives). All the "Low Efficiency" units had implemented improved housekeeping measures, recycling programmes, environmental audits, reduction in packaging and employee environmental training programmes[4]. "Low Efficiency" units have high time-capacity slack, but low profit-related slack. They have tended to implement measures which may be costly in terms of managerial and operational time and effort, but not in financial terms (e.g. employee environmental training programmes, environmental audits, recycling programmes).

Figure 7.14 : Comparison of Environmental Initiative Implementation Across Organisational Slack and Efficiency Clusters

	High Slack Cluster	Low Slack Cluster	High Efficiency Cluster	Low Efficiency Cluster	Total	Sig.
Improved housekeeping	1.86	1.84	1.71	2.00	1.82	0.47
Waste management and reduction	1.83	1.58	1.61	1.67	1.69	0.37
Recycling programmes	1.72	1.78	1.32	2.00	1.64	0.02*
Environmental audits	1.72	1.94	1.21	2.00	1.63	0.00**
Reduction in the use of raw materials	1.70	1.18	1.61	1.11	1.50	0.06+
Reduction in packaging	1.77	1.22	1.18	2.00	1.49	0.00**
Energy efficiency measures	1.54	1.21	1.27	1.22	1.36	0.29
Emission reduction	1.29	1.29	1.18	1.75	1.31	0.50
Employee environmental training programmes	1.29	1.33	1.07	2.00	1.30	0.03*
Disclosure of environmental impacts	0.97	1.00	0.86	0.67	0.91	0.82
Certified EMS	0.68	1.00	1.08	0.00	0.79	0.00**
Producing / selling less environmentally damaging products	0.67	1.06	0.79	0.00	0.72	0.06*
Environment-related supplier initiatives	0.61	0.71	0.79	0.38	0.67	0.63
Research programmes for environmental improvement	0.91	0.39	0.29	0.89	0.61	0.02*
Conservation activities in the local area	0.21	0.39	0.79	0.22	0.43	0.03*
Stakeholder partnerships for environmental preservation	0.15	0.59	0.18	0.00	0.24	0.04*
Use of alternative fuel resources	0.32	0.22	0.00	0.00	0.17	0.07+

Source : Questionnaire data. Scores reported are means where "yes" = 2, "planned" = 1 and "not planned" = 0. Similar analyses were conducted with simple proportions of "yes" and of "yes" and "planned" together. Results were similar. Significance level was calculated using one way ANOVA. N = 95.

[4] The "Low Efficiency" clusters' comparatively high aggregate level of environmental initiative implementation tends to support the view that environmental initiatives are costly, and do not enhance

The "High Slack" cluster exhibited the highest mean implementation level of both the clean technology initiatives. These significantly high scores on the initiation of research programmes for environmental improvements ($p < 0.05$) and the use of alternative fuel sources ($p < 0.10$) help support H12 which predicts a positive relationship between available organisational slack at the operating unit level and the implementation of clean technology initiatives. This "High Slack" cluster also implemented several of the materials-reducing initiatives to the highest extent (e.g. reduction in the use of raw materials, energy efficiency measures). This runs contrary to H10 which would have expected the "High Efficiency" group to implement these most.

Hypotheses H15 and H10 – H12 are addressed more directly in Figure 7.15, which compares the mean levels of total implementation and the three types of environmental initiatives derived in Chapter 5 across the organisational slack clusters. There is not a significant difference in the total level of implementation across the clusters ($p = 0.57$, no support for H15). There are significant differences across the clusters in the implementation of both clean technology initiatives ($p < 0.05$), with the "High Slack" cluster scoring highest on the two clean technology initiatives (supporting H12).

Figure 7.15 : Mean levels of environmental initiative implementation by type across the organisational slack clusters

	High Slack Cluster	Low Slack Cluster	High Efficiency Cluster	Low Efficiency Cluster	Total	Sig.
Total Implementation	1.17	1.14	1.01	1.06	1.11	0.57
Clean Technology Initiatives	0.62	0.31	0.14	0.44	0.39	0.02*
Stakeholder Relations Initiatives (narrow)	0.18	0.50	0.61	0.11	0.38	0.02*
Stakeholder Relations Initiatives (broad)	0.72	0.80	0.80	0.67	0.76	0.90
Materials-reducing Initiatives	1.67	1.42	1.45	1.61	1.55	0.11

Source : Questionnaire data. Scores reported are means where "yes" = 2, "planned" = 1 and "not planned" = 0. Similar analyses were conducted with simple proportions of "yes" and of "yes" and "planned" together. Results were similar. Significance level was calculated using one way ANOVA. N = 95.

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the firm's short term competitiveness.

There was no significant difference across the clusters in their materials-reducing initiatives scores ($p = 0.11$). The “Low Slack” cluster scored lowest on these initiatives contrary to H10’s expectation that they would score highest. The highest scorers in this sample were the “Low Efficiency” and “High Slack” clusters, which both have higher than average time-capacity slack. Had the differences across groups been significant (as might be expected in a larger sample), H10 would be rejected.

There was also no significant difference across the clusters in their stakeholder relations scores ($p = 0.90$). The “High Slack” and “low Efficiency” groups scored lower on these initiatives, suggesting that where time-capacity slack is high, this buffer of slack is used to insulate the organisation from having to respond with stakeholder relations activities. Clearly, given the significance level of the ANOVA, this result could have been achieved by chance, but it does call for the buffering role of slack to be closely observed in the later analyses (see sections 3.2.4 and 8.2).

Dividing the operating unit sample into clusters based on their organisational slack profiles has allowed an initial examination of the relationships between organisational slack at the operating unit level and the implementation of environmental initiatives. The total level of implementation did not vary significantly across the groups (fail to accept H15 unaltered). Units with high time-capacity slack introduced total environmental initiatives (accept time-capacity slack specific version of H15), and materials-reducing initiatives (potential rejection of H10) to the greatest extent. Clean technology initiatives were most prevalent in the “High Slack” cluster (support H12), but this cluster did not score highly on stakeholder relations (fail to accept H11).

7.5.4 Bringing organisational slack at the three levels of analysis together

In order to assess the relative impacts of organisational slack at different levels of analysis together, a series of regression analysis were conducted. As with the regressions on environmental visibility (see section 6.6.3), all regression procedures were carried using the operating unit as the main unit of analysis ($n = 95$). Where a variable relates to the business unit level, the business unit score was used for all the operating units within that business unit. The exception is where a business unit-level variable was the dependent variable (i.e. for business unit environmental proactivity). In this case, the operating unit respondent's perception of business unit environmental proactivity was used, rather than the interview respondent's score, so that the sample size remained 95.

Given the model in Figure 3.4, these sets of regressions are "underfitted", because they exclude the effects of some variables deemed to be important to the model (i.e. the visibility variables). For this reason, strictly speaking the coefficients are biased, and somewhat unreliable. Despite this shortcoming, the regressions are presented here to provide some initial results on the role of slack in environmental responsiveness. A fuller discussion of the econometric characteristics of the models is left until the slack and visibility variables are discussed together in the next chapter (see Section 8.3.1).

Figure 7.16 reports the results of a series of regression models with proactivity of the business unit environmental approach as the dependent variable. The inclusion of the organisational slack measures at the three levels of analysis explains an additional 10% of the variance in the dependent variable (R^2 higher for models 2-6 than for model 1). The models indicate a consistently significant and positive relationship between organisational slack at both the corporate and operating unit levels and business unit environmental proactivity. Organisational slack at the business unit level did not have a significant impact on environmental proactivity, but this may be due to the poor reliability of the business unit measure (see Appendix 4). This finding applies to both managerial and operational measures of organisational slack, and emphasises the importance of measuring organisational slack at different levels of the organisation separately. None of the control variables showed a significant relationship with business unit environmental proactivity when the organisational slack variables were included, which echoes the findings of the regressions conducted with environmental visibility (see section 6.6.3). Neither corporate nor operating unit size had any impact on business unit environmental proactivity (see sections 5.5.1 and 5.5.2).

Figure 7.16 : Regression on Proactivity of Business unit Environmental Approach

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	6.018**	3.86**	3.65*	3.20+	4.04+	3.63
	(0.00)	*(0.01)*	*(0.02)*	*(0.05)*	*(0.05)*	*(0.12)*
Organisational Slack						
Corporate Level						
Available Slack		1.56**	1.66**	1.57**	1.65**	1.51*
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.01)*
Business Unit Level						
Profit-related Slack		-0.20	-0.20	-0.01	-0.27	-0.10
		(0.28)	*(0.28)*	*(0.98)*	*(0.23)*	*(0.72)*
Time-capacity Slack		-0.00	-0.04	0.10	-0.07	0.07
		(0.77)	*(0.89)*	*(0.74)*	*(0.85)*	*(0.87)*
Operating Unit Level						
Profit-related Slack		0.25*	0.24*	0.24*	0.24*	0.23+
		(0.02)	*(0.04)*	*(0.04)*	*(0.05)*	*(0.06)*
Time-capacity Slack		0.35**	0.33**	0.32**	0.31**	0.29**
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.01)*
Unit Size						
Number of employees (log)	0.002		0.05	0.05	0.06	0.05
	(0.98)		*(0.55)*	*(0.60)*	*(0.49)*	*(0.57)*
Industry Group						
Other Manufacturing	-0.64+			-0.59		-0.55
	(0.06)			*(0.13)*		*(0.17)*
Other non-manufacturing	-1.08**			-0.57		-0.60
	(0.00)			*(0.12)*		*(0.10)*
Corporate Size						
Medium Corporation	-0.49+				-0.09	-0.05
	(0.09)				*(0.84)*	*(0.90)*
Large Corporation	0.07				0.13	0.19
	(0.83)				*(0.81)*	*(0.71)*
Adjusted R squared	*0.14*	*0.24*	*0.23*	*0.26*	*0.24*	*0.27*

*Notes : "Proactivity of Business Unit Environmental Approach" is derived from the 95 operating unit general mangers' perceptions as captured on the questionnaire (see section 5.3.1 for derivation). All other business unit level data is from interviews, and operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. + : $p < 0.10$; * : $p < 0.05$; ** : $p < 0.01$.*

The patterns of significance were quite different for total environmental initiative implementation (see Figure 7.17). The only consistently significant predictor of the total level of environmental initiative implementation is operating unit size. None of the organisational slack measures exhibit any significance except for time-capacity slack at the operating unit level in model 2 (at $p < 0.05$). However, even this relationship is insignificant when operating unit size is included (cf. Model 2 with models 3-6). This reflects the highly significant relationship between operating unit size and the total implementation of environmental initiatives illustrated earlier (see section 5.5.2 and Figure 6.17), and illustrates that this relationship is not due simply to organisational slack as has been argued in the literature (see section 2.4).

Figure 7.17 : Regression on Total Environmental Initiative Implementation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.56**	0.47	-0.06	-0.10	-0.23	-0.23
	(0.00)	*(0.41)*	*(0.91)*	*(0.86)*	*(0.75)*	*(0.78)*
Organisational Slack						
Corporate Level						
Available Slack		-0.18	0.08	0.16	0.13	0.18
		(0.28)	*(0.63)*	*(0.42)*	*(0.45)*	*(0.41)*
Business Unit Level						
Profit-related Slack		0.05	0.04	0.02	-0.01	-0.04
		(0.48)	*(0.54)*	*(0.85)*	*(0.88)*	*(0.72)*
Time-capacity Slack		0.05	0.14	0.13	0.22	0.20
		(0.65)	*(0.17)*	*(0.22)*	*(0.13)*	*(0.20)*
Operating Unit Level						
Profit-related Slack		0.02	-0.00	0.00	0.00	0.01
		(0.67)	*(0.93)*	*(0.97)*	*(0.97)*	*(0.90)*
Time-capacity Slack		0.08*	0.04	0.05	0.03	0.04
		(0.03)	*(0.21)*	*(0.18)*	*(0.37)*	*(0.32)*
Unit Size						
Number of employees (log)	0.12**		0.13**	0.14**	0.14**	0.14**
	(0.00)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Industry Group						
Other Manufacturing	0.03			0.07		0.08
	(0.77)			*(0.61)*		*(0.56)*
Other non-manufacturing	0.06			0.14		0.11
	(0.63)			*(0.29)*		*(0.38)*
Corporate Size						
Medium Corporation	-0.15				0.09	0.09
	(0.13)				*(0.57)*	*(0.58)*
Large Corporation	-0.04				0.27	0.26
	(0.74)				*(0.14)*	*(0.17)*
Adjusted R squared	*0.23*	*0.09*	*0.25*	*0.26*	*0.27*	*0.28*

*Notes : "Environmental Initiative Implementation" was calculated as the average implementation level across all the environmental initiatives reported above in section 5.3.2 (potential scores from 0 to 2, actual range, 0.06 to 2.00). All business unit data is from interviews, and all operating unit data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. + : p < 0.10; * : p < 0.05; ** : p < 0.01.*

Disaggregating environmental initiative implementation into its constituent types shows that organisational slack does play a role in predicting the implementation of some sub-sets of environmental initiatives. For example, Figure 7.18 shows a series of regressions of the organisational slack measures at the three levels of analysis and the control variables against the clean technology initiative measure.

Figure 7.18 : Regression on Clean Technology Initiative Implementation

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-0.75**	-0.26	-0.57	0.20	-2.47**	-1.90*
	(0.00)	*(0.68)*	*(0.38)*	*(0.76)*	*(0.00)*	*(0.03)*
Organisational Slack						
Corporate Level						
Available Slack		1.15**	1.01**	1.28**	0.84**	0.94**
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Business Unit Level						
Profit-related Slack		0.04	0.04	-0.10	0.28**	0.17
		(0.61)	*(0.65)*	*(0.29)*	*(0.00)*	*(0.10)*
Time-capacity Slack		-0.12	-0.07	-0.22+	0.18	0.06
		(0.31)	*(0.55)*	*(0.09)*	*(0.23)*	*(0.70)*
Operating Unit Level						
Profit-related Slack		0.05	0.04	0.03	0.07	0.07
		(0.31)	*(0.49)*	*(0.57)*	*(0.12)*	*(0.13)*
Time-capacity Slack		0.14**	0.11**	0.13**	0.21**	0.22**
		(0.00)	*(0.01)*	*(0.00)*	*(0.00)*	*(0.00)*
Unit Size						
Number of employees (log)	0.17**		0.08*	0.03	0.05	0.03
	(0.00)		*(0.04)*	*(0.38)*	*(0.17)*	*(0.40)*
Industry Group						
Other Manufacturing	0.17			0.42*		0.29+
	(0.27)			*(0.01)*		*(0.06)*
Other non-manufacturing	0.32*			0.07		0.15
	(0.05)			*(0.65)*		*(0.26)*
Corporate Size						
Medium Corporation	0.33*				0.51**	0.45**
	(0.02)				*(0.00)*	*(0.01)*
Large Corporation	-0.04				-0.19	-0.21
	(0.81)				*(0.34)*	*(0.29)*
Adjusted R squared	*0.33*	*0.44*	*0.47*	*0.53*	*0.62*	*0.63*

*Notes : "Clean Technology Implementation" was calculated as the average implementation level across the clean technology items reported above (see section 5.3.2) (potential scores from 0 to 2, actual range, 0.00 to 2.00). All business unit data is from interviews, and all operating unit data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. + : p < 0.10; * : p < 0.05; ** : p < 0.01.*

There is a consistent and highly significant positive relationship between both time-capacity slack at the operating unit level, and corporate available slack, and the implementation of clean technology initiatives. At the operating unit level, this finding emphasises the role of excess non-financial resources as a spur to experimentation and slack search in an environmental context (see also section 7.2.5 above), since time-capacity slack is significant predictor of clean technology initiatives, while profit-related slack is not. At the corporate level, gains in available financial slack are also highly significantly associated with clean technology initiative implementation. This may reflect the policy/implementation divide discussed in section 2.3.2 - at the corporate level, managerial or financial slack may be devoted to clean technology programmes, whereas at the operating unit level, it is excess operational time, staff and other non-financial resources which are the significant predictors of implementation.

Figure 7.19 : Regression on Stakeholder Relations Initiatives

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-0.16	-0.94	-1.39	-1.65+	-2.46*	-2.97*
	(0.54)	*(0.27)*	*(0.10)*	*(0.08)*	*(0.03)*	*(0.02)*
Organisational Slack						
Corporate Level		0.39	0.57+	0.81*	0.80**	1.04**
Available Slack		(0.18)	(0.05)	(0.02)	(0.01)	(0.00)
Business Unit Level						
Profit-related Slack		0.17	0.16	0.13	0.08	0.10
		(0.12)	*(0.13)*	*(0.31)*	*(0.49)*	*(0.50)*
Time-capacity Slack		0.20	0.29+	0.30+	0.60**	0.65**
		(0.21)	*(0.07)*	*(0.08)*	*(0.01)*	*(0.01)*
Operating Unit Level						
Profit-related Slack		0.06	0.03	0.04	0.05	0.06
		(0.38)	*(0.70)*	*(0.56)*	*(0.48)*	*(0.35)*
Time-capacity Slack		0.00	-0.04	-0.04	-0.05	-0.31
		(0.96)	*(0.48)*	*(0.51)*	*(0.45)*	*(0.61)*
Unit Size						
Number of employees (log)	0.08+		0.13**	0.15**	0.16**	0.19**
	(0.10)		*(0.01)*	*(0.01)*	*(0.00)*	*(0.00)*
Industry Group						
Other Manufacturing	0.26			0.08		0.04
	(0.16)			*(0.71)*		*(0.88)*
Other non-manufacturing	0.19			0.31		0.27
	(0.33)			*(0.13)*		*(0.18)*
Corporate Size						
Medium Corporation	-0.04				0.38+	0.43+
	(0.81)				*(0.10)*	*(0.07)*
Large Corporation	0.10				0.74*	0.70*
	(0.61)				*(0.01)*	*(0.02)*
Adjusted R squared	*0.08*	*0.06*	*0.13*	*0.17*	*0.20*	*0.22*

Notes : "Stakeholder Relations Implementation" was calculated as the average implementation level across the stakeholder relations items reported above (see section 5.3.2) (potential scores from 0 to 2, actual range, 0.00 to 2.00). All business *unit data is from interviews, and all operating unit data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. + : $p < 0.10$; * : $p < 0.05$; ** : $p < 0.01$.*

Business unit level organisational slack did not help predict clean technology initiative implementation. This stands in stark contrast to stakeholder relations initiatives implementation (see Figure 7.19). Time-capacity slack at the business unit level was significantly related to the implementation of stakeholder relations initiatives. This may reflect the external buffering role of operational slack identified in the interviews. Other significant coefficients were estimated for corporate available slack and both operating unit and corporate size. The significance of time-capacity slack at the business unit level is particularly notable when these size variables are included in the model (see Models 5 and 6 in Figure 7.19). Excess non-financial resources at the business unit level, and available slack at the corporate level may spur the introduction of stakeholder relations initiatives, even when operating unit and corporate size are controlled for.

The patterns of significance in Figure 7.19 may indicate that the decision to implement stakeholder relations initiatives resides more at higher levels of the corporation (mirroring the findings on visibility, see Figure 6.19). Organisational slack at the operating unit is not associated with stakeholder relations initiatives since operating units may be required by their business unit or corporate parents to implement them, regardless of their own slack position. This corporate or business unit decision is itself in turn affected by corporate or business unit levels of slack. Further, the significance of the size variables may suggest the complementary role of environmental visibility and organisational slack in predicting stakeholder relations initiatives. The two alternative explanators for the organisational size and environmental responsiveness relationship are simultaneously investigated later in Chapter 8.

Figure 7.20 : Regression on Materials-reducing Initiatives

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	1.03**	0.87	0.29	0.32	1.05	1.39
	(0.00)	*(0.16)*	*(0.62)*	*(0.61)*	*(0.19)*	*(0.12)*
Organisational Slack						
Corporate Level						
Available Slack		0.00	0.27	0.32	0.21	0.16
		(0.98)	*(0.14)*	*(0.14)*	*(0.28)*	*(0.51)*
Business Unit Level						
Profit-related Slack		0.01	-0.01	-0.05	-0.09	-0.16
		(0.88)	*(0.93)*	*(0.61)*	*(0.28)*	*(0.13)*
Time-capacity Slack		-0.03	0.06	0.03	-0.06	-0.13
		(0.77)	*(0.62)*	*(0.78)*	*(0.71)*	*(0.45)*
Operating Unit Level						
Profit-related Slack		0.07	0.01	0.06	0.05	0.05
		(0.12)	*(0.18)*	*(0.16)*	*(0.28)*	*(0.31)*
Time-capacity Slack		0.12**	0.09*	0.09*	0.05	0.05
		(0.00)	*(0.03)*	*(0.02)*	*(0.24)*	*(0.24)*
Unit Size						
Number of employees (log)	0.13**		0.13**	0.14**	0.14**	0.13**
	(0.00)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Industry Group						
Other Manufacturing	0.00			0.12		0.18
	(0.77)			*(0.46)*		*(0.24)*
Other non-manufacturing	-0.02			0.15		0.11
	(0.90)			*(0.31)*		*(0.44)*
Corporate Size						
Medium Corporation	-0.25*				-0.21	-0.24
	(0.02)				*(0.22)*	*(0.17)*
Large Corporation	-0.04				0.04	0.03+
	(0.76)				*(0.86)*	*(0.09)*
Adjusted R squared	*0.25*	*0.11*	*0.25*	*0.26*	*0.28*	*0.29*

*Notes : "Materials-Reducing Initiatives Implementation" was calculated as the average implementation level across the stakeholder relations (narrow) items reported above (see section 5.3.2) (potential scores from 0 to 2, actual range, 0.00 to 2.00). All business unit data is from interviews, and all operating unit data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. + : p < 0.10; * : p < 0.05; ** : p < 0.01.*

Examining the implementation of the final set of environmental initiatives, materials-reducing initiatives, using the same regression technique as above reveals an ambiguous relationship between organisational slack and materials-reducing initiatives (see Figure 7.20). Of the organisational slack variables, only time-capacity slack at the operating unit level is significantly related with materials-reducing initiatives. Even this relationship becomes non-significant, however, when the corporate size dummy variables are included (see Models 5 and 6). Given the significant association between time-capacity slack at the operating unit level and corporate size (see section 5.4.1), it is likely that the significant time-capacity slack coefficients are accounting for some of the variance in corporate size too. With the corporate size control variables in place, this variance is appropriately separated out, and time-capacity slack at the operating unit level is no longer a significant predictor of materials-reducing initiatives. Once this effect is considered, Figure 7.20 shows no significant relationships between organisational slack at any level of analysis and materials-reducing initiatives.

The series of empirical analyses on the relationship between organisational slack and environmental responsiveness have shown that the aggregate relationship is indeed ambiguous (rejecting H16 as expected). Evidence was found to support the alteration of the corporate level hypothesis to consider only available slack, and not total slack (adapt H13). However, no evidence of a relationship between business unit organisational slack and proactivity of business unit environmental approach was found (H14). Although operating unit slack was not found to be related with overall environmental initiative implementation (reject H15), both clean technology initiatives and materials-reducing initiatives were more likely to be implemented in the presence of time-capacity slack at the operating unit level (accept H12 and H10). Contrary to expectation in H11, stakeholder relations initiatives were best predicted by organisational slack at the business unit, rather than operating unit, level (reject H11).

7.6 Chapter Summary

This chapter examined the relationships between organisational slack and environmental responsiveness through analysing the qualitative interview data, and later testing the hypotheses with the quantitative survey data. The importance of organisational slack was established in analysing the qualitative evidence on environmental decision-making. Relationships between organisational slack at the corporate, business unit and operating unit level and all the other variables of interest were explored.

The chapter showed that organisational slack plays several roles in environmental decision-making. It also provided early empirical evidence of the connections between organisational slack at three levels of the organisation and the environmental responsiveness of organisations. As with environmental visibility, organisational slack seems to play a role in environmental decision-making which is independent of size. The combined impacts of visibility and organisational slack on environmental responsiveness will be addressed in the next chapter.

Chapter 8 : The Combined Impacts of Visibility and Organisational Slack on Environmental Responsiveness

8.1 Introduction

This chapter will draw together the empirical findings from the previous three chapters on the relationships between organisation size (Chapter 5), environmental visibility (Chapter 6) and organisational slack (Chapter 7), and environmental responsiveness. The emphasis is on examining environmental visibility and organisational slack not in isolation, as has been done so far, but simultaneously. The chapter has a single aim :

- To assess the extent to which organisation size, environmental visibility and organisational slack are complementary or rival predictors of the different types of environmental responsiveness.

All the variables have now been operationalised in the previous three chapters. This chapter will use these operationalisations to test part of the overall model derived from the literature (see emboldened lines in Figure 3.4). It begins by analysing the environmental responsiveness patterns across clusters of operating units based on their slack and visibility characteristics. There then follows a final assessment of fit of the section of the model with the data through a series of regression analyses. A methodological theme within the chapter is the compromise between econometric characteristics of regression results and the desired theoretical approach. The chapter concludes with an assessment of whether organisational slack and visibility are indeed alternative explanations to size for the various forms of environmental responsiveness.

8.2 Operating unit level visibility and slack as explanations for environmental responsiveness

As a first cut in assessing the rival or complementary role of environmental visibility and organisational slack in predicting environmental responsiveness, patterns of environmental responsiveness across cluster membership were examined. Operating units were allocated into one of 16 different combinations of visibility and slack using their cluster memberships derived in sections 6.6.2 and 7.5.3. Average environmental responsiveness scores were calculated for each of the combinations of cluster membership (see Figure 8.1). This exercise is only possible at the operating unit level, since only the operating units were placed in clusters, however, it should provide a useful first step in illustrating the rival and complementary explanatory power of visibility and slack.

Figure 8.1 : Average Business Unit Environmental Proactivity Scores by Operating Unit Clusters

	High Slack Cluster	**Low Slack Cluster**	**High Efficiency Cluster**	**Low Efficiency Cluster**	**Total**
High Visibility Cluster	6.16 *15*	6.30 *7*	5.24 *9*	6.05 *5*	**5.94** ***36***
Issue Visibility Cluster	4.80 *3*	6.00 *2*	5.60 *11*	4.45 *1*	**5.50** ***17***
Organisational Visibility Cluster	4.96 *9*	4.50 *2*	4.85 *4*	4.72 *5*	**4.83** ***20***
Low Visibility Cluster	4.30 *8*	3.58 *8*	3.90 *4*	5.32 *2*	**4.06** ***22***
Total	**5.31** ***35***	**4.93** ***19***	**4.58** ***28***	**5.39** ***13***	**5.03** ***95***

Source : Operating unit questionnaire. n = 95. Upper number in each cell is mean business unit environmental proactivity score as scored by the operating unit respondent. Lower number is number of operating unit cases in the particular visibility and slack cluster combination.

Figure 8.1 shows the average business unit environmental proactivity score provided by the operating unit respondent across each of the cluster combinations. A simple factorial ANOVA[1] showed no interaction between slack and visibility cluster membership ($F = 1.52$, $p = 0.17$). A significant relationship was found between visibility cluster membership and environmental proactivity score ($F = 19.86$, $p = 0.00$). The three highest average environmental proactivity scores were from units in the high visibility cluster (6.30, 6.16 and 6.05). The three lowest average scores were in the low visibility cluster (3.58, 3.90 and 4.30). This provides additional support for the theme in this thesis that operating units with higher organisational and issue visibility will exhibit a more proactive environmental approach. There was no significant relationship between organisational slack cluster membership and

[1] A Simple Factorial ANOVA procedure was carried out because it allows for cells to be weighted by the number of cases in each cell (Bryman and Cramer, 1997). Conventional two-way analysis of variance requires that the number of cases in each cell are equal (Blalock 1981); a condition which is not met here.

business unit environmental proactivity (F = 0.18, p = 0.91). Thus, visibility characteristics of operating units outweigh their organisational slack characteristics as a predictor of strategic environmental responsiveness.

Figure 8.2 shows the average environmental initiative implementation score across the various combinations of clusters. Again a simple factorial ANOVA test indicated a non-significant interaction term (F = 1.99, p = 0.07), and a significant relationship between environmental visibility cluster and the implementation measure of environmental responsiveness (F = 6.78, p = 0.00). For implementation, however, slack cluster membership was also significant (F = 3.35, p = 0.02), yielding a pattern of implementation more complex than the proactivity clusters. The highest average implementation score is in the low slack and high visibility cluster (1.55). This is followed by the closely related low slack and organisational visibility cluster (1.47), and the contrasting high slack and issue visibility group (1.47). Thus units with the highest implementation scores either have high slack or high visibility.

Figure 8.2 : Average Environmental Initiative Implementation Scores by Operating Unit Clusters

	High Slack Cluster	**Low Slack Cluster**	**High Efficiency Cluster**	**Low Efficiency Cluster**	**Total**
High Visibility Cluster	1.27 *15*	1.55 *7*	1.07 *9*	1.00 *5*	**1.24** ***36***
Issue Visibility Cluster	1.47 *3*	0.76 *2*	1.18 *11*	1.37 *1*	**1.19** ***17***
Organisational Visibility Cluster	1.26 *9*	1.47 *2*	0.61 *4*	1.11 *5*	**1.11** ***20***
Low Visibility Cluster	0.79 *8*	0.80 *8*	0.71 *4*	0.90 *2*	**0.79** ***22***
Total	**1.10** ***35***	**1.14** ***19***	**0.99** ***28***	**1.06** ***13***	**1.07** ***95***

Source : Operating unit questionnaire. n = 95. Upper number in each cell is mean total environmental initiative implementation score (see section 5.3.2). Lower number is number of operating unit cases in the particular visibility and slack cluster combination.

The complementarity of the visibility and slack explanations for environmental implementation is reinforced by examining the five lowest scoring cells. Three of these belonged to the low visibility cluster (0.71, 0.79 and 0.80), and two to the low slack cluster (0.76 and 0.80). Notably, two of the five lowest scoring cells belonged to the high efficiency cluster (0.61 and 0.71), reinforcing the relationship between efficiency and environmental initiative implementation noted earlier (see section 7.5.3).

Thus while environmental proactivity at the operating unit level is best predicted by visibility characteristics of the units, environmental initiative implementation is related to both visibility and organisational slack. Visibility is dominant between the two rival explanations for environmental responsiveness strategy, but visibility and slack are complementary explanations for implementation actions. The next section presents a series of regression models to assess whether these findings hold when the business unit level variables and operating unit size are added into the model.

8.3 Multi-level visibility, slack and size as explanations for environmental responsiveness

In order to asses the relative impacts of the different types of visibility and measures of organisational slack on the dependent variables, a series of regression analyses were conducted. The regression analyses build on the ANOVAs conducted on the clusters presented above in that they include the effects of both organisational slack and visibility. They extend these early results, however, by including measures at both the business unit and operating unit levels, and a fuller specification of control variables, including size. The regression analyses are effectively the combination of those conducted on environmental visibility and organisational slack separately in the previous two chapters (see sections 6.6.3 and 7.5.4). All regression procedures were carried out on the operating unit level data only ($n = 95$), since the small sample size ($n = 25$), and the now increased number of variables made estimates based at the business unit level unstable.

8.3.1 Potential difficulties with the regression models

As with the previous, separate regression analyses (see sections 6.6.3 and 7.5.4), a certain degree of multicollinearity between the independent variables is to be expected. The theoretical discussion in Chapter 3 suggested that organisation size, visibility and slack are likely to be related in a non-random way : large firms are assumed to be more visible than small ones, for example. This implies some difficulties in estimating and interpreting the variable coefficients using ordinary least squares (OLS) regression. Throughout this section, a focus is maintained on identifying and coping with multicollinearity between the independent variables.

The multicollinearity between the variables in these models is unlikely to be perfect and thus it should be possible to obtain unique estimates of all parameters using ordinary least squares regression (OLS) (Gujarati, 1999; Greene, 1993). A more likely situation in this series of regressions is that there will be high, but not perfect, correlations between two or more independent variables. In this situation, the assumptions of OLS are not violated, and the OLS estimators still remain the best linear unbiased estimates (Gujarati, 1999, Kennedy, 1985). However, in the models tested in this section, it is possible that some of the variables could be so highly correlated that their individual influence on environmental responsiveness cannot be isolated (Greene, 1993; Hu, 1982). It would then be difficult to empirically separate the impact on environmental responsiveness attributable to each of the distinct independent variables. Further practical consequences of any multicollinearity between the independent variables include large variances and standard error of OLS estimators resulting in lower precision of OLS estimators, wider confidence intervals, and a higher likelihood of obtaining "insignificant" coefficients (Greene, 1993; Stewart, 1984; Kennedy, 1985; Hu, 1982). Other symptoms of multicollinearity include a high R^2 value, but with few significant coefficients (Greene, 1993; Gujarati, 1999), implying that the model as a whole accounts for a large proportion of the variance, but that this cannot be individually attributed to each variable. Also, in the presence of multicollinearity, standard errors become very sensitive to small changes in the data, and can become unstable (Greene, 1993; Stewart, 1984; Gujarati, 1999).

Given all these difficulties in the presence of multicollinearity, and the nature of the model tested here, there is a focus on multicollinearity's presence and consequences throughout the following analyses. There are a range of ways of detecting the extent of multicollinearity in a regression analyses. The most straightforward is examining the correlation matrix for high pairwise correlations among the explanatory variables.

The definition of "high" in this context is not clear, though Gujatari (1995, 1999) and Kennedy (1985) suggest a cut-off of 0.8. Unfortunately, this is not always a reliable method, since pairwise correlations can be low even in the presence of high degrees of multicollinearity (Gujarati, 1999). An alternative approach is to examine the R^2 statistics of a series of auxiliary regressions (Gujarati, 1999; Stewart, 1984, see [2]). Another classic symptom of multicollinearity is when an analysis yields a high R^2, but few significant coefficients (see above). All of these methods of identifying the degree of multicollinearity were used during data analysis, and correlation matrices and R^2 statistics will be used extensively in this section[2].

A further issue to consider in cross-sectional OLS regression analysis is heteroscedasticity. Difficulties with OLS estimation arise if the error variance is not constant across observations (Gujarati, 1999; Greene, 1993). Specifically, OLS estimators are still linear and unbiased but are no longer have minimum variance (i.e. they are no longer efficient) (Gujarati, 1999, 1995). This yields biased estimates of the coefficients if the usual OLS procedure is used. Given the nature of the models tested in this chapter, it is possible that some heteroscedasticity might affect the results : the variance in environmental responsiveness might be greater in highly visible operating units than in less visible ones, for example.

Standard explorations for heteroscedasticity were performed throughout the analyses reported in this chapter. Plots of residuals were routinely examined for each of the independent variables in each regression, and White's General Heteroscedasticity Test was performed on each set of results (Greene, 1993). The plots were too numerous to include in this discussion, but the results of White's General Heteroscedasticity Tests are presented in Appendix A8. The tests suggest that there was not a widespread heteroscedasticity problem in the data, especially in models where the control variables were not included. Therefore no significant measures were undertaken to combat heteroscedasticity in the data.

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[2] During the data analysis, other diagnostic techniques were also used, especially auxiliary regressions (Stewart, 1984). The results did not differ substantively from the more straightforward examination of correlation coefficients and R^2 which are outlined during the following discussion.

8.3.2 Results of regression models

This section presents the details of a series of regression models presented on each of the five dependent variables. Each set of models brings together the separate findings on environmental visibility (see section 6.6.3) and organisational slack (see 7.5.4). A correlation matrix containing all the variables is presented as Figure 8.3, and will be used throughout this section to assess multicollinearity. A summary figure of the substantive results is provided later in the chapter (see Figure 8.10).

Figure 8.3 : Correlation matrix of all variables used in the full regression analyses

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. BU environmental proactivity	1.00																		
2. Total implementation	.43** (.00)	1.00																	
3. Materials-reducing	.48** (.00)	.83** (.00)	1.00																
4. Stakeholder relations	.30** (.01)	.83** (.00)	.48** (.00)	1.00															
5. Clean technology	.04 (.71)	.52** (.00)	.45** (.00)	.27* (.01)	1.00														
6. VISBUORG	.08 (.43)	.25* (.02)	.22* (.04)	.26* (.01)	-.08 (.44)	1.00													
7. VISBUISS	.17 (.10)	.06 (.58)	.13 (.21)	.00 (.98)	-.26* (.01)	.67** (.00)	1.00												
8. VISOUORG	.50** (.00)	.32** (.00)	.35* (.00)	.24* (.02)	-.01 (.96)	.04 (.73)	.18 (.09)	1.00											
9. VISOUISS	.47** (.00)	.38** (.00)	.39** (.00)	.27** (.01)	.20 (.06)	-.15 (.15)	-.23* (.03)	.42** (.00)	1.00										
10. Corporate slack	.28** (.01)	-.18 (.08)	-.08 (.47)	-.09 (.42)	-.58** (.00)	-.03 (.76)	.08 (.45)	.24* (.02)	.04 (.73)	1.00									
11. BUPR slack	-.11 (.30)	.05 (.62)	.08 (.47)	.03 (.76)	.14 (.19)	.27** (.01)	-.25* (.02)	-.26* (.01)	-.15 (.14)	-.01 (.95)	1.00								
12. BUTC slack	.04 (.73)	.01 (.93)	-.09 (.41)	.04 (.74)	-.17 (.11)	-.22* (.04)	.27** (.01)	.15 (.15)	.06 (.54)	-.00 (.98)	-.75** (.00)	1.00							
13. OUPR slack	.02 (.87)	-.06 (.60)	.06 (.62)	-.03 (.79)	.05 (.62)	-.03 (.77)	-.19 (.06)	.02 (.84)	.22* (.04)	-.06 (.55)	.28** (.01)	-.33** (.00)	1.00						
14. OUTC slack	.27* (.01)	.25* (.02)	.26* (.01)	.16 (.15)	.33** (.00)	.26* (.01)	.36** (.00)	.23* (.03)	-.11 (.32)	-.14 (.19)	-.12 (.25)	.10 (.36)	-.46** (.00)	1.00					
15. OU size	-.01 (.90)	.45** (.00)	.43** (.00)	.34** (.00)	.48** (.00)	.00 (.97)	-.33** (.00)	-.01 (.91)	.07 (.51)	-.37** (.00)	.31** (.00)	-.37** (.00)	.09 (.41)	.20 (.05)	1.00				
16. Medium corporation	-.15 (.14)	-.12 (.24)	-.20 (.06)	-.08 (.45)	.30** (.01)	-.52** (.00)	-.64** (.00)	-.19 (.06)	.19 (.07)	-.13 (.21)	-.11 (.29)	-.26* (.01)	.13 (.20)	-.31** (.00)	.14 (.19)	1.00			
17. Large corporation	.02 (.85)	.15 (.16)	.15 (.15)	.13 (.24)	-.06 (.57)	.84** (.00)	.43** (.00)	-.10 (.36)	-.24* (.02)	-.04 (.67)	.66** (.00)	-.51** (.00)	.12 (.26)	.12 (.24)	.09 (.41)	-.50** (.00)	1.00		
18. Other manufacturing	.01 (.90)	.04 (.68)	.11 (.30)	.04 (.68)	.05 (.63)	-.17 (.11)	-.25* (.02)	-.10 (.32)	.00 (.98)	.35** (.00)	.38** (.00)	-.16 (.12)	.12 (.25)	-.12 (.26)	.23* (.03)	.05 (.61)	-.01 (.95)	1.00	
19. Non-manufacturing	-.23* (.02)	.04 (.67)	-.04 (.68)	.03 (.77)	.10 (.36)	.44** (.00)	.29** (.01)	-.24* (.02)	-.13 (.22)	-.43** (.00)	-.00 (.97)	.02 (.87)	-.04 (.72)	.01 (.97)	-.16 (.13)	-.16 (.13)	.26* (.01)	-.67** (.00)	1.00

Source : Questionnaires and interviews. N = 95. Upper figure in cell is Pearson correlation coefficient. Figure in parentheses is p-value.

Figure 8.4 : Regression on Proactivity of Business Unit Environmental Approach

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	1.398	1.317	1.876	1.013	1.142	1.264
	(0.28)	*(0.34)*	*(0.39)*	*(0.69)*	*(0.69)*	*(0.35)*
Visibility : Business Unit Level : Organisational (VISBUORG)	-0.077	-0.091	-0.183	-0.072	-0.042	-0.042
	(0.40)	*(0.34)*	*(0.20)*	*(0.72)*	*(0.82)*	*(0.68)*
Issue (VISBUISS)	0.157	0.175	0.147	0.180	0.161	0.158
	(0.12)	*(0.10)*	*(0.22)*	*(0.16)*	*(0.18)*	*(0.12)*
Operating Unit Level : Organisational (VISOUORG)	0.231	0.221	0.207	0.147	0.156	0.154
	(0.11)	*(0.13)*	*(0.17)*	*(0.37)*	*(0.34)*	*(0.32)*
Issue (VISOUISS)	**0.563****	**0.568****	**0.579****	**0.583****	**0.577****	**0.577****
	(0.00)	***(0.00)***	***(0.00)***	***(0.00)***	***(0.00)***	***(0.00)***
Slack : Corporate Level : Available Slack	**1.099***	**1.144***	**1.225****	**1.144***	**1.042***	**1.034***
	(0.01)	***(0.01)***	***(0.01)***	***(0.05)***	***(0.03)***	***(0.02)***
Business Unit Level : Profit-related Slack	0.073	0.089	-0.065	0.187	0.179	0.168
	(0.67)	*(0.61)*	*(0.81)*	*(0.62)*	*(0.63)*	*(0.40)*
Business Unit Level : Time-capacity Slack	-0.127	-0.112	-0.039	0.020	-0.011	-0.030
	(0.59)	*(0.65)*	*(0.91)*	*(0.96)*	*(0.97)*	*(0.91)*
Operating Unit Level : Profit-related Slack	0.060	0.043	0.049	0.050	0.064	0.063
	(0.54)	*(0.68)*	*(0.64)*	*(0.64)*	*(0.53)*	*(0.53)*
Operating Unit Level : Time-capacity Slack	**0.239****	**0.226***	**0.236***	**0.217***	**0.228***	**0.227***
	(0.01)	***(0.02)***	***(0.02)***	***(0.03)***	***(0.02)***	***(0.01)***
Organisation Size : Operating unit Number of Employees (log)		0.026	0.037	0.034		
		(0.74)	*(0.64)*	*(0.71)*		
Medium Corporation			0.046	0.040	0.030	
			(0.91)	*(0.93)*	*(0.94)*	
Large Corporation			0.718	0.082	0.011	
			(0.40)	*(0.94)*	*(0.99)*	
Industry Group : Other Manufacturing				-0.412	-0.402	-0.397
				(0.35)	*(0.36)*	*(0.25)*
Non-manufacturing				-0.422	-0.460	-0.460
				(0.38)	*(0.32)*	*(0.20)*
Adjusted R squared	*0.41*	*0.40*	*0.40*	*0.39*	*0.40*	*0.41*

	Model 7
constant	1.227
	(0.31)
BU visibility	0.077
	(0.21)
OU visibility	**0.77****
	(0.00)
C slack	**1.09****
	(0.00)
BU slack	-0.060
	(0.85)
OU slack	**0.346***
	(0.03)
Adjusted R squared	*0.39*

*Source : "Proactivity of Business Unit Environmental Approach" is derived from operating unit general manager's perception as captured on questionnaire (see section 5.3.1 for derivation). All other business unit level data is from interviews, and operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. * : $p < 0.05$; ** : $p < 0.01$.*

Figure 8.4 reports the results of a series of seven regression models with proactivity of the business unit environmental approach as the dependent variable. As with the separate sets of regressions using the visibility and slack variables presented in Figures 6.16 and 7.16, these regressions were undertaken using the operating unit level's perception of business unit environmental proactivity as measured on the general manager questionnaire. Thus the sample size is 95.

The results of models 1 to 6 are broadly in line with the separate regressions run on environmental visibility (see section 6.6.3) and organisational slack (see 7.5.3) : corporate level available slack and time-capacity slack at the operating unit are still positive and significant predictors of business unit environmental approach; issue visibility at the operating unit level is also still significant; and there is no systematic pattern of impacts of the non-significant control variables. There are two main divergences from the previous, separate analyses : neither profit-related slack at the operating unit level, nor VISBUISS or VISOUORG visibility are now significant.

Examining the correlation coefficient matrix in Figure 8.3 may hint at why some of these variables are no longer significant. There are relatively high correlations (greater than | 0.4 | [3]) between the two types of visibility at the business unit level; the two types of visibility at the operating unit level; the two types of slack at the business unit level; and the two types of slack at the operating unit level. Combined with the high adjusted R^2 (of approximately 0.40), and the presence of only three significant variables in models 1-6, this might suggest a damaging degree of multicollinearity in the results. At this stage, several remedial measures are recommended.

The simplest remedy would seem to be dropping variable(s) from the model. However, this may lead to a specification error if the initially proposed model is the one that ought to be tested based on theory, resulting in biased estimates (Gujarati, 1999; Stewart, 1984). In the present case, much effort has gone into establishing what the relevant components of slack and visibility might be through the qualitative

[3] The choice of 0.4 as a cut-off is essentially arbitrary. However, given Gujarati's (1999) and

analyses and operationalisations described in Chapters 6 and 7. Simply dropping a variable would have flown in the face of the theory developed in Chapters 3, 6 and 7, and could additionally lead to biased estimates in the remaining variables. Thus despite early experiments with dropping variables, this "solution" was eventually rejected. Other suggested solutions, such as acquiring additional data or a new sample or using prior information about some parameters (Gujarati, 1999; Stewart, 1984; Kennedy, 1985) were rejected as impractical.

The approach finally adopted involved transformation of some of the variables (Gujarati, 1999; Kennedy, 1985). This approach can minimise, if not solve the problem of multicollinearity. Unfortunately, this also yields a cost in aggregating the data, and not enabling the strictly disaggregated approach advocated in this thesis. This trade-off between the fuller approach with potential multicollinearity problems, and a more aggregated approach with less construct validity, is presented here as a supplement to, and not as a substitute for, the fuller analyses in models 1-6. A simple rule of thumb was followed : where the correlation coefficient between any two of the experimental variables was greater than $|0.4|$, they were aggregated by simply adding the two scores. This yielded the five experimental variables outlined in Figure 8.5. These variables now exhibited low inter-correlations, but at the cost of lower reliability than the individual variables since they included more than one dimension of a construct which were previously entered into the regression analyses separately.

Kennedy's (1985) suggested cut-off of 0.8, it was selected to err on the side of caution.

Figure 8.5 : Inter-correlations between transformed variables

	1.	2.	3.	4.	5.	6.
1. BU visibility	1.00					
2. OU visibility	-0.07 (0.53)	1.00				
3. C slack	0.03 (0.81)	0.15 (0.14)	1.00			
4. BU slack	0.05 (0.64)	-0.24* (0.02)	-0.01 (0.91)	1.00		
5. OU slack	0.24* (0.02)	0.20 (0.06)	-0.20 (0.06)	-0.01 (0.92)	1.00	
6. OU size	-0.18 (0.08)	0.04 (0.72)	-0.37** (0.00)	0.08 (0.43)	0.29* (0.01)	1.00

Source : Questionnaires and interviews. "BU visibility" (visibility at the business unit level) is the sum of VISBUORG and VISBUISS visibility scores; "OU visibility" (visibility at the operating unit level) is the sum of VISOUORG and VISOUISS visibility scores; "C slack" is the unchanged available corporate slack score; "BU slack" (organisational slack at the business unit level) is the sum of profit-related and time-capacity slack at the business unit level; "OU slack" (organisational slack at the operating unit level) is the sum of profit-related and time-capacity slack at the operating unit level; "OU size" is the (unchanged) operating unit size as captured by log of number of employees. Upper figure in cell is Pearson correlation coefficient. Figure in parentheses is p-value. N = 95.

Model 7 in Figure 8.4 shows the result of regressing these summary variables on the proactivity of business unit environmental approach. None of the control variables are included, since they were shown to be non-significant in all of the previous models (1-6). The model 7 results support the findings in the previous models : business unit environmental approach is best predicted by operating unit visibility and slack, and by corporate slack. Model 7 has largely mitigated the previous difficulties with multicollinearity. This has been accomplished at some cost to the validity of some of the variables which now clearly contain more than one dimension of their intended construct. Faced with this trade-off between multicollinearity and validity difficulties, the model represents an econometric compromise. In any case, model 7 reinforces the findings in the separate analyses on visibility and slack in Figures 6.16 and 7.16. The surprising substantive point is that the operating unit measures are more significant predictors of business unit environmental proactivity than the business unit indicators. This appears to contradict the theoretical expectations in Figure 3.4. It may in fact be an artefact of using the operating unit general managers' perception of business unit environmental proactivity, rather than the business unit respondents' view. Unfortunately, this is not a testable conjecture within this study since the business unit sample size of only 25 is too small.

Models 8-13 in Figure 8.6 show the results of the same set of models run against total environmental initiative implementation. Again, the pattern of significance across the first six models is similar to that exhibited in the separate sets of regressions (see Figures 6.17 and 7.17). Three types of environmental visibility and operating unit size are the most enduring correlates with total environmental initiative implementation across these models. Consistent with Figure 7.17, the slack variables show little significance across these six models, especially when the operating unit size measure is included.

As with the previous set of regressions on business unit environmental proactivity, there appears to be some damaging multicollinearity between the independent variables. The same transformation of the variables was applied as for the previous set of regression analyses : aggregate measures of visibility and slack were used at each of the main relevant levels of analysis. Model 14 shows the results of this more aggregated approach, with each of the transformed experimental variables outlined in Figure 8.5 regressed against total implementation. In contrast to Model 7 in Figure 8.4, however, operating unit size is also included in this final model due to its consistent significance across models 8 to 13.

	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Constant	-0.393	-0.874+	-1.480*	-1.033	-0.169	-0.109
	(0.43)	(0.07)	(0.05)	(0.23)	(0.84)	(0.83)
Visibility : Business Unit Level : Organisational (VISBUORG)	0.087*	0.063+	0.088+	0.043	0.126+	0.092*
	(0.02)	(0.06)	(0.08)	(0.53)	(0.07)	(0.01)
Issue (VISBUISS)	-0.061	-0.011	0.010	-0.007	-0.056	-0.062+
	(0.11)	(0.77)	(0.81)	(0.88)	(0.21)	(0.09)
Operating Unit Level : Organisational (VISOUORG)	0.138*	0.112*	0.127*	0.153*	0.164**	0.174**
	(0.01)	(0.03)	(0.02)	(0.01)	(0.01)	(0.00)
Issue (VISOUISS)	0.150**	0.153**	0.146**	0.143**	0.136**	0.137**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Slack : Corporate Level : Available Slack	-0.276+	-0.079	-0.078	-0.065	-0.430*	-0.394*
	(0.06)	(0.58)	(0.61)	(0.74)	(0.02)	(0.02)
Business Unit Level : Profit-related Slack	0.073	0.076	0.154	0.035	0.022	-0.024
	(0.27)	(0.22)	(0.11)	(0.79)	(0.88)	(0.75)
Business Unit Level : Time-capacity Slack	0.102	0.153+	0.196	0.159	-0.003	0.026
	(0.27)	(0.08)	(0.11)	(0.24)	(0.98)	(0.78)
Operating Unit Level : Profit-related Slack	-0.036	-0.052	-0.050	-0.050	-0.046	-0.044
	(0.34)	(0.15)	(0.17)	(0.18)	(0.22)	(0.23)
Operating Unit Level : Time-capacity Slack	0.049	0.007	0.008	0.017	0.035	0.043
	(0.15)	(0.84)	(0.81)	(0.63)	(0.34)	(0.20)
Organisation Size : Operating unit Number of Employees (log)		0.112**	0.112**	0.109**		
		(0.00)	(0.00)	(0.00)		
Medium Corporation			0.097	0.090	-0.050	
			(0.49)	(0.55)	(0.73)	
Large Corporation			-0.167	0.103	-0.232	
			(0.57)	(0.79)	(0.55)	
Industry Group : Other Manufacturing				0.197	0.257	0.304*
				(0.20)	(0.11)	(0.02)
Non-manufacturing				0.179	0.059	0.120
				(0.29)	(0.73)	(0.37)
Adjusted R squared	0.33	0.44	0.43	0.43	0.35	0.37

	Model 14
constant	-0.924*
	(0.03)
BU visibility	0.064**
	(0.00)
OU visibility	0.279**
	(0.00)
C slack	-0.134
	(0.33)
BU slack	0.180
	(0.11)
OU slack	-0.063
	(0.26)
OU size	0.120**
	(0.00)
Adjusted R squared	0.43

*Source : See section 5.3.2 for derivation of Total Environmental Initiative Implementation scale. All business unit level data is from interviews, and all operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. * : p < 0.05; ** : p < 0.01.*

Model 14's results echo those of the more detailed models 8 to 13 : total environmental initiative implementation is best predicted by visibility at both levels of analysis, and organisation size. In contrast to the results from the clustering exercise presented in Section 8.2, slack is not a significant predictor of the total level of environmental initiative implementation. This lack of significance on the slack coefficients may be attributable to the inclusion in model 14 of operating unit size, which was left out of the clustering exercise. As with business unit environmental proactivity above, the results of the combined regression analyses concur with those run with the visibility and slack variables separately.

Models 15 to 20, presented in Figure 8.7, state the results of a similar set of analyses on the clean technology initiative implementation scale. As with the previous separate analyses on slack and clean technology implementation (see Figure 7.18), the most consistent slack predictors of clean technology initiative implementation are corporate level available slack and time-capacity slack at the operating unit level. Despite being the single variable consistently showing a significant relationship with clean technology implementation in the visibility regressions (see Figure 6.18), operating unit size was no longer significant when the slack variables were included. This may indicate that part of the variance attributed to size in the discussion of the visibility regressions is indeed due to organisational slack.

Of note is the significant role of the corporate size and industry variables across all of the models. Firms in other manufacturing and in non-manufacturing industries are more likely to implement clean technology initiatives than firms in high impact industries. Medium sized corporations (i.e. the larger companies within the non-FTSE group, see section 5.2.1) are also more likely to implement clean technology initiatives. These findings, although they do not rest easily with a priori expectations, are consistent with the previous findings on industry, corporate size and clean technology initiatives (see Figures 6.18 and 7.18).

Figure 8.7 : Regression on Clean Technology Initiative Implementation

	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20
Constant	-0.464	-0.539	**-3.28****	**-2.029***	**-1.931***	-0.071
	(0.44)	*(0.39)*	***(0.00)***	***(0.04)***	***(0.04)***	*(0.90)*
Visibility : Business Unit Level: Organisational (VISBUORG)	-0.030	-0.039	0.003	-0.070	-0.058	-0.041
	(0.48)	*(0.37)*	*(0.66)*	*(0.39)*	*(0.44)*	*(0.33)*
Issue (VISBUISS)	**-0.080+**	-0.067	0.002	-0.026	-0.033	**-0.083***
	(0.08)	*(0.18)*	*(0.69)*	*(0.61)*	*(0.49)*	***(0.05)***
Operating Unit Level:Organisational (VISOUORG)	0.015	0.008	0.073	**0.137***	**0.139***	0.097
	(0.82)	*(0.90)*	*(0.24)*	***(0.04)***	***(0.03)***	*(0.13)*
Issue (VISOUISS)	**0.129***	**0.131***	0.105	0.098	0.097	**0.106***
	(0.02)	***(0.02)***	***(0.05)***	***(0.05)***	***(0.05)***	***(0.04)***
Slack : Corporate Level : Available Slack	**1.066****	**1.031****	**0.965****	**1.000****	**1.044****	**1.166****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Business Unit Level : Profit-related Slack	0.073	0.083	**0.375****	0.070	0.068	-0.101
	(0.36)	*(0.31)*	***(0.00)***	*(0.64)*	*(0.65)*	*(0.24)*
Business Unit Level : Time-capacity Slack	-0.105	-0.095	0.175	0.059	0.037	**-0.245***
	(0.34)	*(0.40)*	*(0.24)*	*(0.71)*	*(0.79)*	***(0.02)***
Operating Unit Level : Profit-related Slack	0.032	0.021	0.038	0.036	0.039	0.027
	(0.47)	*(0.67)*	*(0.40)*	*(0.40)*	*(0.34)*	*(0.52)*
Operating Unit Level : Time-capacity Slack	**0.195****	**0.183****	**0.199****	**0.219****	**0.223****	**0.198****
	(0.00)	***(0.00)***	***(0.00)***	***(0.00)***	***(0.00)***	***(0.00)***
Organisation Size : Operating unit Number of Employees (log)		0.023	0.030	0.015		
		(0.52)	*(0.39)*	*(0.71)*		
Medium Corporation			**0.529****	**0.484***	**0.467****	
			(0.00)	***(0.01)***	***(0.00)***	
Large Corporation			-0.369	0.244	0.191	
			(0.31)	*(0.59)*	*(0.65)*	
Industry Group : Other Manufacturing				**0.513****	**0.521****	**0.584****
				(0.00)	***(0.00)***	***(0.00)***
Non-manufacturing				**0.408***	**0.392***	**0.386***
				(0.04)	***(0.04)***	***(0.01)***
Adjusted R squared	*0.54*	*0.54*	*0.61*	*0.64*	*0.65*	*0.61*

	Model 21	Model 22
constant	**-1.377***	**-3.52****
	(0.02)	*(0.00)*
BU visibility	**-0.076***	0.027
	(0.02)	*(0.61)*
OU visibility	0.114	**0.153***
	(0.09)	*(0.02)*
C slack	**1.019****	**1.021****
	(0.00)	*(0.00)*
BU slack	0.127	**0.594****
	(0.42)	*(0.01)*
OU slack	**0.227****	**0.307****
	(0.01)	*(0.00)*
OU size		
Medium Corp.		**0.676***
		(0.01)
Not high impact		-0.138
		(0.46)
Adjusted R squared	*0.48*	*0.53*

*Source : See section 5.3.2 for derivation of Clean Technology Initiative Implementation scale. All business unit level data is from interviews, and all operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. * : p < 0.05; ** : p < 0.01.*

Models 21 and 22 show results of analyses using the transformed variables designed to mitigate the difficulties of multicollinearity in the sample. Operating unit size is not included in either model due to its non-significance in models 15 to 20. Model 22 also includes the significant control variables. Models 21 and 22 concur with models 15 to 20 and the earlier separate regressions. The visibility coefficients only seem to be significant when operating unit size is omitted from the model. The most significant predictors of the implementation of clean technology initiatives are slack at the various levels of analysis, and industry characteristics.

Figure 8.8 presents the results of the same set of analyses run against stakeholder relations initiative implementation (models 23 to 28). The separate analyses on visibility showed that the main predictors of stakeholder relations initiatives were both types of visibility at the business unit level, and, to a lesser extent, organisational visibility at the operating unit level (see Figure 6.19). The slack regressions showed the significant relationship between business unit level time-capacity slack and stakeholder relations initiatives (see Figure 7.19). Both sets of analyses showed a positive and highly significant relationship between operating unit size and stakeholder relations initiatives implementation. All of these variables are consistently significant across the fully disaggregated models in Figure 8.8 (i.e. models 23 to 28).

As with the other sets of regression analysis presented in this section, there is a potential problem with multicollinearity due to some high correlations between independent variables (see Figure 8.3). Model 29 shows the results of a compromise model using the transformed variables derived to mitigate the multicollinearity problem. As with total environmental initiative implementation (Figure 8.6), operating unit size is included in model 29 due to its consistent significance across models 23 to 28, and those presented in Figures 6.19 and 7.19. Model 29's results suggest that the most significant predictors of the implementation of stakeholder relations initiatives are visibility at both levels of analysis and operating unit size. None of the slack variables are significant in the more aggregated model.

It is notable that the adjusted R^2 statistic for model 29, at only 0.23, is substantially below the lowest R^2 in any of the other stakeholder relations models (models 23 to 28, next lowest R^2 is 0.31 in model 23). This difference in goodness of fit of the aggregated model compared with the fully disaggregated ones is far more pronounced for the stakeholder relations initiatives regressions than for any of the other dependent variables (cf. Figures 8.4, 8.6, 8.7, 8.9). Unlike with the other sets of regressions, transforming the variables has lead to a dramatic deterioration in the explanatory power of the model. This presents the modeller with an econometric dilemma : which is "better" model 24 with its multicollinearity problems, or model 29 with its much poorer goodness of fit? This is especially important given the slightly diverging results. In model 24, operating unit level visibility is not significant, and business unit level time-capacity slack is, whereas model 29, these results are reversed. Points of ambiguity such as these will be discussed in more detail in the next chapter on the limitations of the results.

	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
Constant	-0.806	-1.349+	-2.431*	-2.304+	-1.272	-0.516
	(0.27)	(0.07)	(0.04)	(0.09)	(0.31)	(0.49)
Visibility : Business Unit Level : Organisational (VISBUORG)	0.204**	0.183**	0.212*	0.207+	0.308**	0.218**
	(0.00)	(0.00)	(0.01)	(0.06)	(0.00)	(0.00)
Issue (VISBUISS)	-0.175**	-0.121*	-0.087	-0.091	-0.144*	-0.18**
	(0.00)	(0.04)	(0.17)	(0.18)	(0.03)	(0.00)
Operating Unit Level : Organisational (VISOUORG)	0.144+	0.123	0.149+	0.153+	0.154+	0.169*
	(0.07)	(0.11)	(0.06)	(0.08)	(0.09)	(0.05)
Issue (VISOUISS)	0.096	0.095	0.085	0.084	0.080	0.009
	(0.16)	(0.15)	(0.20)	(0.21)	(0.24)	(0.21)
Slack : Corporate Level : Available Slack	-0.084	0.098	0.121	0.107	-0.278	-0.220
	(0.70)	(0.66)	(0.60)	(0.72)	(0.28)	(0.36)
Business Unit Level : Profit-related Slack	0.008	0.011	0.130	0.104	0.101	-0.081
	(0.93)	(0.91)	(0.37)	(0.61)	(0.62)	(0.47)
Business Unit Level : Time-capacity Slack	0.243+	0.301*	0.403*	0.388+	0.177	0.176
	(0.07)	(0.02)	(0.03)	(0.07)	(0.36)	(0.21)
Operating Unit Level : Profit-related Slack	-0.007	-0.023	-0.017	-0.017	-0.016	-0.015
	(0.90)	(0.68)	(0.77)	(0.76)	(0.77)	(0.78)
Operating Unit Level : Time-capacity Slack	0.051	0.000	0.006	0.007	0.030	0.043
	(0.31)	(1.00)	(0.91)	(0.89)	(0.58)	(0.40)
Organisation Size : Operating unit Number of Employees (log)		0.119*	0.122*	0.119*		
		(0.01)	(0.01)	(0.03)		
Medium Corporation			0.205	0.196	0.002	
			(0.34)	(0.40)	(0.99)	
Large Corporation			-0.168	-0.130	-0.615	
			(0.71)	(0.83)	(0.29)	
Industry Group : Other Manufacturing				0.044	0.104	0.259
				(0.85)	(0.66)	(0.18)
Non-manufacturing				0.025	-0.126	0.047
				(0.92)	(0.62)	(0.81)
Adjusted R squared	0.31	0.37	0.38	0.38	0.34	0.33

	Model 29
constant	-0.397*
	(0.04)
BU visibility	0.084*
	(0.02)
OU visibility	0.273**
	(0.00)
C slack	-0.047
	(0.83)
BU slack	0.240
	(0.18)
OU slack	-0.113
	(0.22)
OU size	0.141**
	(0.00)
Adjusted R squared	0.23

*Source : See section 5.3.2 for derivation of Stakeholder Relations Initiative Implementation scale. All business unit level data is from interviews, and all operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. * : p < 0.05; ** : p < 0.01.*

Figure 8.9 : Regression on Materials-Reducing Initiative Implementation

	Model 30	Model 31	Model 32	Model 33	Model 34	Model 35
Constant	-0.139	-0.758	-0.541	0.096	1.092	0.187
	(0.81)	*(0.16)*	*(0.52)*	*(0.92)*	*(0.26)*	*(0.75)*
Visibility : Business Unit Level : Organisational (VISBUORG)	0.012	-0.012	0.029	-0.013	0.077	0.018
	(0.77)	*(0.75)*	*(0.61)*	*(0.86)*	*(0.32)*	*(0.67)*
Issue (VISBUISS)	0.030	**0.088***	**0.087+**	0.064	0.011	0.029
	(0.49)	***(0.04)***	***(0.07)***	*(0.19)*	*(0.82)*	*(0.49)*
Operating Unit Level : Organisational (VISOUORG)	**0.111+**	0.082	0.078	0.107	**0.117+**	**0.153***
	(0.08)	*(0.15)*	*(0.19)*	*(0.10)*	***(0.08)***	***(0.02)***
Issue (VISOUISS)	**0.199****	**0.020****	**0.198****	**0.194****	**0.188****	**0.185****
	(0.00)	***(0.00)***	***(0.00)***	***(0.00)***	***(0.00)***	***(0.00)***
Slack : Corporate Level : Available Slack	-0.162	0.080	0.021	-0.014	-0.419*	-0.297
	(0.34)	*(0.62)*	*(0.90)*	*(0.95)*	*(0.03)*	*(0.11)*
Business Unit Level : Profit-related Slack	0.095	0.089	0.120	-0.026	-0.038	-0.016
	(0.21)	*(0.20)*	*(0.26)*	*(0.86)*	*(0.81)*	*(0.85)*
Business Unit Level : Time-capacity Slack	-0.037	0.025	-0.069	-0.132	**-0.317***	-0.124
	(0.73)	*(0.79)*	*(0.61)*	*(0.38)*	***(.03)***	*(0.25)*
Operating Unit Level : Profit-related Slack	0.004	-0.749	-0.013	-0.015	-0.153	-0.005
	(0.92)	*(0.85)*	*(0.75)*	*(0.71)*	*(0.71)*	*(0.90)*
Operating Unit Level : Time-capacity Slack	**0.074+**	0.248	0.016	0.024	0.042	0.068
	(0.05)	*(0.50)*	*(0.66)*	*(0.54)*	*(0.30)*	*(0.08)*
Organisation Size : Operating unit Number of Employees (log)		**0.138****	**0.129****	**0.120****		
		(0.00)	***(0.00)***	***(0.00)***		
Medium Corporation			-0.131	-0.159	**-0.324***	
			(0.41)	*(0.34)*	***(0.05)***	
Large Corporation			-0.341	-0.066	-0.445	
			(0.31)	*(0.88)*	*(0.31)*	
Industry Group: Other Manufacturing				0.246	**0.312+**	**0.349***
				(0.16)	***(0.09)***	***(0.02)***
Non-manufacturing				0.178	0.044	0.138
				(0.34)	*(0.82)*	*(0.37)*
Adjusted R squared	*0.35*	*0.48*	*0.49*	*0.50*	*0.43*	*0.40*

	Model 36
constant	-0.703
	(0.14)
BU visibility	**0.070****
	(0.00)
OU visibility	**0.28****
	(0.00)
C slack	0.068
	(0.65)
BU slack	0.100
	(0.43)
OU slack	0.033
	(0.60)
OU size	**0.13****
	(0.00)
Adjusted R squared	*0.42*

*Source : See section 5.3.2 for derivation of Stakeholder Relations Initiative Implementation scale. All business unit level data is from interviews, and all operating unit level data is from questionnaire. Sample size = 95. Numbers in parentheses are p-values. * : p < 0.05; ** : p < 0.01.*

Finally, Figure 8.9 presents the results of the regressions on materials-reducing initiative implementation (models 30 to 35). Again, the pattern of results of the models broadly support the findings of the earlier, separate analyses (see Figures 6.20 and 7.20). Materials-reducing initiatives are best predicted by issue visibility at the operating unit level and operating unit size. Transforming the variables to mitigate multicollinearity, and regressing them against materials-reducing initiative implementation yields the results presented in model 36. This model largely summarises the previous models, but with the addition of business unit level visibility as a significant predictor. However, it is worth noting from Figure 8.3 that there are significant correlations between industry and business unit level visibility, so this might explain the inconsistent significance of business unit level visibility across models 30 to 36. Model 36, indicates that the main predictors of the implementation of materials-reducing initiatives are visibility and operating unit size. There is no consistent relationship between slack and materials-reducing initiative implementation.

Figure 8.10 : Summary of Regression Results

	Business Unit Enviro. Proact.	Total Implem-entation	Clean Tech.	Stake-holder Relations	Materials Reducing
Visibility :					
Business Unit Level Organisational (VISBUORG)		(+ve)		+ve	
Business Unit Level Issue (VISBUISS)			(-ve)	(-ve)	(+ve)
Operating Unit Level Organisational (VISOUORG)		+ve	(+ve)	+ve	(+ve)
Operating Unit Level Issue (VISOUISS)	+ve	+ve	(+ve)		+ve
Slack :					
Corporate Level Available Slack	+ve	(-ve)	+ve		
Business Unit Level Profit-related Slack					
Business Unit Level Time-capacity Slack				(+ve)	
Operating Unit Level Profit-related Slack					
Operating Unit Level Time-capacity Slack	+ve		+ve		
Controls :					
Operating unit size		+ve		+ve	+ve
Medium Corporation			+ve		
Large Corporation					
Other Manufacturing Industry			+ve		(+ve)
Non-manufacturing Industry			+ve		

Source : Regression models detailed in Figures 8.4 to 8.9 above. "+ve" indicates positive and significant coefficients across the relevant models, "-ve" indicates negative and significant coefficients across the relevant models. Relationships in parentheses are not consistent across models.

A summary of the fully disaggregated regression results is presented in Figure 8.10. Caution must be exercised in interpreting these results due to the potential multicollinearity problems. However, regressions run with transformed variables on each of the dependent variables broadly supported the more detailed results. The exception was the set of regressions on stakeholder relations initiative implementation, where transforming the variables led to a dramatic decrease in R^2. The results indicate broadly complementary roles for visibility and slack as predictors of environmental responsiveness. They also illustrate the importance of the control variables in some of the models.

8.4 Aggregated visibility, slack and size as explanations for environmental responsiveness

As a final examination of visibility, slack and size as complementary or rival explanations for environmental responsiveness, highly aggregated, summary measures of visibility and slack were developed. Inspired by the variable transformation undertaken to mitigate the difficulties of multicollinearity in the previous section, the different measures of visibility and slack respectively were combined. This analysis to some extent rides against the disaggregated intentions of this thesis since it denies much of the variation in the variables due to differing scores on their different dimensions. The sole purpose of presenting it here is to assess whether patterns of environmental responsiveness can be predicted by visibility, slack and size at the aggregate level.

As with the regressions in the previous section, all regression procedures were carried out at the operating unit level of analysis (n = 95). Business unit level variables were dealt with by giving all operating units in the business unit the same score (as scored by the interview respondent), except for when a business unit level variable was used as the dependent variable. In this case, the operating unit general manager's perception of business unit environmental proactivity was used, so that the sample size remained 95. The correlation coefficient matrix of the independent variables is presented in Figure 8.11, and suggests only a very limited degree of multicollinearity in the data.

Figure 8.11 Inter-correlations among aggregate measures of visibility, slack and size

	Visibility	Slack	OU Size
Visibility	1.00		
Slack	0.23* (0.03)	1.00	
OU Size	-0.15 (0.15)	0.24* (0.03)	1.00

*Source : Operating unit questionnaire and interviews. N = 95. "visibility" is the mean value of all the visibility indicators at both levels of analysis. "Slack" is the mean value of all the slack measures at all three levels of analysis. "OU size" is log of number of employees at the operating unit. Upper figure in cell is Pearson correlation coefficient. Number in parentheses is p-value. * : p < 0.05; ** : p < 0.01.*

The results of regressing the three summary variables against the five main dependent variables are shown in Figure 8.12. The control variables were not included in this run in order to maintain comparability across models. A possible consequence of this decision is that the size coefficient is now significant in the clean technology model, where previously inclusion of both visibility and slack made size non-significant.

Figure 8.12 : Visibility, slack and size regressed on the five dependent variables

	BU environmental proactivity	Total implementation	Clean technology initiative implementation	Stakeholder relations initiative implementation	Materials reducing initiative implementation
Constant	1.665*	-0.047	-1.055	-0.390	-0.160
	(0.01)	(0.90)	(0.06)	(0.46)	(0.68)
Visibility	0.422**	0.183**	-0.10	0.208**	0.206**
	(0.00)	(0.00)	(0.14)	(0.00)	(0.00)
Slack	0.695	-0.063	0.51*	-0.115	0.101
	(0.11)	(0.64)	(0.04)	(0.57)	(0.49)
OU Size	-0.004	0.134**	0.16**	0.144**	0.135**
	(0.95)	(0.00)	(0.00)	(0.00)	(0.00)
Adjusted R-squared	*0.17*	*0.32*	*0.24*	*0.19*	*0.34*

*Source : Interviews and questionnaires. Sample size = 95. Numbers in parentheses are p-values. * : p < 0.05; ** : p < 0.01. See notes of Figures 8.4 to 8.9.*

Aside from this small divergence, the aggregated results shown in Figure 8.12

support this chapter's earlier findings. Business unit environmental proactivity is best predicted by visibility (as supported by the clustering exercise, see Section 8.2). When visibility is properly accounted for, size no longer matters in predicting strategic environmental proactivity. In contrast, the implementation-based measures of environmental responsiveness show a more complex pattern with some role played by each of visibility, slack and size. Of particular note is the importance of visibility for the implementation of stakeholder relations and materials-reducing initiatives, but of slack for clean technology. This is an interesting finding, which fits well with the theoretical approach taken in this thesis, and will be discussed more fully in the next chapter. These results support the empirical separation of visibility and slack from size as recommended in this thesis : different aspects of size which were previously compounded account for different types of environmental responsiveness.

8.5 Chapter Summary

This chapter drew together the empirical findings of the previous three chapters, and tested relevant aspects of the model outlined in Chapter 3. The first set of analyses, based on operating units' cluster memberships, showed that visibility is the dominant explanator for corporate environmental proactivity, but that visibility and slack are complementary explanations for environmental initiative implementation. Regression analyses were then conducted using the multi-level data which combined the previous separate regression analyses for visibility and slack. These showed that environmental visibility, organisational slack, and the size and industry control variables explained a large proportion of the variance in the five main dependent variables.

This chapter aimed to answer the question of whether size, visibility and slack are complementary or rival explanators for environmental responsiveness. The chapter suggests that for individual environmental responsiveness types, size, visibility and slack are rival explanators. But for explaining the profile of environmental responsiveness across the strategy and environmental initiative implementation responses, they are complementary. Many of the main themes in this thesis were supported by the data. Some findings ran contrary to expectations, however, and these points and others of interest or controversy will be discussed in the next chapter.

Chapter 9 : Summary and Discussion of Results

9.1 Introduction

This chapter will summarise the results derived in Chapters 5 to 8, and use them to assess the fit of the model and hypotheses presented in Chapter 3. Limitations and delimitations arising from the methodology employed (Chapter 4), biases present in the data (Chapter 5) and decisions during the model development (Chapter 3) will also be addressed. The chapter acts as a prelude to the conclusions on the thesis' contributions made in the next, and final chapter (Chapter 10). It has three main aims:

- to decide on the acceptance or rejection of the hypotheses presented in Chapter 3 based on the empirical evidence in Chapters 5 to 8.
- to outline some of the broader findings of the empirical work as a basis for assessing its contribution in Chapter 10.
- to address the thesis' limitations and delimitations and consider their implications for the results.

The chapter begins by summarising results relevant to each of the hypotheses, and using these to decide on their acceptance, rejection or modification. The results are broadly in line with expectations from Chapter 3, though some notable exceptions will be discussed. This detailed summary will be followed by a more general discussion of the broader findings of the empirical work. The main message here is that examining the relationship between organisation size and environmental responsiveness depends on disaggregation - to different levels of analysis; to the different effects of visibility and slack; to various types of visibility, slack and environmental responsiveness. The chapter concludes with a discussion of the limitations and delimitations placed on the data and findings by the methodology employed, and their implications for the interpretation of the results. Reflections on the broader contributions of the thesis, and its place in the body of knowledge are left to the conclusions in the final chapter (Chapter 10).

9.2 Assessing the Hypotheses

The hypotheses were assessed using a range of different methods examining the relationships between organisation size, environmental visibility, and organisational slack. As was outlined in the methodology section (see section 4.4.1), the thesis effectively undertakes two different levels of "testing" : "tests" using qualitative data to establish the relevance of visibility and organisational slack in predicting environmental responsiveness, and statistical tests designed to assess the significance and direction of these relationships. In summarising the results, the focus will be on the significance and direction in statistical tests, but the qualitative data is also used to provide supporting detail.

Figure 9.1 presents the list of hypotheses derived in Chapter 3, and summarises the evidence pertinent to each hypothesis. The third column shows whether each hypotheses should be accepted, rejected or modified based on the evidence. The next two sections will discuss each of the hypotheses, starting with the hypotheses based on environmental visibility.

9.2.1 Assessing the hypotheses on environmental visibility

The qualitative evidence in section 6.2 confirmed that the separation of environmental visibility into four types based on whether it is organisational or issue visibility, and at the business unit or operating unit level of analysis, was a useful organising typology. The separate hypotheses on the impact of organisational and issue visibility on environmental responsiveness were both supported at a general level (see H1 and H2 in Figure 9.1). The qualitative evidence and the balance of the regression-based analyses, suggested that visibility is an important predictor of organisations' responsiveness on environmental issues. Thus separating visibility from organisation size (and, by implication, organisational resources) has allowed a more detailed examination of the relationships between environmental visibility and environmental responsiveness.

The generally positive relationship between visibility and responsiveness was echoed at the business and operating unit levels of analysis. At the business unit level, H3 (organisational visibility) and H4 (issue visibility) were not rejected. Direct tests of these relationships were hampered by a small sample size at the business unit level (n = 25), and by unreliable measures of visibility at the business unit level (see

Appendix 4). These yielded non-significant relationships. However, a modification was suggested whereby aspects of business unit environmental proactivity were divided into those visible to external parties, and those with a purely internal focus (see section 6.6.1). A positive relationship was then found between both types of visibility and externally focused business unit environmental proactivity. Thus modified versions of H3 and H4 were accepted. This is consistent with recent treatments of environmental strategies (see for example Howard, Nash et al. 2000), where visible firms are more likely to respond with visible environmental strategies.

The evidence at the operating unit level on the relationships between organisational visibility (H5) and issue visibility (H6) and the implementation of environmental initiatives is more substantial. In the fuller models in Chapter 8 (see Figure 8.10 for a summary), where the joint impacts of visibility, slack and size were analysed, there was considerable evidence that highly visible operating units, or units with highly visible impacts, were more likely to implement environmental initiatives. Thus based on the evidence in Figures 6.17 and 8.6, H5 and H6 are not rejected.

The hypotheses on visibility and the separate types of environmental initiatives were also supported. No significant relationship was found between visibility and clean technology initiatives (accept H9), but stakeholder relations initiatives are positively and significantly related with several aspects of environmental visibility (accept H8). Materials-reducing initiatives were also more likely to be implemented in highly visible operating units (accept H7). Thus visibility as defined and operationalised in this thesis seems to be an important predictor of environmental responsiveness.

Figure 9.1 : List of Hypotheses and Summary of Evidence

No.	Hypothesis	Sources of evidence	Verdict
General Hypotheses			
H1.	There is a positive relationship between the visibility of the organisation and environmental responsiveness	• qualitative evidence (Sect. 6.2.1 & 6.2.3) • summary of regression analyses (Fig. 8.10)	accept
H2.	There is a positive relationship between the visibility of environmental impacts and environmental responsiveness	• qualitative evidence (Sect. 6.2.2 & 6.2.4) • summary of regression analyses (Fig. 8.10)	accept
H16.	There is a positive relationship between organisational slack and environmental responsiveness	• qualitative evidence (Sect. 7.2.2 - 7.2.7) • summary of regression analyses (Fig. 8.10)	reject
Extended by level of analysis			
H3.	There is a positive relationship between the organisational visibility of the business unit (VISBUORG), and the proactivity of the business unit environmental approach	• correlations (Sect 6.6.1) • regression analyses (Fig. 6.16 & 8.4)*	modify
H4.	There is a positive relationship between the visibility of environmental issues at the business unit level (VISBUISS) and the proactivity of the business unit environmental approach	• correlations (Sect 6.6.1) • regression analyses (Fig. 6.16 & 8.4)*	modify
H13.	Business units in corporations which have been slack gainers over the previous period are more likely to have a proactive business unit environmental approach	• t-tests (Fig. 7.8) • regression analyses (Fig. 7.16 & 8.4)*	modify
H14.	There is a positive relationship between available slack resources at the business unit level and the proactivity of the business unit environmental approach	• correlations (Fig. 7.10) • regression analyses (Fig. 7.16 & 8.4)*	reject
H5.	There is a positive relationship between the organisational visibility of the operating unit (VISOUORG) and its implementation of environmental initiatives	• pattern of implementation across clusters (Sect. 6.6.2) • regression analyses (Fig. 6.17, 8.6 and 8.10)	accept
H6.	There is a positive relationship between the visibility of environmental issues at the operating unit (VISOUISS) and its implementation of environmental initiatives	• pattern of implementation across clusters (Sect. 6.6.2) • regression analyses (Fig. 6.17, 8.6 and 8.10)	accept
H15.	There is a positive relationship between available organisational slack at the operating unit level and the implementation of environmental initiatives.	• pattern of implementation across clusters (Sect. 7.5.3) • regression analyses (Fig. 7.17, 8.6 and 8.10)	reject

Extended by type of environmental initiative			
H7.	There is a positive relationship between environmental visibility and materials-reducing initiatives	• pattern of implementation across clusters (Fig. 6.15) • regression analyses (Fig. 6.20, 8.9 and 8.10)	accept
H8.	There is a positive relationship between environmental visibility and stakeholder relations initiatives	• pattern of implementation across clusters (Fig. 6.15) • regression analyses (Fig. 6.19, 8.8 and 8.10)	accept
H9.	There is no relationship between environmental visibility and clean technology initiatives	• pattern of implementation across clusters (Fig. 6.15) • regression analyses (Fig. 6.18, 8.7 and 8.10)	accept
H10.	There is a negative relationship between available organisational slack at the operating unit level and the implementation of materials-reducing initiatives	• pattern of implementation across clusters (Fig. 7.15) • regression analyses (Fig. 7.20, 8.9 and 8.10)	reject
H11.	There is a positive relationship between available organisational slack at the operating unit level and the implementation of stakeholder relations initiatives	• pattern of implementation across clusters (Fig. 7.15) • regression analyses (Fig. 7.19, 8.8 and 8.10)	reject
H12.	There is a positive relationship between available organisational slack at the operating unit level and the implementation of clean technology initiatives	• pattern of implementation across clusters (Fig. 7.15) • regression analyses (Fig. 7.18, 8.7 and 8.10)	accept

Source : List of hypotheses in section 3.3 and figures and other sections cited. * *indicates that the test was undertaken using operating unit data (n = 95), when it should have been undertaken with business unit data only (n = 25). They are included here as a matter of interest, recognising that some business units with many operating units would have been over-represented.*

9.2.2 Assessing the hypotheses on organisational slack

The evidence on organisational slack and environmental responsiveness is also broadly as expected. At the aggregate level, the hypothesis that there is a positive relationship between slack and responsiveness is rejected based on the balance of the regression results and the qualitative evidence (see H16 in Figure 9.1). As anticipated in the theoretical discussion (see section 3.2.4), at the aggregate level, arguments can be proposed to suggest either a positive or a negative relationship between slack and responsiveness, depending on the function of organisational slack or the type of initiative considered. The qualitative evidence also supported this ambivalent view, illustrating some cases where slack is positively related with environmental responsiveness (e.g. by stimulating investments in solar panels, see 7.2.5) and some where they are negatively related (e.g. improving the environmental performance of boilers to recapture the time spent dealing with complaints, see 7.2.4). Thus while H16 is rejected, this rejection is in line with the expectations of the study, and with findings from the other hypotheses on organisational slack.

Other aggregate hypotheses on slack and environmental responsiveness were also rejected. Findings on H14 at the business unit level, and H15 at the operating unit level showed that there was not a consistently positive relationship between business unit organisational slack and environmental responsiveness. This is most likely due to the presence of countervailing forces in the relationship between slack and environmental responsiveness. As argued above, slack can promote or hinder environmental responsiveness, and these hypotheses (H14 and H15) were not sufficiently disaggregated to capture the effects. The rejection of H15 is a particularly notable contrast to the hypotheses on types of environmental initiatives (H10, H11 and H12, see below).

H13, the hypotheses on organisational slack at the corporate level was also in line with expectations, even though it is strictly rejected based on the interpretation of the evidence. H13, which stated that business units in corporations which have been slack gainers over the previous period are more likely to have a proactive business unit environmental approach, was rejected on the basis of t-tests comparing the environmental proactivity of slack gainers and slack losers (see section 7.5.1). However, this hypothesis did hold if it was adapted to consider available slack only, rather than total levels of slack (see section 7.5.1). Indeed, when corporate available slack was included in regression analyses (see Figures 7.17 and 8.6), it was a consistently significant explanatory variable of business unit environmental proactivity. Thus H13 is accepted in its modified form, to include corporate available slack only, and not total slack.

When examined at the disaggregated level of types of environmental initiatives at the operating unit level, the organisational slack evidence is mixed. A positive relationship was found between available organisational slack at the operating unit level and the implementation of clean technology initiatives (H12), supporting the arguments on slack as a facilitator of innovation (see section 3.2.4). However, no consistently significant relationships were found between available organisational slack at the operating unit level and materials-reducing initiatives (reject H10). Despite some qualitative evidence supporting the arguments on slack and satisficing (see sections 3.2.4 and 7.2.6), the quantitative evidence failed to show a consistent tendency among low slack units to implement materials reducing initiatives.

Throughout the regressions on environmental responsiveness, time-capacity based measures of slack were better predictors than profit-related measures. This implies that it is operational rather than managerial slack which best explains the implementation of environmental initiatives. Managerial slack may play a role in inducement to maintain the coalition (see section 7.2.2) and in political activity (see section 7.2.7), but does not in promoting environmental innovations such as clean technology initiatives.

The final hypothesis on organisational slack, on the implementation of stakeholder relations initiatives (H11) was rejected. No consistently significant relationship was found between slack and stakeholder relations initiatives. This was against expectations that high slack units would use some of this slack to respond to constituent demands for improved environmental performance (see section 7.2.3). Instead, stakeholder relations initiatives were best predicted by organisational visibility and by slack at the corporate and business unit levels. Thus stakeholder relations initiatives are undertaken regardless of the slack position at operating units according to corporate or business unit imperatives.

9.2.3 Summary of hypothesis assessment

A complete list of the hypotheses and a verdict on each is presented in Figure 9.1. Many of the hypotheses were accepted unmodified. Several others were modified based on further examination of the evidence. Explanations for the findings on all the rejected hypotheses were found within the data and theoretical approach of the thesis. Thus the findings on the hypotheses were broadly in line with expectations.

9.3 Other Findings

The empirical work in this theses has elicited several other key findings which were not discussed directly above when accepting or rejecting the hypotheses, but do nevertheless contribute to the strength of the thesis. This section will outline some of these findings, focusing first on the separate effect of size as distinct from visibility or slack in predicting environmental responsiveness. Three further findings on the importance of disaggregation are then discussed : types of visibility and slack, explaining strategy and implementation, and types of environmental initiatives.

9.3.1 The separate effect of size

The empirical results in Chapters 5 to 8 support the contention that environmental visibility and organisational slack are separate explanators of environmental responsiveness, and that they are distinct from organisation size. In the highly aggregated models run on all the dependent variables in Figure 8.12, visibility, slack and size were shown to be rival and complementary explanators for environmental responsiveness. For individual environmental responsiveness types, size, visibility and slack are rival explanators, with some types of environmental responsiveness more influenced by one or a combination of the predictors. However, when taken as a whole, the profile of environmental responsiveness across the strategy and environmental initiative implementation can be best explained by the complementary roles of size, slack and visibility.

At the business unit level, marginally significant effects of corporate size on environmental proactivity in models run with only the control variables (Model 1 in Figures 6.16 and 7.17), became non-significant when either the visibility (see Figure 6.16) or the slack (see Figure 7.16) variables were included. In the models combining visibility, slack and size as predictors of business unit environmental proactivity, none of the size variables were significant. Thus the visibility and slack variables explain much of the variance in business unit environmental proactivity as distinct from organisation size.

The patterns are more mixed at the operating unit level. Simply examining the regressions on total implementation levels gives a misleading impression of the role of operating unit size. Operating unit size is the most consistent predictor of the overall level of environmental initiative implementation (see Figures 6.17, 7.17 and 8.6). The finding that large operating units are more likely to implement environmental initiatives stands in stark contrast to the meta-analysis results which indicated a non-significant relationship between size and implementation at sub-units (see section 2.4). Fortunately, disaggregating the results by type of environmental initiative places limits on this finding.

For clean technology initiatives (see Figure 8.7) and stakeholder relations initiatives (see Figure 8.8), the inclusion of the visibility and slack variables greatly reduced the importance of operating unit size as a predictor of implementation. The effect was most dramatic for clean technology initiatives where, despite being the single variable consistently showing a significant relationship with implementation in the visibility regressions (see Figure 6.18), operating unit size was no longer significant when the slack variables were included (see Figure 8.7). Thus part of the variance attributed to size in the discussion of the visibility regressions was shown to be due to organisational slack. For clean technology initiatives in particular, visibility and slack explain much of the variance in implementation which was previously attributed to operating unit size.

The overall positive relationship between operating unit size and total implementation in this study is most likely due to the dominant effect of the materials-reducing initiatives in the total implementation measure. Five of the twelve indicators used in the total implementation scale were deemed "materials-reducing" compared with only two which were allocated as "clean technology" (see section 5.3.2). Given the consistently strong and highly significant relationship between operating unit size and the implementation of materials-reducing initiatives (see Figure 8.9), it is not surprising that the aggregate relationship was also positive. Therefore, when the results are disaggregated by type of environmental initiative, this study's findings on the relationships between operating unit size and implementation are broadly in line with those of the meta-analysis, except for the findings on materials-reducing initiatives.

Thus, at both the business unit and the operating unit level, the findings suggest that slack and visibility separately account for much of the variance in environmental responsiveness previously attributed to organisation size. The exception is the implementation of materials-reducing initiatives which is still best predicted by operating unit size even when all the other variables are included. Possible explanations for this finding are left for future research (see 10.3.3).

9.3.2 Types of visibility and slack

Several of the empirical contributions of this thesis were made before the questionnaire which yielded the quantitative data was even designed. Types of visibility and the various functions of types of slack were examined using qualitative data from the interviews. A significant set of findings from this thesis are those based on the development of organising frameworks of analysis for visibility and slack, and the operationalisations of different types of visibility and slack for use in the quantitative analyses.

The transcript analysis revealed that managers in operating units and their headquarters parents constructed some environmental actions as responses to either their visibility as an organisation or the transparency of their environmental issues. A typology of environmental visibility was developed based on the qualitative data, which echoed the four theory driven types of visibility intimated at in the literature - organisational and issue visibility based at the corporate and operating unit levels of analysis. When the typology was operationalised, it showed good construct validity by matching in predictable ways with organisational characteristics such as size and industry group (see sections 6.3 and 6.4).

It was shown that the extent to which the business unit and operating unit are "visible" are independent (see section 6.4). This is an important finding supporting the separation of incentives for environmental responsiveness by levels of analysis (see section 3.2.3). Discriminating between organisational and issue visibility, however, was not as straightforward. Although the qualitative evidence seemed to support such a separation, differentiating between the two types of visibility quantitatively was difficult (see sections 6.3 and 6.4), and was hampered by poor measures, especially at the business unit level (VISBUISS). In some senses, this is not a serious shortcoming, since the fundamental point that organisations' responsiveness depends on incentives in their institutional surroundings holds whether such incentives are organisation or issue visibility based (see section 3.2.3). Large organisations have the highest levels of organisation and issue visibility (see section 6.5.1), so it may not be important to attempt the differentiation between the sources of visibility which the quantitative part of this study found so difficult.

The typology did, however, provide a good organising framework for tracking the impacts of different types of visibility on environmental responsiveness. It represents an advance on previous empirical treatments of visibility as firm size, number of mentions in the media or brand name recognition.

The qualitative evidence also suggested that organisational slack plays important roles in environmental decision-making in organisations. Examples of all the functions of slack identified in the literature were found in an environmental context, and a extensions were made to include internal and external aspects of some of the functions (such as buffering and political behaviour). Considering the functions of slack from the qualitative evidence gave rise to several guidelines for operationalising slack, especially at the sub-unit level (see section 7.2.8).

Indeed, new operationalisations of sub-unit slack represent one of the incidental contributions of this thesis. Measures based on two different dimensions of slack, time-capacity and profit-related, were shown to have more construct validity and higher reliability than the commonly used measures by Nohria and Gulati (see section 7.3.2). Separating slack into managerial and operational slack allowed operational slack to emerge as more important for environmental responsiveness than managerial slack, since time-capacity slack was consistently a more prominent predictor of environmental responsiveness than profit-related slack (see section 8.3.2). Managerial slack might be expected to be related with slack as an inducement to maintain the coalition or slack as a facilitator of political activity, but this remains to be tested in future applications.

Thus the qualitative evidence on slack represents an advance on existing research in two ways. Firstly, it provides evidence of slack as an important variable as distinct from organisation size in an environmental context. Secondly, it provides the basis of more appropriate operationalisations of slack at sub-units than have previously been used.

9.3.3 Explaining strategy and implementation

Evidence from the cluster analyses broadly suggests that visibility best explains business unit environmental proactivity (strategy), but that slack and visibility jointly predict environmental initiative implementation (see section 8.3.1). This pattern is not immediately obvious from the regression analyses, due to the inclusion of the control, organisation size and business unit level variables. However, it does conform to a priori expectations that strategy and implementation should be kept separate throughout the analyses (see section 3.2.6).

The clustering exercises were used throughout as a supplement to the regression analyses in order to provide a "feel" for the groups of units present within the operating unit sample. They are limited by their reliance solely on operating unit level data, by the exclusion of the size and industry variables, and by the usual vagaries of clustering methods (Kaufman and Rousseuw 1990). Comparison of the average business unit environmental proactivity scores across operating unit cluster membership revealed that there was a significant relationship between visibility cluster membership and environmental proactivity score (see sections 6.6.2 and 8.3.1). When environmental initiative implementation was compared, both visibility and slack cluster membership were significantly related with total implementation levels. This implies that visibility characteristics outweigh slack as a predictor of strategic environmental responsiveness. In contrast, slack is at least as important as visibility in predicting environmental initiative implementation.

These results together suggest that visibility provides the incentives for organisations to signal their environmental intentions by introducing a proactive environmental strategy. However, slack provides organisations with the ability to implement environmental initiatives using excess resources. Thus not only are slack and visibility separate explanations from size, they also predict different levels and types of responsiveness in the form of strategy and implementation.

9.3.4 Types of environmental initiatives

The detailed findings on each of the hypotheses concerning the implementation of different types of environmental initiatives were presented above. However, it is worth emphasising here the importance of considering different types of environmental initiatives separately. The qualitative interview analysis gave rise to numerous initiatives undertaken in the sampled business units which were interpreted by the respondent as "environmental". The quantitative phase could only include fairly generic descriptions of these initiatives, as each operating unit resided in an entirely different organisational and environmental context (see section 5.3.2).

Even with this limited range of initiatives, comparison of incidence of their implementation across environmental visibility (see sections 6.6.2 and 8.3.1) and organisational slack (see sections 7.5.3 and 8.3.1) clusters showed distinctive patterns of implementation. These patterns were later picked up in the regression analyses. Organisational slack showed a positive relationship with some types of initiative (clean technology initiatives), but no relationship with the others. In contrast, environmental visibility was a useful predictor for some types of initiatives (stakeholder relations), but not for others (clean technology).

Thus the separation of environmental responsiveness not only by level of analysis, and by strategy and implementation, but also by type of environmental initiative was broadly supported by the findings. This separation might add clarity to future empirical work, and help explain the non-significant relationship found between organisation size and implementation of environmental initiatives found in the meta-analysis (see section 10.2.5 for further discussion).

9.3.5 Summary of other findings

Several findings not immediately obvious from the discussion of the hypotheses were outlined in this section. The empirical separation of size from both visibility and slack was supported, as was disaggregation to different types of visibility, slack and environmental initiatives. The results also suggest that relationships do indeed differ across levels of analysis, and in particular, visibility and slack have distinct impacts on environmental strategy and implementation. Thus these findings add support to the overall approach taken in this thesis.

9.4 Limitations and Delimitations

This section will discuss the implications for the results of the limitations and delimitations necessarily placed on a piece of research work of this size. Limitations of the research are constraints on the interpretation of the results arising from the sample, operationalisations and analyses used in the research design. Delimitations are broader boundaries of the research where certain aspects of relevance to the research were excluded as outside the scope of the study due to the necessity of keeping project to a practicable size. Each of these sets of constraints, and their impact on the findings discussed above will now be addressed in turn.

9.4.1 Limitations

Several limitations arise as a result of decisions taken in the research design. The first set are limitations arising from the sample of business and operating units used. Several sampling biases were detected due to choices in the sampling process (see section 4.3.2) and due to non-response (see section 5.4.5).

The business unit sample was drawn using a combination of disproportional stratified sampling and random sampling at the business unit level (see section 4.3.1). While this choice was a valid attempt to gain efficient estimates of the incidence of environmental initiative implementation for each of three industry groups, as the project developed the industry groups became less important. The end result of this choice was that high impact business units were over-represented in the sample. Operating units were selected from within the business units. Unfortunately, the number of operating units per business unit was not uniform, with some types of operating units (especially retailing) being over-represented in the operating unit sample. Thus the findings should be interpreted with the knowledge that one of the strict assumptions of parametric tests, random sampling, was violated.

A more serious limitation is recognised here. If due to some systematic business unit level effect, all operating units in the same business unit exhibit the same relationships, this would have an effect on the operating unit level regressions undertaken throughout Chapters 6, 7 and 8. The business unit effects would simply be weighted in the regressions by the number of operating units in the business unit. Several steps were undertaken to try to assess this effect. Firstly, some of the regression analyses were undertaken with the business units with large numbers (over 7) of operating units in the sample excluded. There was no systematic difference in results when these business units were excluded. Secondly, the operating unit level data of the business units with large numbers of operating units was separately examined to see if there was variation in size, visibility, slack and responsiveness within the business unit boundary, and whether there was a dominant pattern within each of the business units. No such patterns were observed. Indeed, in many cases, the variance within business units of environmental initiative implementation was as high as across the entire sample, showing that operating units within the same business unit do indeed differ in their environmental responsiveness levels.

As discussed in sections 4.3.2 and 5.4, some non-response biases were detected . The sample showed bias towards large corporations, and towards organisations more likely to implement environmental initiatives. This is an unfortunate characteristic of much environmental management research, where only companies interested in environmental issues at a basic level tend to respond to requests to participate in research. In some senses, this is not a serious limitation for research which aims to examine the relationships between variables, rather than estimate the incidence of particular practices. However, it is possible that the findings outlined earlier in this chapter are only pertinent for large organisations which are relatively more likely to implement environmental initiatives in any case.

The second set of limitations of the research are based on the operationalisations used. A strength of the research is that it developed new operationalisations of many of the key variables such as types of visibility and slack. A limitation of this approach is that the measures themselves are not widely accepted in the literature, and have not been proven across other samples or research applications. Most of the measures used showed adequate validity and reliability (see Appendix 4). However, the low reliability of some measures, especially at the business unit level, plagued the empirical tests. Particularly problematic were the measures of environmental visibility at the business unit level (VISBUORG and VISBUISS). VISBUISS visibility was also criticised for its lack of validity as it could be interpreted as reflecting the corporate environmental approach rather than measuring an organisational correlate of it (see section 6.3).

The only response to this limitation was to be explicit about the quality of the indicators throughout the research process. Where an indicator was deemed of low quality, this was mentioned when the findings were presented. A broader tactic was also used where several sets of analyses were used to assess each hypothesis (see 3rd column of Figure 9.1). This should lower the reliance on any single indicator or test in assessing the models, as results from several methods were triangulated.

A third limitation to the results are the analyses used. The full model as presented in Figure 3.4 is intrinsically multi-level, and involves a series of nested relationships between the main variables. This might have suggested a more sophisticated modelling approach than simply using multiple regression. Multi-level modelling techniques such as HLM (Braudenbush, Bryk et al. 1999), or structural equation modelling such as LISREL (Joreskog and Sorbom 1993; Joreskog and Sorbom 1996) could have been used to assess the fit of the whole model. Both of these types of analyses were experimented with during the data analysis phase, but were ultimately unsuitable given the data available.

It had originally been intended to gain observations from many operating units within each operating unit. This would have allowed Hierarchical Liner Modelling (HLM) (Braudenbush, Bryk et al. 1999) to be undertaken on the multi-level data set. In the event, due to the existence of fewer UK-based operating units within the business units than expected (see section 4.3), few of the business units contained sufficient data at the operating unit level for HLM to be used properly. There were insufficient operating unit observations to estimate the within-business unit coefficients credibly. Thus attempts to test an explicitly multi-level model properly reflecting the structure of the data by using HLM were abandoned. Using multiple regression in its place resulted in the difficulties over uneven numbers of operating units within each business unit mentioned above.

LISREL (Joreskog and Sorbom 1993; Joreskog and Sorbom 1996) is a structural equation modelling technique that would have allowed the model presented in Figure 3.4 to be tested directly. It can estimate the direct and indirect effects within a model. In this case it could have isolated the amount of variance in environmental initiative implementation due to the direct effects of business unit environmental proactivity, visibility of the operating unit and its impact, operating unit size and operating unit slack, taking into account the indirect effects of the visibility of the business unit and its impacts, total organisation size, business unit slack etc. It would have allowed all the paths in Figure 3.4, to be tested simultaneously with the measurement model.

Unfortunately, experiments with LISREL during the data analysis phase of this project yielded unstable results. This is most likely due to the small sample size (n = 95) relative to the large number of variables used. If the measurement model was added to the structural one, 32 variables would have been used in the model. It is unsurprising that the model failed to converge given the usual minimum ratio of variables to data points of 5-10 (Kelloway 1998). Even the structural model only did not converge with its marginal ratio of 14 variables to 95 data points.

The limitation arising from the failure of the LISREL models is that only part of the whole model was articulated in the hypotheses and tested (i.e. the middle and right columns of Figure 3.4). The thesis examined in detail the roles of visibility and slack in predicting environmental responsiveness, but not the role of size in promoting visibility or slack in the first place (section 4.2.1). The ideal of testing Figure 3.4 directly was not achievable given the data collected, and the multiple regression-based analyses used. Thus a limitation on the findings is that they do not reflect both the indirect and direct impacts on environmental responsiveness, only the direct impacts.

The fourth and final limitation to be discussed in this section is the cross-sectional nature of the research design. As previously outlined in section 4.2.1, the model and hypotheses attempt to examine cause and effect, yet time constraints required the employment of cross-sectional methods which could only capture one snapshot of data. This lead to difficulties of considering impacts of external variables, interaction effects, confounding of static and dynamic effects and inferring causation (see section 4.2.1). The study attempted to overcome these limitations be relying on theory to provide explanations for correlations identified, by including control variables and interaction effects within the complete models, and explicitly operationalising some variables in a dynamic way.

The limitation remains, however, that there is no way to be sure that the findings indicate causal relationships between the variables in the predicted direction. Even if the balance of probabilities based on the evidence suggests that two variables, such as time-capacity slack and clean technology initiatives are positively related, the causal direction is not certain. This thesis has argued that such a relationship is due to the role of slack in facilitating innovation. It is possible, however, that investing in clean technology initiatives can lead to operational efficiencies within operating units, which in time lead to increases in organisational slack. Similarly, it may be that environmentally responsive organisations become more visible to outsiders as their environmental activities are publicised, rather than visibility providing the incentives for organisations to be environmentally responsive.

All of these limitations - based on the sample, operationalisations, and analyses used - place constraints on confidence in the findings presented in Chapters 5 to 8 and outlined above. Many measures have been taken to justify the conclusions made. However, ultimately confidence will only grow in the findings of this thesis as they are replicated and extended in future studies.

9.4.2 Delimitations

Several delimitations, or boundaries, of the scope of this research were defined during the model and hypothesis development. These will be mentioned here, and their implications for the findings of the thesis briefly outlined. However, their implications for future research will be left to the next chapter when the broader implications for the literature of this thesis will be discussed (see section 10.3).

The model was only developed and tested at two levels of analysis - the business unit level and the operating unit level. Other levels, such as the corporate whole or the individual manager were not given much prominence in the hypotheses or in the empirical stages of the work. This delimitation was imposed by the practical limitations of a piece of research of this size, but does impact upon the findings as reported above. Firstly, the roles of both environmental visibility and organisational slack were discussed at other levels of analysis in the qualitative findings, but only at the operating and business unit level in the quantitative tests. The environmental visibility typology identified the importance of the corporate level, but operationalised this effect at the business unit level for consistency (see section 6.4). Similarly, the qualitative evidence noted the potential role of environmental considerations at the individual level of slack as an inducement to maintain the coalition (see section 7.2.2), yet slack was only operationalised at the operating and business unit levels of analysis. Thus the quantitative evidence is limited by its focus on only two levels of analysis due to the simplifying assumption of the model (see section 3.2.3).

Secondly, the findings are all limited to one social (i.e. national) system. The model was designed with controlling for national system differences in mind (see section

2.3.1), and so data was collected only within the national boundary of the UK (see section 4.3.1). Thus the findings are necessarily specific not only to the non-MNC context, but also to operating and business units within the UK. It is possible that evidence gathered in a different national context might have revealed different relationships. The incentives given by visibility, for example, might be much stronger in other European countries where environmental awareness is assumed to be higher than in the UK. Again, what was designed as a desirable attribute of the research - that it was limited to one national context - draws a delimitation around the generalisability of the findings.

A third and final delimitation of the research discussed here is its derivation from a jointly resource dependent and institutionalist perspective. This was taken in order to position the thesis work within an established line of enquiry which has successfully examined the responsiveness of organisations to social or political issues (see section 2.2.3). The resulting delimitation is that the incentives facing large organisations to be environmentally responsive, and their ability to do so were interpreted as environmental visibility and organisational slack respectively. This theoretical focus effectively excluded other potential explanators for the relationship (see section 10.3.3). Thus the findings only address a narrowed version of a more general model which might include other paths between size and environmental responsiveness in Figure 3.4 aside from visibility and slack. Some forms of environmental responsiveness, especially materials-reducing initiatives, still exhibit positive and significant relationships with organisation size. Given this delimitation, it is impossible to conclude whether this relationship is due to some intrinsic connection between size and responsiveness, or due to some other intermediate factor not captured by visibility and slack.

9.5 Chapter Summary

This chapter has summarised the results presented in Chapters 5 to 8 of the thesis. Each hypothesis was accepted, rejected or modified based on the results (see Figure 9.1), and four other key findings not directly addressed in the hypotheses were outlined. On balance, the empirical evidence conformed to a priori expectations, with most deviations from those expectations explained within the overall theoretical approach. Several limitations and delimitations were presented. The sample, operationalisations and data analysis techniques used all decreased confidence in some aspects of the research. The findings were also delimited by focusing on only two levels of analysis, by collecting data from only one social system and by deriving explanations from a particular theoretical stance. Chapter 10 will use these findings to assess the place of the thesis in the existing body of knowledge and to suggest future lines of enquiry.

Chapter 10 : Conclusions

10.1 Introduction

This chapter will draw together the main approaches, findings and contributions of the thesis. It will link the emerging themes in the literature identified in Chapter 2 and the model built in Chapter 3, with the findings identified in Chapters 5 to 8 and Chapter 9. It will also extend the delimitations of the research mentioned in Chapter 9 and suggest future research directions based on the thesis. The Chapter's two main aims are :

- to assess the relevance of the thesis to the emerging themes in the literature identified in Chapter 2.
- to suggest future directions for research on the environmental responsiveness of organisations based on the thesis' findings

The chapter begins by arguing that each of the five emerging themes in the literature identified in Chapter 2 were successfully incorporated in the model and findings. These extensions represent the core contributions of the thesis. A further contribution which arose during the research process is also noted : the development of new operationalisations of visibility and slack for use in empirical research. The chapter then reflects upon the implications of the approach and findings of the thesis for future research on the environmental responsiveness of organisations. Particular reference is made to two of the core research streams in organisational theory mentioned in Chapter 2 : the complementarity of resource dependency and institutionalist explanations for organisational responsiveness to social or political pressures; and the examination of the relationships between corporate economic and environmental performance. Future research on another explanation for the relationship between organisation size and environmental responsiveness which is not based on resource dependency and institutionalism is also suggested. The chapter concludes with a restatement of the core argument presented in this thesis.

10.2 Extending Existing Themes in the Literature

The model was designed to address five main emerging themes in the literature identified in Chapter 2. Each of these extensions as they applied to the approach and findings of the thesis will now be discussed as potential contributions to research on the environmental responsiveness of organisations. Discussion of these five core themes will then be followed by a methodological contribution which arose during the research process.

10.2.1 Theme 1 : Embedded assumptions within previous discussions of the size-responsiveness relationship were examined

The meta-analytic review in Chapter 2 revealed that most studies included size in empirical models without any discussion of why size should be included. Very few gave more than a few sentences' explanation for the role of size in environmental responsiveness (see section 2.4). Being explicit about the role that size may play in predicting environmental responsiveness is important because the relationship is not uniform across different levels of analysis or measures of responsiveness (see section 2.3.1), and because the accepted empirical reality among researchers does not conform to popular perceptions (see section 1.1.2). Understanding these differences requires that embedded assumptions within the size-responsiveness relationship should be examined.

This thesis addressed the assumptions by deriving a theoretical model of the relationship between size and responsiveness which focused on the incentives facing large firms, and the resources which give large firms the ability to be responsive. These two generic explanations were consistent with the rationales for the relationship provided in the meta-analysis studies (see section 2.4). They also provided the framework for the more detailed model which derived visibility and organisational slack as key variables from the jointly resource dependent and institutionalist approach (see Figure 3.4).

Exposing embedded assumptions can help explain the apparent divergence between researchers' empirical findings and the public perception of the environmental performance of large companies (see section 1.1.2). Earlier research has tended to assume that (1) when a firm makes a proactive environmental strategy declaration, this is always transmitted into the implementation of environmental initiatives at operating units (see section 2.3.2); and that (2) the implementation of environmental initiatives visible to outsiders indicates an equal degree of commitment to measures inside its boundaries (see 3.2.3). This thesis, however, provides support for a more sceptical stream of research which suggests that firms will only implement environmental initiatives if they have the incentive or ability to do so at the operating unit level, regardless of their corporate environmental policy statement (e.g. Ketola 1997; Maxwell, Rothenberg et al. 1997), and that firms will implement certain types of initiatives as signals of their environmental awareness to outside constituents without altering their internal operations (e.g. Howard, Nash et al. 2000; King 2000).

Focusing on the previously embedded assumptions throughout this thesis also helped improve understanding of the various relationships between size and responsiveness at different levels of analysis, and using different measures of responsiveness. The findings indicated the importance of disaggregation of the size-responsiveness relationship which was previously viewed in aggregate. Assumptions on the mechanisms by which size leads to responsiveness (through incentives and ability), appropriate levels of analysis (significant relationship at total organisational level, but not at the sub-unit), types of responsiveness (strategy v. implementation), types of environmental initiatives and types of visibility and slack were all exposed and individually treated. Examining several of these assumptions represent elements of the contribution of this thesis to research on environmental responsiveness.

10.2.2 Theme 2 : Size, visibility and organisational slack were empirically separated

No previous study was encountered in the literature review which simultaneously considered size, visibility and slack as separate explanators for environmental responsiveness (see section 2.4). Many authors have hinted at the role of visibility in environmental responsiveness (e.g. Rappaport and Flaherty 1992; Bansal 1996; Russo and Fouts 1997; Howard, Nash et al. 2000), and some at the role of organisational slack (e.g. Atlas and Florida 1997; Sharma and Nguan 1999; King 2000; Sharma 2000). Examples were found where visibility was empirically separated from size (King and Lennox 2000), and of where slack which gave rise to managerial discretion was considered separately from organisation size (Sharma 2000). However, a distinctive characteristic of the thesis is that it built upon these ideas and tested models which contained size, visibility and organisational slack simultaneously.

The findings support the contention that environmental visibility and organisational slack are separate explanators of environmental responsiveness, and that they are distinct from organisation size (see section 2.5). When the slack and visibility variables were added to the regression analyses at the business unit level, the corporate size variables which had previously been marginally significant became non-significant. Thus the mean positive and highly significant relationship between size and responsiveness at the organisational strategy level found in the meta-analysis ($r = 0.28$, see section 2.4) could be due to the previously compounded impacts of organisational slack and visibility.

Similar findings were uncovered at the operating unit level. For some types of environmental initiatives, including the slack and visibility variables made the organisation size variables less significant (see Figure 8.7). Thus variance in implementation levels which would previously have been attributed to organisation size was more precisely attributed to the roles of visibility and slack. This pattern was not observed for the materials-reducing initiatives, however. Size remained an important predictor of materials-reducing implementation (and hence total implementation levels, see Figure 8.6) despite the inclusion of the slack and visibility variables. Potential rationales for this anomalous finding will be discussed below when other explanations for the size-responsiveness relationship are addressed (see section 10.3.3).

Despite the anomalous findings for materials-reducing initiatives, and hence total implementation levels, for most of the measures of environmental responsiveness measures, visibility and slack accounted for much of the variance in environmental responsiveness which was previously attributed to size. Thus a potential contribution of this thesis is the separation of the impacts of visibility and slack from size.

10.2.3 Theme 3 : Pressures on and responsiveness of organisations were considered at multiple levels of analysis

Previous theoretical (e.g. Oliver 1991) and empirical (e.g. Goodstein 1994; Ingram and Simons 1995; Milne and Blum 1998) models of organisational responsiveness to social or political issues have been undertaken at only one level of analysis. This has been echoed in an environmental context by many single-level empirical studies of environmental responsiveness (see section 2.4). The exceptions to this rule have been studies on the environmental responsiveness of MNCs (e.g. Rappaport and Flaherty 1992; Tsai and Child 1997), where different sub-units of the same organisation exhibit different levels and types of environmental responsiveness because of their different institutional surroundings. An extension to theory is to recognise that the pressures on and the responses of the organisation can occur at more than one level of analysis even within the same social system.

This thesis developed a multi-level model of organisational response to social or political pressures (see Figure 3.4). It collected data from multiple levels of analysis within a cross-section of organisations which were all located within the same country of operation (see section 4.3.1). This allowed the differences in pressures on, and responsiveness of, parts of the organisation to be examined. Unfortunately, the main quantitative tests were limited to two main levels of analysis, which provides a delimitation of the research (see section 9.4.2). Expanding the model to more levels of analysis remains as an additional future research challenge (see section 10.3).

The findings broadly supported the adoption of a multi-level approach. While they indicated a strong, and highly significant, relationship between the business unit environmental proactivity and total implementation levels (see section 5.3.3), this relationship was far from perfect, suggesting the role of factors other than business unit direction in predicting operating unit implementation levels. Indeed, for most types of initiatives, operating unit level factors explained implementation levels better than business unit level factors, indicating the importance of local context in implementation decisions (see Figures 8.6 to 8.9). The exception here was stakeholder relations initiatives where the impetus for implementation seemed to come more through policy declarations from a higher hierarchical level than from operating unit circumstances (see Figure 6.8).

The empirical results were also consistent with a surprising finding from the meta-analysis - that there is a non-significant relationship between total organisation size (i.e. corporate size) and the implementation of environmental initiatives (see section 2.4). Thus the multi-level model better explains the empirical results collated across all extant studies than the previous single-level models.

10.2.4 Theme 4 : Responsiveness in the form of environmental strategy and environmental initiative implementation were separated

A further extension to the literature identified in Chapter 2 was to recognise that introducing a corporate environmental strategy does not necessarily lead to the even implementation of environmental initiatives throughout the organisation, and so environmental strategy and environmental initiative implementation should be considered separately (see section 2.3.2). The expectation based on theory, and confirmed by the meta-analysis, was that the type of responsiveness, whether in the form of strategy or implementation actions, may affect the strength of the size-responsiveness relationship (see section 3.2.6).

The findings suggest that not only do strategy or implementation measures affect the strength of the size-responsiveness relationship as expected (see section 3.2.6), but also that strategy and implementation are affected by different aspects of organisation size. Specifically, visibility best explains business unit environmental proactivity (strategy), but slack and visibility jointly predict environmental initiative implementation (see section 8.3.1). Thus visibility provides the incentives for organisations to signal their environmental intentions by introducing a proactive environmental strategy, whereas slack provides organisations with the ability to implement environmental initiatives using excess resources.

The separate specification of environmental responsiveness as strategy or implementation has been a distinctive characteristic of this thesis, and represents a contribution to this theme in the extant literature.

10.2.5 Theme 5 : The specific characteristics of different environmental initiatives were considered

Another extension to the literature was to recognise that it is unlikely that organisation size will have an equal impact on the likelihood of introduction of all the different types of environmental initiatives (see section 2.3.3). The types of environmental initiatives implemented might reveal as much about large organisations' environmental choices as the overall level of implementation. This is not the first study to identify different types of environmental initiatives (see Bansal and Roth 2000; Aragon-Correa 1998; Klassen and Whybark 1999 for examples). However, it is the first to divide initiatives according to their expected relationships with organisational slack, visibility or size (see section 3.2.7).

Dividing environmental initiatives into "materials-reducing", "stakeholder relations" and "clean technology" initiatives allowed tests of whether they were all linked in the same way to slack, visibility and size (see sections 3.2.7 and 5.3.2). The findings suggested that they were not, and that their implementation differed in predictable ways across operating units according to the units' slack or visibility position. Organisational slack showed a positive relationship with some types of initiatives (clean technology initiatives), and non-significant relationships with the others. In contrast, environmental visibility was a useful predictor for some types of initiatives (stakeholder relations), but not for others (clean technology) (see Figures 8.8 and 8.7).

The findings also hinted that the decision to introduce different types of environmental initiatives was made in different organisational locations. Stakeholder relations initiatives were more directed at the business unit level. In contrast, materials-reducing initiatives were prompted by local incentives and abilities. Further work is required to confirm and extend these findings, since knowing the organisational origins of different environmental initiatives would be of use to both managers and policy-makers.

This study developed a new categorisation of environmental initiatives which helped explain the detail hidden within the usually aggregated size - responsiveness relationship. Although the validity of these types should be further tested across new samples of firms, the evidence within this thesis suggests that disaggregating the size-responsiveness by type of initiative implemented is a useful extension to the literature.

10.2.6 Theme 6 : New operationalisations of environmental visibility and organisational slack were developed

The final theme addressed here is a methodological extension to the literature made during the process of the research. Empirical papers included in the meta-analysis tended to give slack and visibility as reasons for the size-responsiveness relationship, but then to operationalise both as organisation size (see section 2.4). Only during the empirical phase of the research did it become obvious that new measures of these concepts would need to be designed (see section 4.4). A significant set of findings from this thesis are those based on the development of organising frameworks of analysis for visibility and slack, and the operationalisations of different types of visibility and slack for use in the quantitative analyses (see sections 6.2 to 6.4).

The environmental visibility typology was developed based on the qualitative evidence[1]. It matched with the categories of environmental visibility expected from the literature (see section 6.2), and provided a basis for the quantitative indicators (see section 6.3). The limitations of the quantitative measures of environmental visibility have been discussed above (see section 6.4). However, they do represent a contribution to the now growing attempts to develop a secondary data-based measure of visibility (see, for example Saiia 2000).

The development of the organisational slack operationalisations is potentially of wider importance, extending to organisational theory beyond the business and society research area. A new measure of operating unit level organisational slack was developed which separates managerial from operational slack, which is dynamic in spirit, and which avoids the use of hypothetical questions (cf. Nohria and Gulati 1996). The measures exhibited high construct validity, and adequate reliability for

[1] The environmental visibility typology has already been published as a standalone contribution to the environmental management literature in Bowen (2000).

use in this sample (see section 7.3.2). They also allowed an empirical separation to be drawn between slack and efficiency (see section 7.5.3). The new organisational slack measures performed better than the extant alternatives on this sample of firms (see section 7.5.3). Their true contribution will only be assessed as they are used on other samples and in other contexts.

The environmental visibility typology and the operationalisations of organisational slack at the operating unit level developed during the process of this research are part of this thesis' contributions to operationalising visibility and slack in a more precise way than simply as organisation size. It is hoped that other researchers will take up the challenge of using these operationalisations on other samples to test their broader applicability.

10.2.7 Summary of extensions to the literature

Six themes followed during this thesis have been identified which may represent extensions to the existing literature. Five of these arose directly out of extensions to the theoretical and empirical literature reviewed in Chapter 2. The model was designed around these extensions, and the findings broadly supported them. A further methodological contribution was made which arose during the research process. Most notable among these were the environmental visibility typology and the new operationalisations of organisational slack at the operating unit level. The implications of the thesis, and its contributions, for future research will be discussed in the next section.

10.3 Future Research Directions

Several future research directions have already been suggested in the foregoing discussion of findings and contributions. Most of those identified so far rely on replication of certain aspects of this research on different samples or in different research contexts, or on correction of certain limitations in this research. This section will address broader implications for three different lines of enquiry in organisational theory and strategic management research. Two of these are core debates in organisational theory identified in the literature review in Chapter 2 : on the complementarity or otherwise of institutionalist and resource dependency approaches, and on the contentious relationship between economic and environmental performance. The third future direction extends the thesis' theoretical approach to include perspectives other than institutionalist and resource dependency, and finds another reason for the size-responsiveness relationship which is derived from the resource-based perspective in strategic management. Each of these future directions will now be discussed in turn.

10.3.1 Institutionalist and resource dependency debate

The literature review identified the balance between institutionalist and resource dependency explanations for firm actions in their task environments and broader social surroundings as a developing theme throughout the last two decades (see section 2.2.3). Earlier conceptions of organisations simply conforming to their institutional surroundings through isomorphic pressures were criticised as too passive. Resource dependency theory, on the other hand, recognises the importance of institutions but gives primary importance to organisations' dependence on critical resources and their attempts to manage their dependencies on external groups in order to acquire more autonomy. Combining these two perspectives recognises the ability of organisations to make strategic choices, but within institutional constraints (see section 2.2.3).

This thesis contributes to an increasing strand of research which provides empirical support for the complementarity of institutionalist and resource dependency theories. Initially evident in the broader business and society literature (e.g. Goodstein 1994; Ingram and Simons 1995; Milne and Blum 1998), empirical evidence is now growing in the environmental management context (e.g. Clemens 1997; Tsai and Child 1997; Howard, Nash et al. 2000). This thesis supports these studies by showing the complementary importance of visibility, as a proxy for the cause of institutional pressure, and organisational slack, as a representation of resource dependence, in explaining environmental responsiveness.

Future research in this stream should take on board at least two new elements based on the thesis. Firstly, multi-level models should be considered. This thesis has shown the importance of treating institutional pressures and resource constraints at the total organisation level as separate from the operating unit level (see theme 3 above). A future extension to this approach might be to combine existing business and society models (e.g. Oliver, 1991 as extended by Goodstein 1994 and others) with contextual models of the transfer of organisational practices within organisations (Kostova 1999). In such an extension, institutional and resource constraints would not only influence environmental responsiveness separately at business units and operating units (as in this thesis), but would also influence the likelihood of transfer of practices from business units to operating units (Bowen 1998).

Secondly, the treatment of resource constraints should be extended beyond simply the technical cost-benefits of responsiveness. Ingram and Simons (1995) have argued for the replacement of the perceptual measures of cost-benefits used by them and others (e.g. Goodstein 1994) with more "objective" measures in the interests of increased "directness". This thesis has taken the opposite approach, by recognising the difficulty in gaining such "objective" measures in an environmental context, and arguing that managers are more influenced by a broader consideration of the perceived affordability of the response (see section 3.2.2). This is a more consistent approach within resource dependency theory, given its emphasis on managerial discretion (Pfeffer and Salancik 1978), and recognises the importance of managerial interpretations, availability of slack and attitudes to risk in environmental management (Lankoski 2000; Sharma 2000). Thus researchers examining the complementarity of institutionalist and resource dependency theory in explaining organisational responsiveness to social or political pressures should focus not on ever more "direct" measures of cost-benefit considerations, but instead on a broader conception of perceived affordability, including organisational slack.

This thesis, therefore, both contributes to and suggests new directions for, the growing stream of environmental organisational theory research which recognises the complementarity of institutionalist and research dependence theory.

10.3.2 Economic and social performance debate

The thesis also contributes to, and suggests extensions to, the controversial debate on the relationship between economic and social performance of organisations. The direction of causation, and even the direction of the relationship itself has been under debate for many years. Two recent reviews came to opposite conclusions on the relationship between social and financial performance (cf. Griffin and Mahon 1997; Roman, Hayibor et al. 1999). To the extent that large firms can be considered high performers, this thesis is relevant to the social and financial performance debate.

The findings of the thesis suggest that in aggregate, there is no clear relationship between organisation size and environmental responsiveness. When the relationship is disaggregated to specific paths in the relationship, levels of analysis and types of responsiveness, predictable relationships can be observed. The lesson for researchers examining the relationship between social and environmental performance may be to disaggregate their analyses in the same way. One promising route may be to undertake a meta-analysis analogous to that conducted in Chapter 2 on the relationship between social and economic performance. This might help identify moderating variables such as levels of analysis or types of measures. Both Griffin and Mahon (1997) and Roman et al. (1999) rely solely on a vote count method (see section 2.4), and a narrative literature review which makes inconsistent interpretations of the quality of studies included (Mahon and Griffin 1999).

As in this thesis, a meta-analysis of extant empirical work could go a long way to defining relevant disaggregation categories and future directions for research. Studies could then go on to test disaggregated models of the social and financial performance relationship as this study has done with size and environmental responsiveness.

10.3.3 Alternative theoretical perspectives on the size-responsiveness relationship

The thesis was delimited by its focus on institutionalist and resource dependency approaches (see section 3.2.2). This perspective was chosen as the it was the most widespread in organisational theory during the early stages of the project, and provided two alternative reasons for the size-responsiveness relationship which was at the core of the thesis. However, a resource-based perspective of environmental management has gained in momentum over the last few years, and offers an alternative explanation for the relationship between visibility and organisational slack.

The resource-based approach to environmental management argues that firms differ in their environmental responsiveness due to their possession of particular costly-to-copy capabilities (see section 2.2.2). According to this perspective, firms are environmentally responsive because they have the capabilities to do so at comparatively little cost (Hart 1995; Den Hond 1996; Bowen, Cousins et al. 2000). The resource-based perspective expects a positive aggregate relationship between organisation size and environmental responsiveness because large firms may be expected to hold a wider range of capabilities simply due to their broader scope of activities and resources (Sharma and Nguan 1999). Such an explanation was not pursued in this thesis, but clearly deserves further examination in future work.

The "breadth of capabilities" explanation for the relationship between organisation size and environmental responsiveness might explain one of the disappointing results from this study. As noted earlier (see Figure 8.9), there remained a positive relationship between organisation size and environmental implementation even after the visibility and slack variables were included in the full model. Early indications in a green supply context suggest that capabilities appropriate for managing green issues are positively related with the implementation of materials-reducing initiatives (Bowen, Cousins et al. 2000). Cross-functional liaison, a partnering approach, understanding environmental issues, high technical skills of personnel and detailed policies and procedures all stimulated the implementation of materials-reducing green supply initiatives (Bowen, Cousins et al. 2000). Thus the persistent relationship between operating unit size and the implementation of materials-reducing initiatives could be due to larger operating units possessing more capabilities such as these for implementing such initiatives.

Whether the capabilities argument holds more generally for other environmental or social contexts remains an open empirical question. However, future research on size and responsiveness should include not only the visibility and slack identified as important in this thesis, but also the capabilities explanation derived from the resource-based perspective.

10.3.4 Summary of future research directions

Several future research directions have been suggested based on the perspectives and findings of the thesis. Many of these were based on replication or extension of the results to different research contexts. However, four other directions were identified within three broad theoretical areas : organisational theorists should investigate further multi-level models of organisational responsiveness to social or political pressures, and concentrate on the institutional and resource conditions required for the effective transfer of responsiveness strategies to different parts of the organisation. They should also concentrate on "subjective" measures of cost-benefit considerations consistent with the resource dependent approach. Researchers in business and society should disaggregate their discussions of the social and economic performance of organisations. Strategic management researchers should investigate the role of capabilities in the relationship between size and environmental responsiveness. Ultimately, many of the insights of the thesis will only be truly tested when they are extended in this way within the broader body of knowledge.

10.4 Restatement and Conclusion

This thesis has argued that explaining the ambiguous relationship between organisation size and environmental responsiveness depends on disaggregation. Business and society, and environmental management, researchers routinely include organisation size in empirical studies of environmental responsiveness by convention. Yet, this is done with little explanation and with mixed results. Explaining the relationship required embedded assumptions to be exposed, and the examination of different types of environmental responsiveness at different levels of analysis.

Two explanations for the relationship were derived from a jointly institutionalist and resource dependent perspective. The main empirical analyses within the thesis examined the separate relationships between organisation size, visibility and slack at both the business unit and operating unit levels of analyses. The findings indicated broad support for the disaggregated approach employed. Including slack and visibility accounted for much of the variance previously attributed to organisation size. Slack and visibility also affected different types of environmental responsiveness in predictable ways.

The thesis has moved forward two old debates in organisational theory : on the complementarity of institutionalist and resource-based perspectives, and on the corporate economic and social performance link. It has also suggested a novel direction to a newer debate on capabilities and environmental responsiveness. Six themes were identified which represented unusual features of the research and potential contributions to the extant literature.

This research suggests that size does not always matter for predicting environmental responsiveness. It is not size *per se* which promotes environmental responsiveness, but elements of an organisation's visibility and the resources available to it which may result from its size. Large firms may make more proactive strategy declarations forced upon them by their high visibility in society. However, these declarations are not always translated into implementation actions. The implementation of environmental initiatives at operating units at multi-plant firms depends more on the incentives and the resources available to those operating units. Primary among these incentives and resources are the visibility of their activities and impacts, and organisational slack at a local level. When slack and visibility are considered separately from size, size matters far less in predicting environmental responsiveness.

Appendices

Appendix 1 : The ESSCMo Project

The main empirical part of this research was conducted in parallel with an EPSRC funded project on Environmentally Sound Supply Chain Management (ESSCMo) (EPSRC Grant No. GR/L23253). The researcher was employed on the project over the three years in which the majority of the thesis work was completed, and conducted the data collection simultaneously for the ESSCMo Project and the thesis. A project outline is provided here as an indication of the broader context for the data collection. The conceptual development, data analysis and overall theoretical approach of the thesis remained entirely separate from that conducted in the ESSCMo Project.

A1.1 ESSCMo Project outline

A1.1.1 Introduction

With the increased environmental awareness of the 1990s, some companies are coming under growing public and financial scrutiny of their environmental performance. Recent government commitments to Green Procurement, and high-profile pressure group policing of industrial initiatives have highlighted the importance of dealing with the environmental impacts not only within a single business, but across entire supply chains. Environment-related supplier initiatives can form part of a firm's response to stakeholder environmental pressures, and can be seen as a potentially powerful force in the greening of industry.

Initiated in 1996, the three year ESSCMo project will develop both conceptual and practical tools to guide managers in their decision making processes with respect to environmentally sound supply chain management, and provide a clearer understanding of the critical role that suppliers play in helping the firm meet its strategic environmental objectives. The project is jointly funded by the Engineering and Physical Sciences Research Council and London Underground Ltd. as well as receiving support, both financial and in kind, from a number of other major organisations through their commitment to the ESSCMo Club.

The ESSCMo project is based within the Centre for Research in Strategic Purchasing and Supply (CR*i*SPS), part of the School of Management of the University of Bath. CR*i*SPS is the largest centre of its kind in Europe, and the School of Management was one of only ten business schools in the UK awarded the highest '5' ranking for research of national and international excellence in the most recent Research Assessment Exercise.

A1.1.2 Objectives

Practising managers often lack appropriate decision-making tools to help them assess the risks and benefits associated with managing their suppliers responses to environmentally based strategic objectives. The ESSCMo project, therefore, addresses two main areas of study :

1. An investigation of environmental impacts of industrial and commercial activity along the entire length of the firm's extended supply chain.
2. Examining the role of risk and strategic purchasing capabilities in motivating and developing risk-reducing environment-related supplier initiatives.

A1.1.3 Project deliverables

Both branches of research will culminate in the publication of research results, and the development of a management tool aimed at practising purchasing managers.

A1.1.4 Industrial and academic collaborators

The project also encompasses the formation and running of the ESSCMo Club and collaboration with other academics both in the UK and abroad. The ESSCMo Club is an industrial forum for debate and discussion of environmental issues affecting a broad cross section of economic activities. There are currently twenty five club members who, through a self funding mechanism, meet three times per year to discuss the research results as they become available and to participate in a wide ranging discussion of environmentally based issues. Invited guest speakers provide different perspectives on issues of environmental concern. The Club provides a means for:

- Examination and dissemination of the research results and extensions of the conceptual model

- Discussion of current environmental issues managers face and successful & unsuccessful environmental policies
- Networking among managers of similar concern about environmental issues

CR*i*SPS works closely with the International Centre for the Environment (ICE) also based within the School of Management. The outstanding international connections of ICE, particularly in the extraction industries, provide an ideal opportunity to gain synergy between two centres of research excellence.

A1.1.5 Project people

Professor Richard Lamming, Director of CR*i*SPS

Dr. Paul Cousins, Lecturer in Operations Management

Adam Faruk, Research Officer

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Appendix 2 : Industry Group Classifications

In order to define appropriate industry groups, several measures of industry-level environmental awareness were examined. Each classification allocated industries into three or four broad bands of environmental engagement, impact or penetration, as outlined in Figure A2.1.

Figure A2.1 : Outline of available industry environmental classifications.

Source	Environmental dimension	Origins of classification
Business in the Environment (1996)	"Environmental engagement"	survey of environmental systems of FTSE 100; industry aggregates deduced from company-level data
Halme & Huse (1996)	Environmental impact	combination of several previous empirical studies using industry-level environmental impact as control variable
Templet & Ferber (1994)	Environmental impact	emissions-to-jobs ratio calculated at 2-digit SIC level using pollution data in the USA
Taylor in Hutchinson (1996)	Environmental penetration	environmental management literature

The classifications are all based on slightly different dimensions, but a striking similarity was observed between the classifications as to which industries are both more harmful to the environment, and more engaged in environmental issues. Companies in the FTSE All Share Index were classified into appropriate categories according to their primary NACE code[1], and the correlations between the measures were calculated. Figure A2.2 shows Kendall's Tau for the bivariate correlations between each classification scheme[2]. The measures are all significantly correlated with each other, with Kendall's Tau ranging from 0.56 to 0.79. The individual cross-tabulations of each pair of classifications were checked for counterexamples, but no systematic pattern of exceptions to the general trend of correlations were observed.

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[1] NACE codes are European industry classification codes, and are the successors to the UK SIC codes.
[2] Kendall's Tau was deemed the most appropriate measure of correlation because the categories are ordinal and because of the large number of tied values. The number of cases varied across classifications because each classification scheme left some of the industry codes undefined. All significance levels on a one tailed test were 0.000

Figure A2.2 : Kendall's Tau

	Halme & Huse (1996)	**Business in the Environment (1996)**	**Taylor (1994)**	**This project**
Business in the Environment (1996)	0.6751			
Taylor (1994)	0.6318	0.613		
This project	0.9228	0.6891	0.4339	
Templet & Ferber (1996)	0.7872	0.6177	0.5623	0.7845

Given that the classifications all correlate with each other, the simplest classification was chosen as the basis for the stratification. Halme & Huse's (1996) categorisation has the additional advantages of being more easy to classify than the others, being comprehensive, and having been used in previous empirical studies. The industry grouping was simplified further by reversing some of the exceptions in Halme & Huse's classification. Kendall's Tau for the classification used in this project is shown in Table A2.2[3].

[3] The rather low Kendall's Tau for the correlation between the classification used for this project and Taylor's measure is not a cause for concern - Taylor's classification is the least well grounded, and has several idiosyncratic industry groups e.g. shipping is classified in the highest penetration group, where all the other classifications consider it as part of the service industries.

Appendix 3 : Interview Protocol

See over for a reproduction of the interview protocol used to guide the conversation with interview respondents.

VIRONMENTAL PRESSURES/RISKS

What are the main environmental issues which are currently being discussed in the business?	• type - legislative, technological, competitive • impacts
What are the main risks to your company that arise out of the environmental agenda?	• source of risk • predictability • consequences • triggers
Do you have any strategies/policies in place to manage these risks?	• who responsible • parallels with H & S. quality • perceived effectiveness
What sort of losses might the company face from environmental issues?	• financial, performance, physical, social, psychological, time • which most damaging • which most likely • which experienced in past

VIRONMENTAL MANAGEMENT/STRATEGY

Why is your company engaged in environmental issues to the extent that it is?	• motives
What sort of capabilities are required by a business in your industry to respond to environmental demands?	• people, knowledge, skills, systems, resources • if don't have, how can you get it?
Do you have any specific environmental initiatives which are designed to be implemented across the entire group?	• name of initiative • geographic scope • flexibility of implementation • why introduced
Do you work with suppliers on environmental issues?	• name of initiative • geographic scope • flexibility of implementation • why introduced
How is environmental management organised in your company?	• centralised/decentralised • same as other functions?
How is supply management managed in your company?	• centralised/decentralised • same as other functions?
Do you use any performance measures?	• environmental performance measures • supply management performance measures

HER GENERAL

How much slack is there in the business at the moment?	• different parts of business / industry: last year • capacity, cash, people

GET PERMISSION / SUGGESTIONS FOR QUESTIONNAIRE

Appendix 4 : Summary of the Construct Measurements Used

Construct	Source Measurement	Questions	α (std. α)
		Dependent Variables	
Business Unit Environmental Proactivity	specially developed multi-item Likert scale (5 items)	• We always attempt to go beyond compliance with laws and regulations on environmental issues • Our corporate management gives a high priority to environmental issues • The top managers in our business unit give environmental issues a high priority • We lead our industry on environmental issues • We effectively manage the environmental risks that effect our business	o.u. data 0.84 b.u. data 0.61
Implementation of Environmental Initiatives	modified from (Sharma and Vredenburg, 1998) and (Bayliss, Connell et al., 1997) series of categorical answers on specific initiatives "yes", "planned", "not planned"	To what extent has your operating unit undertaken the following voluntary actions (i.e. actions that are not required by regulation) for environmental reasons? Reduction in the use of raw materials; conservation activities in the local area; use of alternative fuel sources; energy efficiency measures; producing/selling less environmentally damaging products; stakeholder partnerships for environmental preservation; disclosure of environmental impacts; research programmes for environmental improvements; employee environmental training programmes; waste management and reduction; environment-related supplier initiatives; recycling programmes; undertaking environmental audits; reduction in packaging; emission reduction efforts; improved housekeeping	0.86
Clean Technology Initiative Implementation	As above, but only for limited set of initiatives	To what extent has your operating unit undertaken the following voluntary actions (i.e. actions that are not required by regulation) for environmental reasons? Use of alternative fuel sources; research programmes for environmental improvement	0.71

Construct	Source Measurement	Questions	α (std. α)
Stakeholder Relations Initiative Implementation	As above, but only for limited set of initiatives	To what extent has your operating unit undertaken the following voluntary actions (i.e. actions that are not required by regulation) for environmental reasons? Conservation activities in the local area; stakeholder partnerships for environmental preservation; employee environmental training programmes; disclosure of environmental impacts; environment-related supplier initiatives	0.76
Materials-Reducing Initiative Implementation	As above, but only for limited set of initiatives	To what extent has your operating unit undertaken the following voluntary actions (i.e. actions that are not required by regulation) for environmental reasons? Improved housekeeping; waste management and reduction; recycling programmes; reduction in the use of raw materials; reduction in packaging	0.72
Environmental Visibility			
Type 1 visibility: VISBUORG organisational visibility at the business unit	specially developed multi-item Likert scale (2 items) & dichotomous variables from secondary sources	• our activities are closely monitored by the media • our company's name is not easily recognisable outside the immediate circle of our customers and suppliers (rev.) secondary sources on : member of FTSE 100?	0.33
Type 2 visibility: VISBUISS issue visibility at the business unit	one Likert scale item & one dichotomous variable from interviews	• our most relevant competitors place a greater marketing emphasis on environmental issues than us interview data on : publish an environmental report?	0.63
Type 3 visibility: VISOUORG organisational visibility of operating unit	specially developed multi-item Likert scale (5 items)	• we are a major local employer • we get involved in local and community issues • we have a good local reputation on social and environmental issues • are activities at [operating unit] are monitored closely by the local media • we are easily recognised by outsiders as part of [business unit]	0.75

Construct	Source Measurement	Questions	α (std. α)
Type 4 visibility: VISOUISS issue visibility at the operating unit	specially developed multi-item Likert scale (4 items)	• our environmental impacts are obvious in the local area • community representatives and other groups often visit our site • we publicise our achievements to external groups • we report our environmental weaknesses as well as our strengths to interested parties	0.71
Organisational Slack			
Corporate Organisational Slack	(Bourgeios and Singh, 1983) from financial data	available slack : • (net profit – dividends)/sales (+ve) • dividends / net worth (-ve) • (cash & securities – current liabilities) / sales (+ve) recoverable slack : • accounts receivable / sales (+ve) • inventory / sales (+ve) • (general & administrative expenses) / sales (+ve) potential slack : • long-term debt / net worth (-ve) • price / earnings ratio (+ve)	n/a
Profit-related slack at the business unit level	specially developed multi-item Likert scale (2 items)	• compared with this time last year, we are more profitable • we are more profitable than our most relevant competitors	0.48
Time-capacity slack at the business unit level	specially developed multi-item Likert scale (2 items)	• compared with this time last year, we are more busy in our day to day activities • compared with this time last year, we are working closer to full capacity	0.53

Construct	Source Measurement	Questions	α (std. α)
Profit-related slack at the operating unit level	specially developed multi-item Likert scale (3 items)	• compared with this time last year, we are much more profitable • compared with this time last year, we are more likely to meet the targets [our business unit] sets us • we are more profitable than our most relevant competitors	0.71
Time-capacity slack at the operating unit level	specially developed multi-item Likert scale (2 items)	• compared with this time last year, we are more busy in our day to day activities • compared with this time last year, we are working closer to full capacity	0.74
Control Variables			
Corporate size	Categorical variable	Small : corporation has less than 5,000 employees Medium : corporation has between 5,000 and 30,000 employees Large : corporation has more than 30,000 employees	n/a
Operating unit size	Single interval variable	Number of full time equivalent employees at operating unit	n/a
Industry group	Categorical variable based on previous categorisations and NACE codes	High impact : 11000-23999, 25000-31299, 47000-47999 Other manufacturing : 24000-24999, 40000-42999, 46000-46199, 48000-48999, 31300-39999, 43999-45999, 46200-46999, 49000-49999 Non-manufacturing : 50000-59999, 70000-79999, 60000-56999, 81402	n/a

Appendix 5 : Operating Unit Questionnaire

See over for a reproduction of the operating unit questionnaire sent to operating unit respondents.

Please complete the following questions on your site, your relationship with Do It All HQ, your personal opinions on environmental matters, and what (if any) environmental initiatives you have implemented at your site.

Return completed questionnaires to : Frances Bowen, School of Management, University of Bath, Bath, BA2 7AY, enclosing a business card if you would like a summary of the results.

Any answers you give will remain **COMPLETELY CONFIDENTIAL** ***within the research team at Bath.***

I. BASIC FACTS ON YOUR SITE :

a) **What is your site's approximate annual turnover?** £.........

b) **How many full time equivalent employees are employed at your site?** .... employees

c) **What are the main activities carried out at your site?**

....

....

d) **How long has your site been a part of Do It All?**

☐1 less than 2 years ☐2 2-5 years ☐3 more than 5 years ☐4 since establishment

II. ABOUT YOU

a) **How long have you personally worked for the company?** ....years

b) **How long, if ever, have you personally worked at Do It All HQ?** ....years ....months

c) **Are you personally a member of a local business association?** Yes ☐1 No ☐2

d) **Are you personally a member of an industry business association?** Yes ☐1 No ☐2

III. YOUR SITE IN THE CONTEXT OF DO IT ALL HQ

a) **In general terms, how big (in terms of sales or number of employees) is your site compared with others in Do It All?**

☐1 much smaller ☐2 smaller ☐3 about the same ☐4 larger ☐5 much larger

b) **How would you rate your site's performance relative to Do It All HQ's expectations?**

	much better			as expected			much worse
1. profitability	☐1	☐2	☐3	☐4	☐5	☐6	☐7
2. sales performance	☐1	☐2	☐3	☐4	☐5	☐6	☐7
3. environmental performance	☐1	☐2	☐3	☐4	☐5	☐6	☐7
4. effectiveness of supply activity	☐1	☐2	☐3	☐4	☐5	☐6	☐7

c) **Please rate the following statements according to whether you agree or disagree**

	strongly agree			neither			strongly disagree
1. For most tasks, we are provided with a fairly well-defined set of rules and policies	☐1	☐2	☐3	☐4	☐5	☐6	☐7
2. To the extent possible, there are manuals that define the courses of action to be taken under different situations	☐1	☐2	☐3	☐4	☐5	☐6	☐7
3. Do It All HQ continually monitors us to ensure that rules and policies are not violated	☐1	☐2	☐3	☐4	☐5	☐6	☐7
4. Representatives from Do It All HQ come to our site often	☐1	☐2	☐3	☐4	☐5	☐6	☐7
5. We are easily recognised by outsiders as a part of Do It All	☐1	☐2	☐3	☐4	☐5	☐6	☐7
6. I have regular contact with people at Do It All HQ, with whom I can discuss important issues for our site	☐1	☐2	☐3	☐4	☐5	☐6	☐7
7. We are set demanding profit goals by Do It All HQ	☐1	☐2	☐3	☐4	☐5	☐6	☐7
8. Do It All HQ sets us demanding sales goals	☐1	☐2	☐3	☐4	☐5	☐6	☐7

III. YOUR SITE IN THE CONTEXT OF DO IT ALL HQ (cont.)

d) **How much influence do you at your site have over decisions regarding the following?**
(1=no influence by us, decision made higher in the company; 4=equal influence between us and higher in the company; 7=total influence by us, no involvement higher in the company)

	no influence			about equal			total influence
1. The decision to introduce a new product	1	2	3	4	5	6	7
2. Direction and content of environmental policy	1	2	3	4	5	6	7
3. Supply management policy	1	2	3	4	5	6	7
4. Changes in product design	1	2	3	4	5	6	7
5. Changes in the manufacturing process	1	2	3	4	5	6	7

e) **Please RANK the following factors in the order that Do It All HQ would see their importance.**
(1=most important; 5=least important)

creativity	environment	product quality	people	profit
....	....	....	....	....

f) **Please RANK the following factors in the order that your site would see their importance.**
(1=most important; 5=least important)

creativity	environment	product quality	people	profit
....	....	....	....	....

g) **Please RANK the following factors in the order that you personally would see their importance.**
(1=most important; 5=least important)

creativity	environment	product quality	people	profit
....	....	....	....	....

IV. YOUR SITE'S GENERAL PERFORMANCE

a) **Please rate the following statements about your opinion of your site's performance according to whether you agree or disagree**

	strongly agree			neither			strongly disagree
1. We are more profitable than our most relevant competitors	1	2	3	4	5	6	7
2. Compared with this time last year, we are much more profitable	1	2	3	4	5	6	7
3. Compared with this time last year, we are more busy in our day-to-day activities	1	2	3	4	5	6	7
4. Compared with this time last year, we are working closer to full capacity	1	2	3	4	5	6	7
5. Compared with this time last year, we are more efficient	1	2	3	4	5	6	7
6. Compared with this time last year, we are more likely to meet the targets Do It All HQ sets us	1	2	3	4	5	6	7

b) **Assume that due to some sudden development, 10% of the time of all people working in your site has to be spent on work totally unconnected with the tasks and responsibilities of your business. How seriously do you think your output be affected ?**

1	2	3	4	5
Output down less than 5%	Output down around 5%	Output down 10%	Output down around 15%	Output down more than 15%

c) **Assume that due to some similar development, your site's annual budget is decreased by 10%. How significantly do you think your work will be affected over the next year?**

1	2	3	4	5
Output down less than 5%	Output down around 5%	Output down 10%	Output down around 15%	Output down more than 15%

V. ENVIRONMENTAL PRIORITY

a) Please rate the following statements according to whether you personally agree or disagree

	strongly agree			neither			strongly disagree
1. We always attempt to go beyond basic compliance with laws and regulations on environmental issues	1	2	3	4	5	6	7
2. Environmental initiatives always pay off in the long run	1	2	3	4	5	6	7
3. Our corporate management gives a high priority to environmental issues	1	2	3	4	5	6	7
4. Only very profitable companies can afford the luxury of environmental programmes	1	2	3	4	5	6	7
5. Improving our environmental performance could also make us more profitable	1	2	3	4	5	6	7
6. The top managers in Do It All HQ give environmental issues a high priority	1	2	3	4	5	6	7
7. We lead our industry on environmental issues	1	2	3	4	5	6	7
8. Environmental initiatives always present a net cost to the business, however well intentioned	1	2	3	4	5	6	7
9. There are more threats for our business arising out of the environmental agenda than opportunities	1	2	3	4	5	6	7
10. Many of our employees are interested in environmental issues	1	2	3	4	5	6	7

VI. ENVIRONMENTAL IMPACTS

a) What are the main environmental impacts of your site?

....

....

b) Which of the above impacts could be potentially most damaging to your commercial success?

....

....

VII. LOCAL ISSUES

a) Please rate the following statements about your site according to whether you agree or disagree

	strongly agree			neither			strongly disagree
1. We have a good local reputation on social and environmental issues	1	2	3	4	5	6	7
2. Our environmental impacts are obviously visible in the local area	1	2	3	4	5	6	7
3. Our activities are monitored closely by the local media	1	2	3	4	5	6	7
4. We are a major local employer	1	2	3	4	5	6	7
5. We get involved in local and community issues in our local area	1	2	3	4	5	6	7
6. Community representatives and other local groups often visit our site	1	2	3	4	5	6	7
7. If we wanted to, it would be easy to hide our environmental impacts	1	2	3	4	5	6	7
8. Our site's name is not widely recognisable outside the immediate circle of our customers and suppliers	1	2	3	4	5	6	7
9. Local environmental regulators take an active interest in our activities	1	2	3	4	5	6	7
10. Other companies in our local area are active on environmental issues	1	2	3	4	5	6	7

VIII. ENVIRONMENTAL MANAGEMENT

a) Please rate the following statements according to whether you agree or disagree

	strongly agree			neither			strongly disagree
1. We need to develop our competences in environmental management	1	2	3	4	5	6	7
2. We effectively manage the environmental risks that affect our business	1	2	3	4	5	6	7
3. Wherever possible, we co-operate with suppliers on environmental issues	1	2	3	4	5	6	7
4. We have the capabilities in our business to continue to improve on environmental issues	1	2	3	4	5	6	7
5. We are in a highly regulated industry	1	2	3	4	5	6	7

VIII. ENVIRONMENTAL MANAGEMENT (cont.)

	strongly agree			neither			strongly disagree
6. We spend time on keeping track of emerging environmental issues and technologies which may affect our site	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
7. We are encouraged by Do It All HQ to experiment with different types of environmental innovations	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
8. We are able to experiment with different solutions to environmental problems	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
9. We can make decisions locally on environmental issues without consulting Do It All HQ	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
10. We have never had Do It All HQ reject an environmental initiative we have suggested on the basis of cost/benefit considerations	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
11. We publicise our environmental achievements to external groups	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
12. We report our environmental weaknesses as well as our strengths to interested parties	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

b) Have you been required to implement a Do It All environmental policy in the last two years?

Yes ☐ 1 No ☐ 2

If you answered "Yes", then please indicate the extent to which you agree with the following statements :

	strongly agree			neither			strongly disagree
1. We have implemented the corporate environmental policy at least as quickly as Do It All HQ would have liked	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
2. We have integrated the environmental policy with our existing systems (e.g. quality, health and safety)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
3. We have exceeded Do It All HQ's expectations in implementing the policy	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
4. We have implemented the policy more effectively than our sister units in Do It All	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

c) Have any of the following environmental initiatives been implemented at your site that are NOT required by current laws or regulations?

	Yes, implemented in last two years	Currently being planned	Not planned
1. Reduction in the use of raw materials	☐ 1	☐ 2	☐ 3
2. Waste management and reduction	☐ 1	☐ 2	☐ 3
3. Energy efficiency measures	☐ 1	☐ 2	☐ 3
4. Conservation activities in the local area	☐ 1	☐ 2	☐ 3
5. Use of alternative fuel sources (e.g. solar, wind power)	☐ 1	☐ 2	☐ 3
6. Producing/selling less environmentally damaging products	☐ 1	☐ 2	☐ 3
7. Stakeholder partnerships for environmental preservation	☐ 1	☐ 2	☐ 3
8. Disclosure of environmental impacts (e.g. in a Report)	☐ 1	☐ 2	☐ 3
9. Research programmes for environmental improvements	☐ 1	☐ 2	☐ 3
10. Employee environmental training programmes	☐ 1	☐ 2	☐ 3
11. Environment-related supplier initiatives	☐ 1	☐ 2	☐ 3
12. Recycling programmes	☐ 1	☐ 2	☐ 3
13. Environmental audits	☐ 1	☐ 2	☐ 3
14. Reduction in packaging	☐ 1	☐ 2	☐ 3
15. Emission reduction (e.g. water treatment plant, scrubbers)	☐ 1	☐ 2	☐ 3
16. Improved housekeeping	☐ 1	☐ 2	☐ 3
17. Certified Environmental Management System	☐ 1	☐ 2	☐ 3

Thank you for completing the questionnaire

Please return to : **Frances Bowen, School of Management, University of Bath, Bath, BA2 7AY**

Ref. no.

Appendix 6 : Business Unit Questionnaire

See over for a reproduction of the business unit questionnaire sent to business interviewees before the interview.

Please complete before our meeting, and give your company profile to me when I arrive.

Thankyou.

Q1. **Please rate the following statements according to whether you agree or disagree** *(1=strongly agree; 2=agree; 3=neither agree nor disagree; 4=disagree; 5=strongly disagree)*

	Strongly Agree				Strongly Disagree
GENERAL COMPANY CULTURE					
1. For most tasks, operating units are provided with a fairly well-defined set of rules and policies	1	2	3	4	5
2. The corporate centre exercises much control over the activities of the operating units	1	2	3	4	5
3. To the extent possible, there are manuals that define the courses of action to be taken under different situations	1	2	3	4	5
4. The corporate centre continually monitors operating units to ensure that rules and policies are not violated	1	2	3	4	5
5. Our business operates largely on a decentralised basis	1	2	3	4	5
CURRENT BUSINESS PERFORMANCE					
6. We are more profitable than our most relevant competitors	1	2	3	4	5
7. Compared with this time last year, our business is much more profitable	1	2	3	4	5
8. Compared with this time last year, we are more busy in our day-to-day activities	1	2	3	4	5
9. Compared with this time last year, our business is working closer to full capacity	1	2	3	4	5
STRATEGIC CONTEXT					
10. Our company name is a brand worth protecting	1	2	3	4	5
11. We face intense competition in our marketplace	1	2	3	4	5
12. Our industry is in a period of rapid technological change	1	2	3	4	5
13. Our activities are monitored closely by the media	1	2	3	4	5
14. Our company's name is not widely recognisable outside the immediate circle of our customers and suppliers	1	2	3	4	5
ENVIRONMENTAL PRIORITY					
15. We always attempt to go beyond basic compliance with laws and regulations on environmental issues	1	2	3	4	5
16. There are more threats for our business unit arising out of the environmental agenda than opportunities	1	2	3	4	5
17. Our corporate management gives a high priority to environmental issues	1	2	3	4	5
18. The top managers in our business unit give environmental issues a high priority	1	2	3	4	5
19. We lead our industry on environmental issues	1	2	3	4	5
20. Our most relevant competitors place a greater marketing emphasis on environmental issues than us	1	2	3	4	5
21. We as a company should share the responsibility for the environmental impacts of our suppliers	1	2	3	4	5
22. We need to develop our competences in environmental management	1	2	3	4	5
ENVIRONMENTAL POLICY					
23. We effectively manage the environmental risks that affect our business	1	2	3	4	5

	Strongly Agree				Strongly Disagree
Wherever possible, we co-operate with suppliers on environmental issues	1	2	3	4	5
It is important for us to subject all environmental initiatives suggested by operating units to an analysis of their potential costs and benefits	1	2	3	4	5
Where our operating units source their materials from is largely a matter for them to decide	1	2	3	4	5
. We have the capabilities in our business to continue to improve on environmental issues	1	2	3	4	5
. We spend time on keeping track of emerging environmental issues and technologies which may affect our business	1	2	3	4	5
. We encourage operating units to experiment with different types of environmental innovations	1	2	3	4	5
. Operating units are able to make decisions locally on environmental issues without consulting us	1	2	3	4	5

2. Is there a high profile person at the corporate level of the company with responsibility for environmental initiatives? yes / no

If yes, then please give their name and title here ______________________________

)3. How much influence do individual operating units have over decisions regarding the following?
(1=no influence by operating units, decision made by company HQ;
3=equal influence with company HQ;
5=total influence at operating units, no company HQ involvement)

	no influence				total influence
. The decision to introduce a new product	1	2	3	4	5
. Direction and content of environmental policy	1	2	3	4	5
. Supply management policy	1	2	3	4	5
. Changes in product design	1	2	3	4	5
. Changes in the manufacturing process	1	2	3	4	5

Q4. Please RANK the following factors in the order that your company as a whole would see their importance
(1=most important; 5=least important)

creativity___ environment___ product quality___ people___ profit___

Q5. Please RANK, in your own opinion, the importance of the following factors
(1=most important; 5=least important)

creativity___ environment___ product quality___ people___ profit___

Appendix 7 : Details of the Business Units selected in the sample

A7.1 High Impact Manufacturing

A7.1.1 BOC Gases, Europe

Part of : The BOC Group plc

Principal Activities : BOC is a British-based group primarily engaged in the production and delivery of industrial gases and in the use of vacuum technology.

Interview : conducted with Geoff Stebbing, Environment Manager (BOC Gases Europe) on 23rd June 1998.

A7.1.2 Body Shop (manufacturing)

Part of : The Body Shop International

Principal Activities : The Group originates, produces and sells skin care and hair care products and related items through its own shops and franchised outlets.

Interview : conducted with Bob McCusker, Operations Manager (Littlehampton) on 17th June 1998.

A7.1.3 BP plc

Part of : The British Petroleum Company Plc.

Principal Activities : BP is one of the world's largest petroleum and petrochemical groups. Their main activities are exploration and production of crude oil and natural gas refining, marketing, supply and transportation; and manufacturing and marketing of petrochemicals. The interview was confined to BP's UK operations.

Interview : conducted with Richard Newton, Director Europe, BP International Ltd. on 7th July 1998.

A7.1.4 Brunner Mond (UK) Ltd.

Part of : Brunner Mond plc

Principal Activities : Brunner Mond is a leading UK based manufacturer and supplier of alkaline chemicals.

Interview : conducted with Chris Wardle, Director of Safety, Health and Environment on 11th September 1998.

A7.1.5 Ellis & Everard (UK) Ltd.

Part of : Ellis & Everard plc

Principal Activities : The principal activities of the group are th sales, marketing and distribution of chemicals and polymers. Ellis & Everard (UK) Ltd. undertakes these activites in the UK.

Interview : conducted with John McKensie, Operations Manager and Director (Ellis & Everard UK), on 15th June 1998.

A7.1.6 KCA Drilling UK Ltd.

Part of : Abbot Group plc

Principal Activities : The Group's principal activies are the provision of drilling and related well and facilities engineering services, both offshore and onshore, and the provision of non-destructive testing and inspection services. Other business services include the generation of electricity from renewable energy sources. KCA is a UK-based drilling business.

Interview : conducted with Richard Watkiss, Operations Manager (KCA) on 29th May, 1998.

A7.1.7 Severn Trent Water

Part of : Severn Trent plc

Principal Activities : The principal activities of the company and its subsidiary undertakings are the supply of water and the treatment and disposal of sewerage. Severn Trent Water is a UK based water and sewerage company.

Interview : conducted with Jim Lamb, Group Environment Manager, on 3rd June, 1998.

A7.1.8 Unilever Home & Personal Care Europe

Part of : Unilever plc

Principal Activities : The principal activities of the group are the origination, manufacture, distribution and marketing of foods, detergents, personal products and

speciality chemicals. HPCE conducts these activites for the home and personal care products in the UK and the rest of Europe.
Interviews : conducted with Wim Hoogstad, Senior Vice-President Supply (HPCE); and Malcolm Shaw, Technical Liaison & Environmental Co-ordinator (HPCE) on 12th June 1998.

A7.2 Other Manufacturing

A7.2.1 British Gypsum

Part of : BPB plc
Principal Activities : BPB is one of the world's largest gypsum groups. They primarily supply plasters and plasterboard, and manufacture complementary building materials and paperboard products. British Gypsum is manufacutres plasterboard and plaster in sacks in the UK.
Interview : conducted with Carl Kruger, Group Environmental Manager on 26th May 1998.

A7.2.2 BPB Paperboard (UK)

Part of : BPB plc
Principal Activities : BPB is one of the world's largest gypsum groups. They primarily supply plasters and plasterboard, and manufacture complementary building materials and paperboard products. The Paperboard division in the UK consists of papermills and converting mills which manufacture plasterboard liner and other cardboard and felt products.
Interview : conducted with Carl Kruger, Group Environmental Manager on 26th May 1998.

A7.2.3 EMI Manufacturing (UK)

Part of : The EMI Group plc
Primary Activities : EMI is a music business including the commisioning, publishing, recording, distributing and retailing of music. EMI Manufacturing (UK) produces compact discs, vinyl records and cassette tapes for EMI Music.

Interviews : conducted with Alan McElroy, Senior Director, Manufacturing, UK and ROW; Mark Stephenson, Environmental Manager EMI Compact Disc UK; and John Ashley, Procurement Director EMI Compact Disc UK on 2nd July 1998.

A7.2.4 Specialist Products Division, Meyer

Part of : Meyer International plc

Principal Activities : Meyer International plc acts as the holding company of a group of companies, the principal activities of which, both in the UK and overseas, comprises the merchanting of building materials and timber, and the import and distribution of timber and timber products, panel and laminates. The Specialist Products Division encompass the groups specialist businesses, including the manufacture of telegraph poles, railway sleepers and laminate products.

Interview : conducted with Matt Thomas, Chief Executive of Specialist Products, on 8th June 1998.

A7.2.5 Pilkington plc

Principal Activities : The manufacture of glass for the building and automotive markets. The interview and questionnaires were limited to Pilkington's UK manufacturing operations.

Interview : conducted with Derek Norman, Director of Environmental Affaris, Pilkington plc, on 7th July 1998.

A7.2.6 St. Ives plc

Principal Activities : The activities of the group comprise offset magazine printing, book printing and binding, direct response and general commercial printing, corporate and financial security printing and printing for the multimedia and music industries. The interview was confined to manufacturing activities in the UK.

Interview : conducted with Ken Pardy, Director, on 27th May 1998.

A7.2.7 Otford Plastics Group

Part of : TransTec plc

Principal Activities : TransTec plc is the group holding and management company of several subsidiaries in the automotive manufacturing, plastic and rubber products and controls manufacturing industries. Otford Plastics is the main UK business unit in the plastic and rubber sector.

Interview : conducted with Valerie Tootal, Director (Otford Plastics); and Neville Rowney, Manufacturing Manager (Otford Plastics) on 19th June 1998.

A7.2.8 Automotive Products Division, TransTec

Part of : TransTec plc

Principal Activities : TransTec plc is the group holding and management company of several subsidiaries in the automotive manufacturing, plastic and rubber products and controls manufacturing industries. The Automotive Products Division includes aluminium die casting and high volume machining for automotive components.

Interview : conducted with Mike Wright, Director (Automotive Products) on 16th September 1998.

A7.2.9 Unilever Food & Beverages Europe

Part of : Univlever plc

Principal Activites : The principal activities of the group are the origination, manufacture, distribution and marketing of foods, detergents, personal products and speciality chemicals. FBE conducts these activities for the food and beverage products in the UK and the rest of Europe.

Interview : conducted with Bert Dekker, Director of Safety & Environment (FBE) on 23rd July 1998.

A7.3 Other Non-Manufacturing

A7.3.1 Civil Engineering Division, Alfred McAlpine

Part of : Alfred McAlpine plc

Principal Activities : The Group is involved in a wide range of construction, housebuilding and minerals activities principally in the UK and USA. The Civil Engineering Division is a leading business with interests in the PFI road programme and specialist skills in plant hire and pipeline servicing.

Interview : conducted with Bob Arnold, Group Services Director, Alfred McAlpine plc on 12th June 1998.

A7.3.2 Bellway plc

Principal Activities : The Company is a holding company owning subsidiary undertakings which continue to be principally engaged in housebuilding in the UK.

Interview : conducted with John Watson, Technical Director, Bellway plc on 4th June 1998.

A7.3.3 Body Shop (retailing)

Part of : The Body Shop International

Principal Activities : The Group originates, produces and sells skin care and hair care products and related items through its own shops and franchised outlets.

Interview : conducted with Bob McCusker, Operations Manager (Littlehampton) on 17th June 1998.

A7.3.4 Do It All Ltd.

Part of : The Boots Company plc

Principal Activities : The Boots Company embraces businesses operating prinacipally in retailing, the manufacture and marketing of health and personal care products throughout the world and the development and management of retail property. Do It All is a joint venture company with WHSmith engaged in retailing home decorating and improvement products.

Interview : conducted with Mike Inchley, Director (Do It All Ltd.), on 11th June 1998 and with Ian Blythe, Group Environmental Manager (Boots Group) on 31st March 1998.

A7.3.5 Halfords Ltd.

Part of : The Boots Company plc

Principal Activities : The Boots Company embraces businesses operating prinacipally in retailing, the manufacture and marketing of health and personal care products throughout the world and the development and management of retail property. Halfords is the largest retailer of car parts, car accessories, cycles and cycle accessories in the UK. Halfords is also the largest garage servicing organisation in the country.

Interview : conducted with Neil Bayley, Environmental Manager (Halfords) on 16th June 1998 and with Ian Blythe, Group Environmental Manager (Boots Group) on 31st March 1998.

A7.3.6 Salvesen Logistics

Part of : Christian Salvesen plc

Principal Activities : Christian Salvesen plc is a business-to-business services provider. Its activities include power hire and temperature control equipment rental, distribution and logistics services and provision of freezing, cold storage, packing and associated services to the food industry. Salvesen Logistics is the logistics division focused on serving the UK and Europe.

Interview : conducted with Andy Rowe, Group Fleet Services Manager, on 25th May 1998.

A7.3.7 Comet Ltd.

Part of : Kingfisher plc

Principal Activities : The Group trades principally as retailers in stores in the UK through its subsidiaries. Comet is a leading out-of-town electrical retailer.

Interview : conducted with Scott Keiller, Director (Comet) on 10th June 1998.

A7.3.8 NatWest UK

Part of : The NatWest Group plc

Principal Activities : The Group is engaged in a wide range of banking, financial and related activities in the UK and in 29 other countries. NatWest UK is the Group's principal domestic financial services arm.

Interview : conducted with Les Moscow, Director, Group Purchasing, on 18th June 1998.

Appendix 8 : Regression Diagnostics

See section 8.3 for a fuller discussion. All calculations based on White's General Test for heteroscedasticity as outlined in Greene (1993).

Figure A8.1 : Diagnostics for Figure 8.4

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
White's General Test							
R^2 of regressed residuals	0.11	0.11	0.14	0.11	0.11	0.08	0.07
nR^2	10.26	10.83	13.02	10.17	10.45	7.22	7.03
χ^2 critical value (K-1 d.f.)	15.51	16.92	19.68	22.36	21.03	18.31	18.31
Significant?	n	n	n	n	n	n	n

Figure A8.2 : Diagnostics for Figure 8.6

	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 17
White's General Test							
R^2 of regressed residuals	0.10	0.17	0.18	0.23	0.14	0.12	0.09
nR^2	9.69	16.44	16.72	21.85	13.30	11.40	8.08
χ^2 critical value (K-1 d.f.)	15.51	16.92	19.68	22.36	21.03	18.31	18.31
Significant?	n	n	n	n	n	n	n

Figure A8.3 : Diagnostics for Figure 8.7

	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22
White's General Test								
R^2 of regressed residuals	0.04	0.05	0.35	0.45	0.43	0.21	0.06	0.29
nR^2	3.61	4.85	33.25	42.75	40.57	19.67	5.42	27.08
χ^2 critical value (K-1 d.f.)	15.51	16.92	19.68	22.36	21.03	18.31	18.31	18.31
Significant?	n	n	y	y	y	y	n	y

Figure A8.4 : Diagnostics for Figure 8.8

	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28	Model 29
White's General Test							
R^2 of regressed residuals	0.13	0.15	0.18	0.18	0.15	0.14	0.11
nR^2	12.73	14.25	16.72	16.72	13.97	12.83	10.36
χ^2 critical value (K-1 d.f.)	15.51	16.92	19.68	22.36	21.03	18.31	18.31
Significant?	n	n	n	n	n	n	n

Figure A8.5 : Diagnostics for Figure 8.9

	Model 30	Model 31	Model 32	Model 33	Model 34	Model 35	Model 36
White's General Test							
R^2 of regressed residuals	0.16	0.23	0.25	0.31	0.20	0.16	0.16
nR^2	15.20	21.66	23.94	29.64	19.38	14.82	15.39
χ^2 critical value (K-1 d.f.)	15.51	16.92	19.68	22.36	21.03	18.31	18.31
Significant?	n	y	y	y	n	n	n

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