An Empirical Analysis of Environmental Strategy, Eco-controls, Environmental and Economic Performance

by

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Submitted in fulfilment of the requirements for the degree of

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June, 2014
I am the author of the thesis entitled

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Campbell Heggen

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Abstract

A body of research has emerged around the concept of eco-controls, which pertains to the application of financial and strategic controls to environmental management. A review of the literature, however, indicates that prior studies have paid little attention to the use of eco-controls, as a critical mediating variable between an organisation’s environmental strategy, and its environmental and economic performance outcomes. Guided by the resource-based view of the firm, this study develops a conceptual model that proposes that the level of proactive environmental strategy will have positive effects on i) the style of use of eco-controls, in terms of each of Simons’ (1995) four Levers of Control (LOC) (i.e., beliefs, boundary, diagnostic and interactive), and ii) the bureaucratic stance towards eco-controls (i.e., enabling versus constraining) (Adler and Borys, 1996). Further, it is hypothesised that the emphasis on the four LOC and a more enabling bureaucratic stance towards eco-control will have a positive effect on firms’ environmental outcomes, which, in turn, is expected to be positively associated with firms’ economic performance.

The study adopts a mixed-mode research design conducted over two phases. The first phase utilises a survey-questionnaire to collect data from a cross-sectional sample of 221 firms operating in Australia, with analysis undertaken using structural equation modelling (SEM). The findings indicate positive associations to exist between a proactive environmental strategy and three levers of control (i.e., beliefs, diagnostic and interactive) as well as a positive relationship between a proactive strategy and an enabling use of eco-controls. However, only two control levers (beliefs and interactive) and the enabling use of eco-controls have positive and direct effects on environmental performance. Finally, a positive relation is also observed between
environmental and economic performance. Overall, the survey findings indicate that the mediating role played by eco-controls are more complex than initially proposed, with the use of eco-controls by decision-makers throughout the organisational hierarchy significantly contributing to firms’ performance outcomes.

The second phase of this study involves a comparative case analysis of two organisations within the Australian forestry industry (called *Hardwood* and *Softwood*). Data from in-depth interviews of key managers and environmental specialists from the two firms, as well as company documents and corporate websites, are utilised to understand the organisational dynamics related to why and how firms differ in their approaches to environmental management and the use of eco-controls. Analysis is guided by an institutional perspective and draws on the framework developed by Arena et al. (2010) where environmental strategic rationalities, environmental experts and champions, and eco-control technologies are contended to be critical facets in how environmental strategy is understood and implemented, specifically through their influence on the meanings attributed to environmental management practices.

The case analysis suggests that although both firms were in a highly-regulated, environmentally-sensitive industry, the rationalities imbued in the strategic vision of the two firms significantly shaped the institutionalised meanings of environmental management as an organisational activity. Further, various actors (i.e., key environmental experts, senior managers and auditors) assumed critical roles in making sense of the strategic rationalities which justify environmental management activities, which, in turn, was further reflected in the design and use of eco-control technologies.
The primary contributions of this study to the literature are twofold: First, it provides much needed empirical evidence supporting eco-controls as a critical mediating variable between environmental strategy and firms’ environmental and economic performance. Second, this study provides deeper insights into the socially-complex, organisational dynamics of environmental strategy and management controls. Thus, the combined results of the survey and case analysis provide detailed empirical evidence on the determinants, consequences and processual aspects of the uses of eco-controls in environmental performance management.
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<tr>
<td>AFS</td>
<td>Australian Forestry Standard</td>
</tr>
<tr>
<td>ANZSIC</td>
<td>Australian and New Zealand Standard Industrial Classification</td>
</tr>
<tr>
<td>AVE</td>
<td>Average Variance Extracted</td>
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<td>CFA</td>
<td>Confirmatory Factor Analysis</td>
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<td>EFA</td>
<td>Exploratory Factor Analysis</td>
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<td>EMA</td>
<td>Environmental Management Accounting</td>
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<td>EMAS</td>
<td>Eco-Management and Audit Scheme</td>
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<td>EMS</td>
<td>Environmental Management System</td>
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<tr>
<td>EPI</td>
<td>Environmental Performance Indicator</td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
</tr>
<tr>
<td>ISI</td>
<td>Information System Integration</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
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<td>LOC</td>
<td>Levers of Control</td>
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<td>MCS</td>
<td>Management Control Systems</td>
</tr>
<tr>
<td>MCAR</td>
<td>Missing Completely At Random</td>
</tr>
<tr>
<td>ML</td>
<td>Maximum Likelihood</td>
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<td>SEM</td>
<td>Structural Equation Modelling</td>
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<td>SMC</td>
<td>Squared Multiple Correlations</td>
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<td>SME</td>
<td>Small and Medium Enterprise</td>
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Chapter 1: Introduction

1.1 Introduction

In recent times, the pressure on business organisations for better environmental management systems has increased, with heightened focus on corporate responsibility towards the environment. This development, in turn, has given rise to renewed research interest in the strategy-structure-performance link, where greater scrutiny has been paid to variations in environmental strategies among firms and the types of firm-specific capabilities and management controls that may support or hinder achieving particular environmental goals and outcomes (Russo & Fouts 1997; Aragón-Correa 1998; Judge & Douglas 1998; Sharma & Vredenburg 1998).

According to the resource-based view of the firm (Wernerfelt 1984), the competitive strategies and performance of organisations are associated with their firm-specific resources and capabilities (Barney 1991; Grant 1991; Amit & Schoemaker 1993). Following this rationale, it can be argued that the impact of an organisation’s environmental strategy on its environmental performance is likely to be a function of key internal resources, such as organisational control and decision-making systems. Prior studies describe how environmental strategic orientations of organisations may vary in their nature and degree of responsiveness to environmental change, from highly proactive to highly reactive strategies (Hunt & Auster 1990; Roome 1992; Aragón-Correa 1998; Sharma & Vredenburg 1998; Sharma 2000). For instance, highly proactive strategies involve firm willingness to be leaders in environmental innovation, waste reduction and pollution prevention, while more reactive strategies assume a defensive, late-mover position (Hart 1995; Russo & Fouts 1997; Aragón-Correa 1998; Aragón-Correa & Sharma 2003). There is, however, little evidence on
how environmental strategies may affect the design and use of an organisation’s management control systems (MCS) (Perego & Hartmann 2009; Pondeville, Swaen & De Rongé 2013; Rodrigue, Magnan & Boulianne 2013) and whether such associations affect an organisation’s environmental and economic performance (Henri & Journeault 2010).

MCS have been defined as ‘the mix of formal and informal procedures and processes used by management to facilitate the attainment of their goals and those of the organisation’ (Kober et al. 2007, p. 426). As such, the MCS construct encompasses a wide range of accounting and other control facets including planning, performance evaluation and reward structures that guide the achievement of organisational goals. Despite being identified as a potentially fruitful area of inquiry almost two decades ago (Otley, Broadbent & Berry 1995), researchers have only recently started paying greater attention to control and environmental management issues (see Berry et al. 2009). The emergence of a more specialised research strand in this area concentrates on the concept of eco-controls (Schaltegger, Burritt & Petersen 2008; Henri & Journeault 2010). More specifically, eco-controls pertain to the set of management controls that ‘use financial and ecological information (e.g., pollution or social benefit indicators) to maintain or alter patterns in environmental activity’ (Henri & Journeault 2010, p. 64). The approach adopted by recent studies on eco-controls follows the rationale undertaken in the mainstream MCS research, where the design and use of MCS are assumed to be fundamental in supporting a firm’s strategic priorities (e.g., Otley et al. 1995; Langfield-Smith 1997; Chenhall 2003). However, prior studies aiming to assess the antecedents and outcomes of eco-controls have generally paid attention only to selected dimensions of an eco-control system, such as plans and procedures (Epstein & Wisner 2005; Wisner, Epstein & Bagozzi 2006),
internal accounting and reporting measures (Henri & Journeault 2008a; Ferreira, Moulang & Hendro 2010), and employee reward systems (Perego & Hartmann 2009). Hence, research in the area is still developing with various theoretical and methodological gaps, as listed below and discussed further in Section 1.2.

First, the important distinction between the design and the use of eco-controls has not been made in many prior studies (e.g., Epstein & Wisner 2005; Henri & Journeault 2010). For example, in the mainstream MCS literature it is argued that, besides the design of MCS information, the style of use of MCS is also critical for supporting organisational strategies and goals (Simons 1990, 1995; Widener 2007). As contended by Simons (1990), ‘the effective implementation of strategic priorities does not necessarily influence the importance of accounting controls, but rather, influences the manner in which these controls are used’ (Abernethy & Brownell 1999, p. 199).

Secondly, the relation between eco-controls and environmental strategy remains unclear. While there is general consensus within the mainstream MCS literature that an alignment between organisational strategies and MCS leads to better organisational outcomes (Langfield-Smith 1997; Chenhall 2003; Tucker, Thorne & Gurd 2009), such evidence in relation to environmental strategy and eco-controls remains limited (e.g., Perego & Hartmann 2009; Pondeville et al. 2013; Rodrigue et al. 2013).

The third limitation pertains to the nature of the relationship between a firm’s environmental and economic performance. While empirical prior studies have, in general, identified a positive relationship between a firm’s environmental management activities and its environmental and economic performance outcomes
(Judge & Douglas 1998; Sharma & Vredenburg 1998; Christmann 2000; Epstein & Wisner 2005), evidence regarding the direct relation between environmental and economic performance is inconsistent and remains inconclusive (cf. Wisner et al. 2006; Henri & Journeault 2010).

The above limitations raise the need for additional research to explore the relationship between environmental strategy and ‘a comprehensive set of performance criteria’ (Banerjee, Iyer & Kashyap 2003, p. 120), as well as to further illustrate the use of eco-controls and their contribution to environmental performance (Perez, Ruiz & Fenech 2007) and to dependent measures of financial performance (Sharma & Vredenburg 1998; Henri & Journeault 2010). Researchers have further identified the need for a more detailed analysis of the full chain of variables in order to investigate the effects of strategic alignment, and determine whether an alignment between environmental strategic elements and eco-control systems effectively leads to better performance outcomes (Perego & Hartmann 2009; Arjaliès & Mundy 2013; Pondeville et al. 2013; Rodrigue et al. 2013), including elements such as eco-efficiency, corporate reputation and financial performance (Perego & Hartmann 2009).

The following section will examine the three main aims of this study: i) to better understand the link between environmental strategy and the use of eco-controls; ii) to assess the association between the use of eco-controls and a firm’s environmental outcomes; and, iii) to provide evidence on the ‘business case’ for environmental management, by exploring the relationship between a firm’s environmental and economic performance.
1.2 Objectives and Motivations for Study

The overall aim of this study is to assess whether there are systematic linkages among firms’ proactive environmental strategy, use of eco-controls and their environmental and economic performance. In doing so, the study purports to draw from two streams of research. The first research stream pertains to the emerging body of literature on the strategies adopted for managing environmental opportunities and threats, and their impact on organisational structure and processes. The second stream of research is grounded in the literature on control mechanisms focusing on environmental management within firms, more commonly termed eco-controls, and their impact on organisational outcomes. Specifically, the key objectives of this study are as follows.

The first objective is to gain a better understanding of the link between environmental strategy and MCS, specifically in relation to the use of eco-controls. Prior studies have characterised the environmental strategies of a firm in a variety of ways, such as operational versus administrative measures and uni- versus multi-dimensional (Sharma & Vredenburg 1998; Buysse & Verbeke 2003; Aragón-Correa et al. 2008; Henri & Journeault 2008a). In this study, the focal dimension of environmental strategy relates to the extent to which environmental issues have been integrated in strategic planning and decision-making processes (Judge & Douglas 1998; Banerjee et al. 2003; Perego & Hartmann 2009), ranging from a highly proactive to a highly reactive stance. For instance, a highly proactive strategy entails the anticipation and scoping of potential issues and impacts (Aragón-Correa & Sharma 2003), the identification of short- and long-term performance objectives which typically exceed regulatory requirements (Hunt & Auster 1990; Roome 1992; Buysse & Verbeke 2003), and a commitment to continuous improvement and
organisational learning (Russo & Fouts 1997; Aragón-Correa 1998; Sharma & Vredenburg 1998). Reactive strategies tend to be more cautious with defensive approaches that merely aim to meet legal requirements (Roome 1992; Buysse & Verbeke 2003), and are characterised by attempts to solve problems as and when they arise, such as through investments in already-developed management techniques and technologies (Russo & Fouts 1997).

Given the distinctiveness of these two strategic approaches, it is also likely they will promote different uses of eco-controls. For example, Henri and Journeault (2008a), focusing on environmental performance indicators (EPIs) (an example of eco-control design), found that proactive firms place greater emphasis on EPIs to provide data for decision-making and motivate continuous improvement compared with more reactive firms. Further, prior studies have observed that more proactive firms place greater emphasis on the use of both formal and informal eco-control systems (Pondeville et al. 2013), and rely more on accurate forecasting of environmental impacts, the use of broad scope information and timely access to performance data (Perego & Hartmann 2009).¹ In other words, it can be argued that as environmental strategies become more proactive, the importance and sophistication of eco-controls will also increase.

However, prior studies have largely focused on the design and information features of eco-controls (e.g., the metrics relating to performance indicators) and have ignored the manner in which eco-control information is used. Notable exceptions include Rodrigue et al. (2013) and Arjalies and Mundy (2013) who illustrate how the use of MCS may assist organisations identify and manage both environmental threats and opportunities. Yet, the issue remains an empirical one as these contributions are

¹ The relationship between environmental strategy and eco-controls is discussed in detail in Chapter 2.
largely theoretical or descriptive in nature, and informed by limited case evidence (Rodrigue et al. 2013) or qualitative survey data (Arjalies and Mundy 2013). Thus, further study on this link is important to determine how organisations’ environmental strategy impacts the use eco-controls.

The second objective of this study is to examine how eco-control information may be used throughout the organisation. More specifically, the aim of this study is to empirically assess the impact of environmental strategy on eco-controls by distinguishing between: i) the style of use of eco-controls by senior management (Simons 1995), and ii) the bureaucratic stance towards eco-controls (Adler & Borys 1996; Ahrens & Chapman 2004) in the decision-making activities of subordinate managers and employees generally. The motivation for making this distinction in the conceptualisation of eco-controls is founded upon Tessier and Otley (2012) who contend that prior studies have neglected to differentiate between the concept of positive and negative controls underlying Simons’ framework (i.e., as complementary, with both being useful), and the enabling versus constraining roles that controls may perform.

In conceptualising the style of use of MCS, prior studies have drawn on Simons’ (1995) *Levers of Control* (LOC) framework, to describe how senior management use beliefs systems, boundary systems, as well as the diagnostic and interactive uses of MCS, in order to achieve organisational strategies and goals (Abernethy & Brownell 1999; Tuomela 2005; Henri 2006; Widener 2007). For example, empirical evidence provided by Widener (2007) suggests a firm’s business strategic risks and uncertainties have significant effects on the style of use of MCS, (e.g., in a diagnostic and in an interactive manner), and that they, in turn, have implications for organisational learning and ultimately firm performance. However, as noted above,
there is limited evidence on the style of use of eco-controls and their subsequent implications for environmental strategy implementation and firm performance (e.g., Arjaliès & Mundy 2013; Rodrigue et al. 2013). Further evidence in this regard is required to develop a more in-depth understanding of the effectiveness of different styles of use of eco-controls vis-à-vis the environmental strategic imperatives of organisations.

The bureaucratic stance towards eco-controls draws on Adler and Borys’s (1996) concept of enabling versus coercive forms of bureaucracy, to examine the relation between firms’ environmental strategic imperatives and the operation of eco-controls at lower hierarchical levels of the organisation. These approaches (i.e., an enabling versus a coercive approach) can be distinguished based on the senior management’s attitudes and approaches to the implementation of formal organisational resources and systems. According to one rationale, organisations may elect to emphasise an enabling approach where the control system user is seen as a source of skill and intelligence to be supported, and systems are designed to assist committed employees to better perform their task. By contrast, another rationale (i.e., a coercive perspective) is that the MCS users are viewed as a source of problems to be eliminated and organisational systems need to be designed with a fool-proofing logic (Adler & Borys 1996; Adler 1999; Ahrens & Chapman 2004).

Prior MCS research describes how the bureaucratic stance towards control may shape operational employees’ involvement in the strategy implementation and renewal process (Ahrens & Chapman 2004; Wouters & Wilderom 2008; Jørgensen & Messner 2009). In particular, these studies have identified the ways in which an enabling stance towards control may allow organisations to simultaneously pursue both efficiency and flexibility through their formal management control systems.
Chapter 1: Introduction

(e.g., Ahrens & Chapman 2004; Jørgensen & Messner 2009). Nevertheless, additional empirical investigation in this regard is needed given the paucity of research in this area. In particular, the call for further research has been recently echoed by Adler (2012) who contends that empirical research needs to examine how more enabling forms of formalisation, standardisation, hierarchical authority, specialisation, and staff/line relations have evolved in industry or professional environments where there is more environmental uncertainty and demand for innovation and creativity.

The third objective of this study is to examine the impact of the use of eco-controls on organisations’ performance outcomes. The motivation for this is because while the MCS literature contends that appropriate design of MCS potentially influences the link between strategy and firm performance, such an analysis has hardly been undertaken from an environmental strategy perspective. There are, however, two notable studies, namely, Epstein and Wisner (2005) and Henri and Journeault (2010). Epstein and Wisner (2005), based on a survey focusing on organisational structure, environmental challenges and environmental performance issues of 236 Mexican manufacturing facilities, observe that management commitment, planning, beliefs systems, measurement systems, and rewards contribute to environmental performance in terms of compliance with environmental regulations. Henri and Journeault’s (2010) study, which involves survey data from a sample 303 Canadian manufacturing firms, suggests that while eco-control has no direct effect on economic performance, a limited mediating effect of environmental performance is observed whereby eco-control indirectly influences economic performance in different contexts. However, as outlined above, the important distinction between the design and the use of eco-controls has not been acknowledged in many prior studies.
Thus, further empirical research is required examining how the use of eco-control information contributes to firms’ environmental and economic performance outcomes.

Finally, a review of the literature also identifies another limitation where the conceptualisation of environmental performance by prior studies on the environmental strategy-structure-performance link has been rather narrow, largely focusing on the organisation’s impact on the natural environment (e.g., Judge & Douglas 1998; Wagner & Schaltegger 2004; López-Gamero, Molina-Azorín & Claver-Cortés 2009). Increasingly, it is recognised that environmental outcomes need to be understood from a broader perspective, to include issues such as firm reputation, product and process innovations, increased organisational learning, knowledge management and productivity (e.g., Henri & Journeault 2010). Thus, further study of the association between environmental strategy and eco-control ought to encompass a broader set of environmental outcomes in order to provide a more complete understanding of how managers may better utilise eco-controls to maximise financial and non-financial environmental strategic outcomes.

1.3 Research Questions

Following the above discussion, this study addresses three specific research questions:

*RQ1:* Is there a significant association between the extent of a more proactive (versus more reactive) environmental strategy and the emphasis placed on firms’ use of eco-controls?
**RQ2a:** Is there a significant association between the emphasis placed on the use of eco-controls and firms’ environmental and economic performance?

**RQ2b:** Is there a significant association between firms’ environmental and economic performance?

These questions are investigated by adopting a resource-based view of the firm, which is briefly outlined in the next section. This is followed by an overview of the conceptual framework, and a delineation of the main research hypotheses to be addressed.

### 1.4 Resource-based View of the Firm

The fundamental principle of the resource-based view is that the basis for a competitive advantage for a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal (Wernerfelt 1984). Such resources can be tangible, personnel-based or organisational in nature (Barney 1991; Grant 1991; Amit & Schoemaker 1993). To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile. Such resources must be valuable and non-substitutable, rare and/or specific to a given time (Barney 1991), and difficult to replicate because they are either tacit (causally ambiguous) or socially complex, that is, resources which are skill-based and people intensive, such that few people have sufficient breadth of knowledge to grasp the overall phenomenon (Hart 1995).

However, firms may accumulate large stocks of resources and still fail to generate a competitive advantage. The real sources of advantage are to be found in management’s ability to consolidate the collective learning in the organisation into
unique capabilities and adapt quickly to changing opportunities (Prahalad & Hamel 1990). These capabilities, or core competencies, are the complex bundles of skills and knowledge, exercised through organisational processes, which enable firms to co-ordinate activities and make use of their resources (Amit & Schoemaker 1993; Day 1994). Although idiosyncratic and path-dependent in their emergence, they have significant commonalities across firms (popularly termed ‘best practices’) and consist of specific and identifiable processes which allow the generation of new, value-creating strategies (Eisenhardt & Martin 2000).

Within the environmental strategic management literature, researchers have argued that the ability to integrate the natural environment into the strategic planning process is itself a unique organisational capability (Russo & Fouts 1997; Judge & Douglas 1998; Aragón-Correa & Sharma 2003). More commonly, studies have sought to identify the specific capabilities developed by firms adopting more proactive environmental strategies, and their contribution to sustained competitive advantage. In this respect, the most-researched capabilities include those for stakeholder integration, organisational learning and continuous innovation (Sharma & Vredenburg 1998; Christmann 2000; López-Gamero et al. 2009; Surroca, Tribó & Waddock 2010).

However, such studies have largely focused on firms’ deployment of physical and human capital resources in the achievement of their environmental performance objectives. An alternate perspective concerns the third resource domain, specifically, firms’ use of key organisational resources, including formal and informal planning, management control and reporting systems, to support strategic priorities. Within the

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2 Although the terms *capabilities* and *core competencies* are often distinguished in the literature, following Day (1994) (footnote 3, p.38) the two terms are essentially interchangeable.
management control literature, researchers have adopted a resource-based view approach – sometimes explicitly, other times implicitly (Franco-Santos, Lucianetti & Bourne 2012) – to argue that the use of MCS influences the strategic capabilities of organisations through the routines they stimulate. Of these studies, the majority adopt Simons’ (1995) LOC framework, with the most researched organisational capabilities including innovation (Bisbe & Otley 2004; Henri 2006) and organisational learning (Tuomela 2005; Henri 2006; Widener 2007), as well as entrepreneurship and market orientation (Henri 2006).

Thus, although it has largely been ignored in the traditional MCS-strategy literature (Henri, 2006), recent studies have argued that the resource-based view offers ‘a more detailed understanding of the role of MCS as an antecedent to the development of organisational capabilities’ (Grafton, Lillis & Widener 2010, p. 691) and may help to resolve some of the ambiguous findings from the literature that attempts to relate MCS use and organisational performance (Henri 2006; Widener 2007). For the present study, it is similarly proposed that insights from the resource-based view may help clarify some of the ambiguities surrounding the role of eco-controls in supporting firms’ environmental strategic priorities, and its implications for both environmental and economic performance.

1.5 Conceptual Framework

The conceptual framework developed for this study responds to calls from the literature for future research to determine whether an alignment between environmental strategic elements and eco-control systems effectively leads to better performance outcomes (Perego & Hartmann 2009; Arjaliès & Mundy 2013; Pondeville et al. 2013; Rodrigue et al. 2013). Specifically, this study seeks to provide
evidence on the role of eco-controls as a critical mediating variable between an organisation’s environmental strategy, and its environmental and economic performance.

In doing so, the present study adds a further dimension to recent empirical studies of eco-control by Perego and Hartmann (2009), and Pondeville et al. (2013), by systematically examining not just the impact environmental strategy has on the importance of eco-controls, but the manner in which such eco-controls are used. Further, in the assessment of this link, this study extends the conceptualisation of eco-controls provided by Rodrigue et al. (2013) and Arjaliès and Mundy (2013) by empirically assessing how eco-controls are used by key decision-makers, in terms of both the style of use (Simons 1995) and bureaucratic stance (Adler & Borys 1996) towards eco-controls.

As outlined in Figure 1, it is argued that the level of proactive (as opposed to reactive) environmental strategy is likely to affect how managers utilise the various eco-controls. The constructs for eco-controls are based on Simons’ (1995) four basic levers of control, namely: i) beliefs systems, ii) boundary systems, iii) diagnostic controls, and iv) interactive controls, as well as Adler and Borys’s (1996) enabling (versus coercive) bureaucratic stance towards control.
The second link of the conceptual framework seeks to identify how the use of eco-controls contributes to firms’ performance outcomes. It is proposed that the effect of eco-controls, being a specific application of MCS, may therefore be observable at an intermediary level of performance, that is, environmental performance (Henri & Journeault 2010). As such, following prior studies such as Henri and Journeault (2010) and Wisner et al. (2006), the conceptual framework undertakes a mediating stance on the role of eco-controls in increasing economic performance through improved environmental performance.

Based on the framework, three distinct sets of hypotheses are developed (Chapter 3). First, it is proposed that the level of proactive environmental strategy will have
positive associations with: i) the *style of use* of eco-controls in terms of each of Simons’ four LOC, and ii) the *bureaucratic stance* on eco-controls. Second, it is proposed that the emphasis of the four LOC and a more enabling bureaucratic stance on eco-controls will have a positive association firms’ environmental outcomes. The third and final set of hypotheses proposes a positive link between environmental and economic performance. A more detailed theoretical development of the conceptual model is undertaken in Chapter 3.

### 1.6 Brief Overview of the Research Design

This study adopts a mixed-mode research design which includes the use of both quantitative and more interpretive qualitative techniques (Modell 2009) in order to place a balanced emphasis on both theory testing and development (Modell 2005).

The quantitative component involves the use of data obtained from a cross-sectional questionnaire-survey administered to medium- to large-sized organisations operating within Australia. Grounded in the resource-based view of the firm (Wernerfelt 1984), the study adopts structural equation modelling (SEM) to test eleven (11) hypotheses based on the conceptual framework outlined above. Following the formal hypothesis testing, a model generating process (Jöreskog 1993) is used to assess the validity of the primary findings, and also to explore the finer relations existing between the focal constructs. Additional details about the survey design and administration, as well as the statistical analysis methods, are presented in Chapter 4.

The qualitative component of this research involves case analysis of two organisations in the Australian forestry industry, informed by in-depth interviews of a total of eleven (11) managers and environmental specialists from the two firms. Analysis is guided by an institutional perspective (Rose & Miller 1992; Arena,
Arnaboldi & Azzone 2010) to elucidate the environmental strategic rationalities, environmental experts and champions, and eco-control technologies which shape the case firms’ environmental management practices. The methodology followed to conduct the case studies appears in detail in Chapter 6.

By combining a cross-sectional survey with a comparative case studies concerning the organisational dynamics of environmental strategy and managerial controls, this study attempts to draw some exploratory results about how key organisational members come together to make sense of their environmental strategy, and the human perceptions and interactions involved in selecting and using eco-controls for environmental performance management. Thus, the use of case studies allows the analysis to focus on the socially-complex nature of environmental management practices, in an attempt to identify the actors and organisational roles which may be critical, yet remain unspecified in a large-scale survey.

1.7 Intended Contributions of the Study

This study presents several potential contributions to theory and practice. The primary contribution lies in the assessment of the gap in knowledge about the relationship between environmental strategy and eco-control systems, and their impact on organisational performance outcomes. Specifically, this study contributes to the literature in the following ways:

First, prior studies, such as Perego and Hartmann (2009) and Pondeville et al. (2013, p. 327), have identified that ‘the fit between corporate strategy and a firm’s MCS translates into a natural environment framework’. In line with the descriptive and case evidence provided by Arjaliès and Mundy (2013) and Rodrigue et al. (2013), this study extends the conceptualisation of eco-controls by empirically examining
how eco-controls are *used* by key decision-makers, in their achievement of organisational environmental strategic priorities.

In the process, this study also potentially contributes to the mainstream MCS literature in two ways. First, in conceptualising the uses of eco-controls, this study daws on the theoretical arguments of Tessier and Otley (2012) and Adler and Chen (2011), as well as case evidence provided by Chenhall et al. (2010) and Mundy (2010), to distinguish between the *style of use* (Simons 1995) and *bureaucratic stance* (Adler & Borys 1996) towards eco-controls. In doing so, this study provides the first known empirical assessment of the two MCS taxonomies concurrently, thus providing the opportunity to identify potential complementary and substitution effects among these MCS dimensions.

Second, the study responds to calls from the literature to undertake a more holistic view of control by considering how MCS are used at lower hierarchical levels of the organisation (Langfield-Smith 1997; Ferreira & Otley 2009). Specifically, this study provides an empirical assessment of the bureaucratic stance towards eco-control, in order to assess how senior managers’ intentions for employee involvement in the strategy implementation and renewal process relate to firms’ performance outcomes. Further, whereas Chapman and Kihn (2009) examined the underlying design traits of an enabling approach to control (i.e., repair, internal transparency, global transparency and flexibility), this study responds to calls from the MCS literature to further develop the empirical measurement of the theoretical constructs (Ahrens & Chapman 2004; Naranjo-Gil & Hartmann 2006) and explicitly analyses the overall concept of enabling bureaucracy.
This study further intends to contribute to the eco-control literature by providing additional insight into the link between firms’ use of eco-controls and their performance outcomes. In particular, it provides an added dimension to Henri and Journeault’s (2010) study by systematically examining how the use of eco-control information by organisational members, in terms of the impact of the style of use and bureaucratic stance towards eco-controls, contributes to firms’ environmental performance outcomes.

Finally, the assessment of the link between environmental and economic performance aims to contribute to an area where the results are inconclusive. Uncertainty surrounding this link stems from the ambiguity of the relationship between pollution reduction and profitability (Christmann 2000; Wagner 2005), and from the inconsistent findings concerning benefits derived from formal environmental management systems versus an informal or less rigorous set of environmentally-focused activities (Melnyk, Sroufe & Calantone 2003; Perez et al. 2007; Boiral & Henri 2012). Specifically, consistent with Henri (2006) and Grafton et al. (2010), this study proposes that insights from the resource-based view of the firm may help to resolve some of the ambiguous findings from the literature that attempts to relate MCS use and organisational outcomes, in terms of both environmental and economic performance.

Further to the confirmatory analysis of the conceptual model outlined above, the current study also seeks to advance the extant theory in the area. Specifically, the study undertakes a more exploratory analysis of the strategy-structure-performance link within an environmental management context, through the use of both quantitative and qualitative research methods. First, by adopting a model generating strategy within SEM (Jöreskog 1993), this study seeks to identify possible alternate
models which offer substantively meaningful explanations of the relations present in the sample data. Such a strategy, although widely embraced by other disciplines, has been infrequently used in management accounting research (Smith & Langfield-Smith 2004). Second, two comparative case studies are undertaken from an institutional perspective (Rose & Miller 1992; Arena et al. 2010) in order to gain deeper insight into the socially-complex, organisational dynamics of environmental strategy and management controls. Thus, the case studies aim to complement the findings from the questionnaire-survey and allows for a more in-depth analysis of the internal mechanisms driving environmental management activities.

This study also offers several possible implications for management practices. First, managers are likely to become more aware of how using control systems in particular ways (e.g., interactively versus diagnostically, and enabling versus constraining) in a given environmental strategy may affect firm environmental as well as economic performance. Further, a better understanding of the trade-offs or synergistic effects within eco-control systems, in relation to style of use and bureaucratic stance towards eco-controls, will also foster the use of different dimensions of eco-controls both effectively and efficiently.

1.8  Overview of Thesis

The remainder of this research is organised as follows. Chapter 2 begins by reviewing the two major streams of literature pertaining to this study, in relation to environmental strategy and eco-controls and their respective impacts on firms’ environmental and economic outcomes. This is followed by a review of the mainstream MCS literature to introduce two conceptual frameworks which elaborate on how controls systems may be used, namely, the style of use of controls and the
Chapter 1: Introduction

bureaucratic stance towards control, and finally, provides an overview of the literature concerning the link between firms’ environmental and economic performance. Chapter 3 develops a conceptual framework integrating the environmental strategy and eco-control literature. Drawing primarily on theoretical insights from the resource-based view of the firm, as well as empirical findings of previous studies, specific research hypotheses based on the framework are developed. Chapter 4 outlines the methodology adopted in carrying out the quantitative part of the research, and provides an explanation of the sampling frame and selection criteria, the use of a survey questionnaire, and the definition and measurement of the individual constructs. This is followed by a description of the procedures and methods of analysis of the data collected.

Chapter 5 reports and discusses key findings from the survey study. The results of the formal hypotheses testing are presented, followed by the outcomes of a model generating process to further explore the relations present in the data. Chapter 6 presents comparative case studies of two firms operating in the Australian forestry industry about the organisational dynamics of environmental strategy and management control. Chapter 7 concludes the thesis by drawing on the results of the survey and insights from the case studies to summarise the overall findings and contributions of the study. This is followed by a summary of the limitations of the study, and suggested directions for future research.
Chapter 2: Literature Review

2.1 Introduction

This chapter provides a literature review of the two major streams of research pertaining to this study. The first research stream relates to the environmental strategy-performance linkage and the review covers the conceptualisation of different environmental strategies, and their impact on organisational structure and processes. The second stream of research reviews the role of management control mechanisms in environmental management within firms (otherwise referred to as eco-controls), and their impact on the firms’ economic and environmental outcomes.

Section 2.2 evaluates the environmental strategy literature and the review includes an overview of how the construct has been conceptualised in prior studies, as well as the key antecedents and organisational outcomes which have been examined in the literature. Section 2.3 introduces the concept of eco-control, as a specific application of MCS, and outlines the limited empirical research in the area. Section 2.4 provides a review of the mainstream MCS literature to introduce two conceptual frameworks which elaborate on how controls systems may be used, namely, the style of use of controls and the bureaucratic stance towards control. The final section (i.e., Section 2.5) provides an overview of the literature concerning the link between firms’ environmental and economic performance.
2.2 Environmental Strategy

2.2.1 Definition of Strategy

The concept of strategy, put simply, refers to a plan to achieve a pre-determined goal or set of goals (Chandler 1962; Ansoff 1965). In management research, the study of strategy has been undertaken at different levels – organisational versus business, tactical and operational. Further, the propensity has been to study strategy as given or one that has been intended, rather than as an emergent phenomenon (Langfield-Smith 1997; Tucker et al. 2009). The traditional view of intended strategy as ‘a deliberate conscious set of guidelines that determine decisions into the future’ regards strategy as explicit, developed consciously and purposefully, and made in advance of the specific decisions to which it applies (Mintzberg 1978, p. 935). An alternate view recognises that a strategy may be realised through a pattern in a stream of decisions, that is, something to be understood by observing the emerging pattern of organisational decisions (Mintzberg 1978).

Environmental strategy pertains to the achievement of certain goals in relation to firms’ interactions and impact on the natural environment. This includes the consideration of the various threats and opportunities facing an organisation in managing and interacting with the natural environment. As noted above, environmental strategy may be either pre-determined, or realised through a consistent pattern of organisational decisions over time. A review of the literature, however, finds that environmental strategy as a research construct lacks consistency, in terms of both focus and its measurement. The following section outlines commonalities observed in the environmental strategy typologies, as adopted in empirical studies.
2.2.2 Environmental Strategy Classifications and Typologies

The literature on environmental management comprises fragmented conceptualisations of the subject matter, influenced by the diversity of academic disciplines that examine the natural environment and business organisations. Within the managerial literature alone, there exists a wide variety in the nomenclature adopted to describe a firm’s approach to the natural environment. Examples include: *environmental management practices* (Aragón-Correa 1998), *environmental issues integration* (Judge & Douglas 1998), *environmental commitment* (Henriques & Sadorsky 1999), *environmental management* (Christmann 2000), *corporate environmentalism* (Banerjee 2002; Banerjee et al. 2003), and, perhaps more popularly, *environmental strategy* (Sharma & Vredenburg 1998; Sharma 2000; Buysse & Verbeke 2003; Wisner et al. 2006; Aragón-Correa et al. 2008; Perego & Hartmann 2009).

However, within these broader definitions, a general consensus is observed. The majority of studies primarily owe their epistemological foundations to early models developed by Carroll (1979) and Wartick and Cochrane (1985) on corporate social responsibility – namely, the reactive, defensive, accommodative and proactive (RDAP) scale (Henriques & Sadorsky 1999; Buysse & Verbeke 2003). Early conceptual works, such as Roome (1992) and Hunt and Auster (1990), establish progressive stage models to categorise firms based on their response to the challenges presented by the natural environment. These classifications were empirically identified in the literature by studies such as Aragón-Correa (1998), who

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3 The scale suggests that ‘social responsiveness can range on a scale from no response (do nothing) to a proactive response (do much)’ (Carroll 1979, p. 501). In detail, a reactive firm does nothing (and fights all the way), a defensive firm does only what is required, an accommodative firm is progressive on social responsiveness, and a proactive firm leads the industry (Carroll 1979).
applies Roome’s (1992) strategic options model to group firms based on their adoption and implementation of a range of environmental management practices.

Table 1: Environmental strategy continuum models / typologies

<table>
<thead>
<tr>
<th>Source</th>
<th>Model Stages or Typologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunt &amp; Auster (1990)</td>
<td>Beginner, Fire Fighter, Concerned Citizen, Pragmatist, Proactivist</td>
</tr>
<tr>
<td>Aragón-Correa (1998)</td>
<td></td>
</tr>
<tr>
<td>Henriques &amp; Sadorsky (1999)</td>
<td>Reactive, Defensive, Accommodative, Proactive</td>
</tr>
<tr>
<td>Aragón-Correa et al. (2008)</td>
<td></td>
</tr>
<tr>
<td>Sharma et al. (1998, 2000)</td>
<td>Conformance, Voluntary</td>
</tr>
</tbody>
</table>

Other studies that cluster strategy groups based on the subject firms’ environmental strategy include Henriques and Sadorsky (1999) and Buysse and Verbeke (2003), who identify four and three strategy-clusters in their respective studies of stakeholder influence on firms’ environmental management practices. However, recent studies adopt a simplified continuum ranging from a reactive stance at one end to a proactive stance at the other end (e.g., Perego & Hartmann 2009). At one end of the scale, a reactive posture is a post hoc response to environmental regulations, stakeholder pressures and environmental incidents (Aragón-Correa & Sharma 2003). This involves investments in already developed technologies, which do not require the firm to develop expertise or skills (Russo & Fouts 1997). At the other end, a proactive environmental strategy considers the natural environment a source of

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4 Aragón-Correa et al. (2008) also identify three environmental strategy clusters, congruent with the theoretical typologies adopted in Buysse and Verbeke (2003), during the preliminary analysis of their study of environmental strategy and performance in small firms.
opportunity and ‘involves anticipating future regulations and social trends and
designing or altering operations, processes and products to prevent (rather than
merely ameliorate) negative environmental impacts’ (Aragón-Correa & Sharma
2003, p. 73). This requires the acquisition and installation of new technologies
(Russo & Fouts 1997) that involve higher-order learning, motivated by continuous
improvement (Russo & Fouts 1997; Aragón-Correa 1998; Sharma & Vredenburg
1998).

Although there is substantial overlap between measurement constructs, approaches to
the operationalisation of environmental strategy in empirical studies may generally
be distinguished from two perspectives. The first perspective concerns the
operational and administrative domains of environmental management. Operational
or functional measures typically start with a list of environmental management
practices, and seek to identify patterns in the behaviour of organisations based on
their higher or lower levels of implementation (e.g., Aragón-Correa 1998). Such
measures may be customised to the specific environmental impacts of operations in a
single industry (Sharma & Vredenburg 1998; Christmann 2000; Sharma 2000), or
generalised across industry sectors (Aragón-Correa 1998; Henri & Journeault
2008a). By contrast, administrative measures assess the extent to which
environmental issues have been integrated into the organisation’s formal planning
and decision-making processes. Again, a broad range of measurement items have
been adopted, such as whether the organisation has an environmental management
committee or Environment, Health and Safety unit (Henriques & Sadorsky 1999),
has incorporated environmental issues in strategic planning processes and mission
statements (Judge & Douglas 1998; Perego & Hartmann 2009), or undertakes
internal and external reporting of environmental performance (Buysse & Verbeke 2003).

The second perspective concerns the number of dimensions adopted in the environmental strategy measure, which vary from single to multiple dimensions (González-Benito & González-Benito 2005). The first group of studies observes that an organisation’s operational or administrative facets of environmental management can be reduced to a single factor. That is, they assume a single linear path that firms follow when developing their environmental strategies (Hunt & Auster 1990; Roome 1992; Judge & Douglas 1998; Sharma & Vredenburg 1998; Henriques & Sadorsky 1999; Sharma 2000; Buysse & Verbeke 2003; Perego & Hartmann 2009). Other studies have adopted a multi-dimensional and contingent view, and suggest that the diversity of approaches to environmental management give rise to different manifestations of environmental strategy. For example, Banerjee et al. (2002; 2003) differentiate between *environmental strategy focus*, the degree to which the natural environment has been integrated into the organisation’s strategic planning processes, and *corporate environmental orientation*, which involves the diffusion of environmental preservation values throughout the organisation.

In summary, environmental strategy has been studied based on a variety of assumptions. For the purposes of this study, environmental management is framed as the intended strategic response to the various threats and opportunities facing an organisation. Environmental strategy thus is assumed to vary from a more reactive to a more proactive approach, where strategic proactivity is defined as ‘a firm’s tendency to initiate changes in its various strategic policies rather than react to events’ (Aragón-Correa 1998, p. 557). Further, such a strategy may be either intentionally formed or realised through a pattern in a stream of decisions. In the
following section, the factors that affect and characterise a proactive environmental strategy are discussed.

2.2.3 Proactive versus Reactive Strategic Approaches to the Environment

Common to the prior studies is the underlying assumption that the level of environmental management undertaken by an organisation represents a strategic choice exercised by top management, and that this choice is influenced by management’s perceptions of a number of contingencies in firms’ internal and external operating environment. Further, Banerjee (2002) identifies three major themes underlying the conceptualisation of environmental strategy in past studies: recognition of the importance of environmental issues, recognition of multiple stakeholders’ environmental concerns, and the level of integration of environmental issues into a firm’s strategic planning.

A seminal study by Aragón-Correa (1998) draws on the entrepreneurial, engineering, and administrative dimensions of the Miles and Snow (1978) prospectors and defenders typologies to examine the relation between proactive business strategies and firms’ approaches to the natural environment. The study’s findings indicate that approaches to the natural environment can be grouped into three distinct clusters (traditional, modern and information/education), and that firms with more proactive business strategies adopt more advanced approaches to the management of the natural environment.

While the results of Aragón-Correa (1998) suggest a consistency between overall business strategies and approaches to environmental management, other studies focus on the perceived strategic importance of environmental responsiveness. For
example, Judge and Douglas (1998) report that increases in the level of resource commitment to environmental management, and the broad functional coverage of environmental management responsibilities (decentralisation), facilitate companies’ abilities to integrate environmental concerns into the formal strategic planning process. Sharma (2000) examines the links between managerial interpretations of environmental issues and corporate choice of environmental strategy. Using survey data from the Canadian oil and gas industry, the results indicate that managers’ interpretation of environmental issues as opportunities, rather than threats, leads to a higher likelihood of the company exhibiting voluntary environmental strategies. Further, managers’ interpretation of environmental issues as opportunities were significantly influenced by the legitimation of environmental issues as an integral aspect of corporate identity, and the discretionary slack (time and resources) available to managers.

Through their examination of both internal and external influences on firms’ approaches to environmental management, Banerjee et al. (2003) adopt an approach typical of contingency theory in which contextual and structural variables are posited to ‘fit’ with different manifestations of environmental strategy (Burns & Stalker 1961; Lawrence & Lorsch 1967). The study findings indicate that top management commitment is the single most influential precursor to both environmental strategic planning and company-wide environmental orientation (Banerjee et al. 2003).

Other studies adopt a perspective consistent with stakeholder theory to explore the influences motivating firms’ environmental management practices. Based on a cross-sector survey of Canadian firms, Henriques and Sadorsky (1999) identify four strategy clusters, ranging from reactive to proactive, based on their integration of environmental issues into the administrative functions of the organisation. The
authors observe that firms with more proactive strategies do differ from less environmentally-committed firms in their perceptions of the relative importance of different stakeholders.

Buysse and Verbeke (2003) provide similar evidence for firms operating in Belgium in a range of industries. The results of the study indicate that firms with a reactive environmental strategy attach importance primarily to domestic regulators, local public agencies and international agreements, suggesting that ‘firms pursuing a reactive environmental strategy would probably not even have addressed environmental issues in the absence of regulations’ (Buysse & Verbeke 2003, p. 463). However, the more proactive environmental leadership strategy is associated with deeper and broader coverage of both internal and external stakeholders, but not associated with a rising importance of environmental regulations. This suggests firms in the environmental leadership group tend to voluntarily adopt proactive environmental strategies, and are motivated by ethical or entrepreneurial objectives rather than regulatory observance alone (Buysse & Verbeke 2003).

The above discussion illustrates that organisations’ rationales for environmental responsiveness goes beyond the traditional normative moral or social arguments. Taken collectively, these studies provide a view of proactive environmental strategies as a strategic choice made by management in the pursuit of mutually beneficial outcomes which serve to both reduce the environmental impact of their operations and increase overall competitiveness. The following section outlines studies which have explored how firms’ environmental management activities have both directly and indirectly contributed to overall firm performance.
2.2.4 Environmental Strategy and Organisational Outcomes

Some early researchers contend that while talk is cheap, responding to environmental challenges is a costly and complicated position for managers (e.g., Walley & Whitehead 1994). Nevertheless, studies examining the long-run relation between pollution prevention and economic performance in environmentally-sensitive industries have failed to support the expectation that firms’ pollution abatement activities would result in a negative impact on economic performance (e.g., Freedman & Jaggi 1992, 1994).

Other scholars argue that rather than concentrate on the trade-offs between business and environmental concerns, firms should consider the positive aspects of environmental management. Porter and Van der Linde (1995a, 1995b) sought to shift the debate away from focusing on costly pollution control techniques, to a view of pollution as a resource inefficiency and potential source of cost advantage. This concept, termed eco-efficiency, thus requires managers to exhibit innovative and creative methods to produce more or the same level of useful goods, while simultaneously reducing environmental degradation, resource consumption, and costs (WBCSD 2000).

Beyond an environmental least-cost strategy, firms may also achieve a competitive advantage through adopting environmental differentiation, niche market, and first-mover strategies (Hart 1995; Shrivastava 1995c; Reinhardt 1999). For example, firms may pursue increased revenues by promoting their environmental credentials in a bid to improve their external image relative to competitors and attract environmentally-conscious consumers. Furthermore, there are competitive advantages in the innovations and development of internal firm capabilities that
often result from the examination of capital processes and product improvements (Hart 1995; Shrivastava 1995c; Epstein 1996b).

These studies mostly draw on the resource-based view (Wernerfelt 1984; Barney 1991) and natural resource-based view (Hart 1995) as competitive theories of the firm. These views, in general, argue that the basis for a competitive advantage for a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal (Wernerfelt 1984). These resources can be classified into three general categories: First, tangible resources include the physical capital resources, such as the technology adopted by a firm, plant and equipment, and access to raw materials. Second, personnel-based human capital resources consider the training, experience and expertise of employees, as well as broader notions of firm culture. Finally, the third type of organisational resources include a firm’s formal and informal planning, management control, and reporting systems, as well as the firm’s ability to foster good relationships between groups within the firm and in its external environment (Barney 1991; Grant 1991; Amit & Schoemaker 1993). To transform a short-run competitive advantage, such as a cost advantage derived from adopting eco-efficient practices, into a sustained competitive advantage requires that these resources must be valuable and non-substitutable, rare and/or specific to a given time (Barney 1991), and difficult for competitors to replicate because they are either tacit (causally ambiguous) or socially complex (Hart 1995).

Grounded in the resource-based view of the firm, Russo and Fouts (1997) highlight the role environmental management plays in generating broader organisational advantages that allow firms to capture premium profits. Drawing on the three general categories of competitive resources outlined above, Russo and Fouts (1997, p. 552) provide theoretical support for their contention that firms that tend towards a reactive
environmental strategy will differ in their resource base from those that tend towards a proactive strategy, and that this strategic choice will affect firms’ ability to generate profits. Using independently-developed environmental ratings, the study observes that ‘it pays to be green’ and finds a positive relation with firm performance. Given the study does not explicitly quantify either firm resources or capabilities, the authors conclude that a conspicuous research implication is the need for future researchers to ‘identify the full chain of variables connecting the end links’.

Consistent with this reflection, Judge and Douglas (1998, p. 249), for instance, suggest that the integration of environmental issues into the strategic planning process ‘goes beyond mere compliance with regulations, and includes activities that also measure the proactiveness of the organisation with respect to this issue’. Following Hart (1995), the authors argue that dealing with natural environmental issues is a complex, social process, and therefore ‘the ability to integrate the natural environment into the strategic planning process offers a firm the opportunity to develop a valuable, potentially rare, and not easily imitated organisational capability’ (Judge & Douglas 1998, p. 243).

Other studies seek to identify the specific capabilities developed by firms adopting proactive environmental strategies. Sharma and Vredenburg (1998) employ a two-phase study in a single industry context, to establish the applicability of the resource-based view to environmental responsiveness. Using comparative case studies of nine companies in the Canadian oil and gas industry, they provide evidence of the development of capabilities for stakeholder integration, higher-order learning, and continuous innovation in firms labelled as having proactive environmental strategies. Sharma and Vredenburg (1998, p. 749) thus conclude that ‘proactive environmental..."
strategies may invoke the process suggested by the resource-based view of the firm and lead to competitive advantage’.

Christmann (2000) further considers the facilitating role of firm resources and capabilities, and analyses whether these complementary assets are required to gain cost advantage from implementing ‘best practices’ of environmental management. Results based on survey data from 88 US chemical companies indicate that the adoption of (already developed) pollution prevention technologies and the early timing of environmental initiatives relative to industry peers do not contribute to cost advantage, whereas the in-house innovation of pollution prevention technologies provided a weak, but positive contribution. However, after controlling for the role of complementary assets, the results indicate that capabilities for process implementation and innovation moderated the relationship between all three process-focused best practices and cost advantage, and explain why some firms get positive economic benefits from adopting such practices while others do not. Thus, the author concludes that ‘the application of the resource-based view of the firm to the analysis of environmental strategies highlights the importance of heterogeneity in firm resources and capabilities’, and suggests that future research analyses environmental strategies in the broader context of firms’ existing resources and capabilities (Christmann 2000, p. 675).

2.2.5 Summary

There have been a number of different approaches to assessing a business’s environmental strategy. Further, a number of contingencies have been identified in firms’ internal and external operating environments which contribute to the

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5 Complementary assets are defined as ‘resources that are required to capture the benefits associated with a strategy, a technology, or an innovation’ (Christmann 2000, p. 664), and are thus analogous to the concepts of competitive resources and capabilities outlined above.
development of proactive environmental strategies. Examples of business settings conducive to proactive environmental management include: firms pursuing prospector business strategies (Aragón-Correa 1998; Aragón-Correa et al. 2008); the legitimation of environmental issues as part of the corporate identity (Sharma 2000); senior managers’ commitment to environmental management (Banerjee et al. 2003; Wisner et al. 2006) and perception of environmental issues as opportunities for competitive advantage (Sharma 2000; Banerjee et al. 2003); and, consideration of a broad range of stakeholder influences (Henriques & Sadorsky 1999; Buysse & Verbeke 2003) to respond to environmental issues in a manner that goes beyond conformance to institutional and regulatory pressures (Sharma & Vredenburg 1998).

However, strategic priorities alone may not be sufficient to achieve competitive advantage and ensure high organisational performance. Drawing on the resource-based view of the firm (Wernerfelt 1984; Barney 1991), an organisation’s competitive resources, and in particular its personnel and human-capital resources, play a key role in supporting and indeed developing organisational environmental strategy (Judge & Douglas 1998). Furthermore, management’s ability to capture the collective learning of the organisation and cultivate unique internal capabilities points to a potential avenue for converting proactive environmental strategies into a competitive advantage (Sharma & Vredenburg 1998; Christmann 2000).

Still, prior studies have largely focused on the first two of the three resource domains comprising the resource-based view of the firm (Barney 1991; Grant 1991), tending to focus on firms’ tangible resources, such as pollution prevention technologies, and personnel-based human capital resources, such as the collective experience and expertise of employees for innovation. A more recent vein of research has begun to explore concepts consistent with the third resource domain, comprising firms’
organisational resources. These studies explore how a firm’s formal and informal planning, management control, and reporting systems are used to support proactive environmental strategies and deliver desirable performance outcomes. Accordingly, the following section provides an introduction to the second major stream of research relevant to this study, that is, the research on eco-control and, more broadly, MCS.

### 2.3 Management Control Systems (MCS)

Management control was defined by Anthony (1965) as ‘the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of the organisations objectives’, and is accordingly regarded as the key function of corporate management. This definition, which has since proved limited in its scope, suggests a focus on largely accounting-based controls of planning, monitoring, and performance measurement, and consequentially separated management control from strategic and operational control (Langfield-Smith 1997).

Another common view describes MCS as the set of procedures and processes that managers use to help ensure that employees achieve both their own and their organisation’s objectives (Otley & Berry 1994; Bisbe & Otley 2004). They may be formally designed and implemented, such as feedback mechanisms, which identify the success or failure to achieve specific objectives. Formal controls also include feed-forward mechanisms, such as administrative controls (rules and standard operating procedures), personnel controls (HR systems) and behaviour controls (the ongoing monitoring of activities and decisions) (Langfield-Smith 1997). Control may also be informal, based on shared values, beliefs and traditions which guide the behaviour of employees. Such informal controls ‘often derive from, or are an artefact of the organisational culture’ (Langfield-Smith 1997, p. 208), and from subtle
reading of signals relayed from supervisors and co-workers (Norris & O'Dwyer 2004).

Studies investigating the design of MCS are generally concerned with the configuration of specific controls, such as rules, procedures, routines, mechanisms and practices that provide information for decision-making (Tucker et al. 2009). These studies focus on subjects such as the formality of controls (Slagmulder 1997); the scope, integration, aggregation and timeliness of information (Bouwens & Abernethy 2000); the selection of particular accounting performance measures (Ittner & Larcker 1998); and the extent to which specific targets were set and revised (Chenhall 1997).

It is also acknowledged that MCS play a critical role in supporting an organisation’s strategies (Kober et al. 2007). Accordingly, a broad body of research linking strategy and MCS has evolved, much of which supports the need for internal organisational procedures, including MCS, to be aligned with the entity’s strategic orientation. Traditionally, strategy-MCS research has focused primarily on the search for controls that are suited to particular business-focused competitive strategies (Langfield-Smith 1997; Chenhall 2003). Such content-based studies generally rely on generic typologies of business strategies, such as prospectors-analysers-defenders-reactors (Miles & Snow 1978); build-hold-harvest (Gupta & Govindarajan 1984); and product differentiation-cost leadership (Porter 1980).

For example, prospector strategies, which involve firms competing through seeking new product and market development opportunities, are seen to place a higher

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6 Alternatively, process approaches to strategy-MCS research typically identify and investigate the processes used to formulate and implement strategy, the dynamic relationships between strategic position, resources and outcomes, and issues relating to strategic change (Tucker et al. 2009).

7 See Langfield-Smith (1997) for a review of early-strategy research, including a comparative graphical mapping of the alternate typologies listed here.
importance on forecast data, budget setting and the monitoring of outputs (Simons 1987). Conversely, defender firms, that engage in little market/product development and compete through cost leadership, quality and service, generally use control systems less intensively, and may experience negative relations between firm performance and control attributes, such as tight output goals and budget monitoring (Simons 1987).

This study seeks to examine the use of eco-control systems as a specific application of MCS, in order to support a firm’s environmental strategic priorities. The next section provides an overview of the concept of eco-control, followed by a review of studies concerned with the linkages between organisational environmental strategy and aspects of eco-control, as well as the impact of adopting eco-control systems on businesses’ environmental and economic performance.

2.3.1 Eco-control

The concept of eco-control refers to the formalised organisational systems and resources concerned with the environmental and related financial impacts of a company. As outlined in Figure 2, eco-control is a multi-dimensional concept which can be divided into five procedures: goal and policy development; information management (environmental accounting and reporting); decision support; steering and implementation; and internal and external communication (Schaltegger & Burritt 2000).

Schaltegger and Burritt (2000) envisage goal and policy development as central to the effectiveness of a formalised eco-control system. They argue ‘it is essential that top managers define the purpose of environmental management activities and are involved in the process of goal-setting in order to ensure organisational commitment
to the environmental strategy once it is formulated’ (Schaltegger & Burritt 2000, p. 386). Such practice helps to signal top management’s commitment to environmental issues, as well as providing clarity on the strategic rationalities justifying why a particular environmental strategy has been chosen and the specific operational domains where environmental improvements are to be made.

Figure 2: The concept of eco-control

![Diagram of eco-control process]

Adapted from Schaltegger and Burritt (2000)

After this first eco-control procedure is complete, and strategic priorities have become apparent, the remaining four procedures are concerned with the operationalisation of these priorities into the day-to-day activities of the organisation. ‘Information management is at the core of any environmental management system’
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(Schaltegger et al. 2008, p. 438), and may be facilitated via the establishment of an environmental management accounting (EMA) system. This may be broadly defined to include the identification, collection, and analysis of two types of information: physical information on the use, flows and destinies of energy, water, and materials (including wastes); and monetary information on environment-related costs, earnings and savings (International Federation of Accountants 2005).

The communication procedure requires formalised processes to ensure that the link between environmental strategy and corporate success is explained. Employees throughout the organisational hierarchy ‘should be familiar with the environmental issues in their area and how the company is dealing, or plans to deal with them. Managers should also have an idea of how they can use the information derived from eco-control to help improve corporate competitiveness’ (Schaltegger & Burritt 2000, p. 397). Relatedly, decision support requires providing decision-makers throughout the organisation with ‘a logical and transparent method for taking environmental and economically-sound decisions in accordance with the data’ collected and analysed during information management procedures (Schaltegger & Burritt 2000, p. 389). For example, the inclusion of environmental aspects in formal employee training régimes, along with readily accessible environmental procedure manuals, can substantially contribute to the transparency of environmental management activities.

The final procedure of steering and implementation encapsulates the various means used to ensure alignment between environmental goals and policies and employee behaviour. Eco-control addresses different levels within the organisation, and combines the very different tasks of environmental data compilation at the operational level and strategic environmental management (Schaltegger & Burritt 2000). Accordingly, the use of eco-controls to align employee behaviour with
environmental goals and policies may range from linking remuneration packages to environmental measures, to promoting the development of shared values and organisation culture surrounding environmental issues.

The five interlinked procedures of eco-control thus underlie a central tenet of the concept of eco-control: the observation that, ‘in practice, it is often the case that only what is measured is managed’ (Schaltegger & Burritt 2000, p. 384). Certainly, environmental management field studies have observed ‘incongruities’ between firms’ external representation of environmental responsiveness, and the operation (or existence) of internal environmental management systems (Masanet-Llodra 2006; Durden 2008). Further, integrating environmental measures into traditional planning and monitoring systems, rather than replacing existing tools and practices, seems an effective means to internalise environmental issues and values, and improve environmental performance (Masanet-Llodra 2006; Perez et al. 2007; Riccaboni & Leone 2010). Accordingly, while the concept of eco-control initially grew out of the operations management literature,8 issues surrounding performance measurement, information management, and management control are generally drawn from the broader organisational accounting and MCS literature. The following section provides a review of studies which draw on the extant MCS literature to examine the antecedents and outcomes of firms’ use of eco-controls.

2.3.2 Empirical Studies of Eco-control

To date, there are limited empirical studies concerning the adoption and role of eco-controls in supporting firm environmental strategy. Of the few studies which have

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8 The concept of eco-control has been attributed to Seidel (1988), though several systems consistent with eco-control were developed in the German-speaking parts of Europe (i.e., Germany, Austria, and Switzerland) and have since become popular across continental Europe (Schaltegger & Burritt 2000).
been undertaken, most have focused on specific elements of eco-control systems, such as plans and procedures (Epstein & Wisner 2005; Wisner et al. 2006), internal accounting and reporting measures (Henri & Journeault 2008a; Ferreira et al. 2010), and employee reward systems (Perego & Hartmann 2009). For example, Henri and Journeault (2008a) report on an exploratory study concerning the use of environmental performance indicators (EPI) among Canadian manufacturing firms. Their findings indicate that, inter alia, firms adopting a proactive environmental strategy use EPIs significantly more than firms with a reactive strategy. Further, they suggest that firms reflecting a proactive environmental strategy appear to use EPIs more intensively to motivate continuous improvement and to provide data for decision-making compared with those firms reflecting a reactive strategy (Henri & Journeault 2008a, p. 171).

Perego and Hartmann (2009) examine firms’ use of EPI in their performance measurement systems, to align decisions and motivate employees’ efforts towards the attainment of environmental strategy (i.e., for steering and implementation). The authors suggest that increased integration of environmental issues into strategic planning ‘signifies the extent to which environmental values and principles have become accepted and ingrained within an organisation’ (Perego & Hartmann 2009, p. 400). They draw upon the definition and measurement of corporate environmentalism developed in Banerjee et al. (2002; 2003) to measure the level of proactivity of environmental strategy. Using survey data from Dutch manufacturing firms, their results indicate that firms with a proactive, as opposed to a more reactive, environmental strategy rely more on employee performance measurement systems.

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9 EPI represent numerical measures, financial or non-financial, that provide key information about environmental impact, regulatory compliance, stakeholder relations, and organisational systems (Henri & Journeault 2008a, p. 166), and thus form part of the information management process of eco-control.
that systematically report environmental performance measures. Further, firms pursuing a proactive environmental strategy rely more on: i) performance measures quantified in both financial and non-financial terms, ii) broad-scope information including forecasts of both internal and external environmental performance, and iii) environmental performance information that is provided on a timely and systematic basis.

Pondeville et al. (2013) further observe a positive relation between environmental strategy and the development of eco-control processes, in a sample of Belgian manufacturing companies. Their study also draws on Banerjee et al. (2003) to develop an activity-based measure to cluster firms based on their degree of corporate environmental strategy proactivity. The study findings indicate that proactive firms are more likely to have developed an environmental information system, and also place greater emphasis on the use of both formal and informal eco-control systems to facilitate communication, decision support, as well as the steering and implementation of environmental objectives. The authors thus conclude that ‘the fit between corporate strategy and a firm’s MCS translates into a natural environment framework’ (Pondeville et al. 2013, p. 327).

While the studies above provide evidence of a general relation between firm environmental strategy and the use of various elements of eco-control, Ferreira et al. (2010) find no such relation between the use of EMA for information management and a prospector business strategy. In their study concerning the role of strategy in relation to EMA use and innovation, Ferreira et al. (2010) found EMA use to be more prevalent in high environmental risk industries (chemical, mining and smelting), and that EMA has a positive association with process innovation but not with product innovation. The authors, however, do acknowledge that the low
response rate (14%) and small sample size (n=40) do limit the generalisability of their findings.

Further to such prior studies that mainly focused on how eco-controls support firm environmental strategy, there have been few attempts to test the influence of eco-control on environmental and economic performance. A notable exception, however, is Epstein and Wisner’s (2005) study that used data from Mexican manufacturing facilities to empirically link the implementation of environmental strategy to performance outcomes through a variety of eco-control processes. Their results indicate facilities that incorporate environmental issues into measurement systems (i.e., information management), plans and procedures (i.e., decision support), as well as internal mission statements and employee reward systems (i.e., steering and implementation), also report higher levels of compliance with environmental regulations. In a comparable study, Wisner et al. (2006) report that an alignment of management commitment, strategic planning, and proactive managerial actions towards environmental management, is associated with higher environmental performance for a sample of US firms with an explicit interest in environmental management. They also demonstrate that such an alignment may contribute to a competitive advantage, finding that good environmental performance that is driven by effective management processes is significantly and positively related to measures of earnings growth and return on investment.

Henri and Journeault (2010) adopt a broader conceptualisation of eco-control which incorporates the use of environmental budgeting, performance measures, and employee incentives within a single, uni-dimensional measure. Using survey data collected from a sample of Canadian manufacturing firms, the authors report there is no direct relation between firms’ use of eco-controls and economic performance, but
a mediating effect of environmental performance is observed in limited contexts. The findings of Henri and Journeault (2010), therefore, raise the question of why the economic benefits of using eco-controls to improve environmental performance do not accrue uniformly, given some firms attain a competitive advantage from improved environmental performance whereas others do not?

In fact, this question is consistent with observations emerging from a growing body of literature concerning environmental certification standards, such as the European Community’s Eco-Management and Audit Scheme (EMAS) and the International Standard ISO 14001, which provide organisations with guidance on the development of an eco-control system. For example, Melnyk et al. (2003) observe that firms adopting a formalised eco-control system perceive benefits well beyond pollution abatement and also experience improved performance such as reduced costs, improved quality, and enhanced reputation. Furthermore, an additional significant, positive incremental impact on performance is observed for firms who obtain certification to the ISO 14001 standard (Melnyk et al. 2003). However, a number of recent studies concerning environmental certification standards suggest a more complex relationship exists.

Using case evidence from ten Spanish EMAS registered sites, Perez et al. (2007) observe that levels of ‘environmental embeddedness’ varied between the organisations studied, despite their adherence to a uniform standard. The authors further note that a higher commitment of managers and a more sophisticated use of management accounting practices – favouring visibility, control, and decision-making – contribute to embedding environmental issues and values into the organisation, facilitating organisational change and enhancing environmental performance (Perez et al. 2007).
An alternate perspective is provided by Boiral (2007), who presents the case study results of nine ISO 14001 certified Canadian organisations. The study finds that although rigorous compliance with the standard resulted in real improvements, most improvements were primarily technical and administrative in nature and allowed organisations to showcase their conformity with the ISO 14001 system during audits. Further, in most of the cases studied, ‘daily practices remained somewhat decoupled from the prescriptions of the ISO 14001 system, of which employees generally had only a vague understanding’ (Boiral 2007, p. 127). In addition to these observations, Boiral and Henri (2012) use survey data collected from Canadian manufacturing firms to compare a traditional instrumental model and a legitimacy-based model to explain why firms seek ISO 14001 certification. Their results suggest that ISO 14001 certification ‘is primarily a response to external pressures aimed at re-aligning the organisation with social expectations’ (Boiral & Henri 2012, p. 91), and that managerial practices specifically required by this standard (environmental audits, documentation of practices, etc.) do not seem to be linked to improved environmental performance. Instead, improved environmental performance is the result of actions independent from ISO 14001 certification, such as the integration of environmental issues into strategic planning.

Prajogo et al. (2012) build on the perspectives offered by Perez et al. (2007), Boiral (2007), and Boiral and Henri (2012), to assess whether the underlying motives for adopting formalised eco-control systems is aligned with the types of benefits accrued. Using survey data of Australian organisations certified to ISO 14001, their results indicate that firms adopting formalised eco-control systems due to external pressures will focus on obtaining legitimacy and marketing benefits from their status as certified firms, whereas those with internal motives achieve both improved
environmental performance and social benefits. Further, internal motives do not appear to have a direct effect on market benefits, but rather must be achieved through the positive association with environmental and social benefits.

2.3.3 Summary

A review of the emergent stream of literature focusing on the adoption of an environmental perspective in the design and use of management controls, termed eco-controls, suggests that research in the area is still developing. Initial studies have established that the link between strategy and MCS may also exist within a natural environment framework (Perego & Hartmann 2009; Pondeville et al. 2013), and also that the use of eco-controls may lead to improved environmental and economic performance in certain circumstances (Epstein & Wisner 2005; Wisner et al. 2006; Henri & Journeault 2010).

However, the conceptual development of eco-controls requires further consideration, with most prior studies focusing on limited aspects of eco-control (Henri & Journeault 2008a; Perego & Hartmann 2009; Ferreira et al. 2010) rather than measures which encapsulate the broader concept (Schaltegger & Burritt 2000; Henri & Journeault 2010). Further, the important distinction between the design and the use of eco-controls has not been acknowledged in many prior studies (e.g., Epstein & Wisner 2005; Henri & Journeault 2010). For example, while the information management procedure of eco-control provides for the collation of physical and monetary data for decision-making, the different uses of eco-controls may significantly affect how such data are used, and who uses the data, in facilitating the communication, decision support, and steering and implementation procedures, respectively.
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The following section provides a review of the mainstream MCS literature to introduce two conceptual frameworks which elaborate on how controls systems may be used to implement organisational strategy, namely, the style of use of controls and the bureaucratic stance towards control.

2.4 The Use of Management Control Systems

In a recommendation for the future of strategy-MCS research, Langfield-Smith (1997, p. 226) suggests that ‘the appropriate orientation for examining controls is their use and importance to key decision-makers’. Further, Chenhall (2003, p. 131) has warned of the ‘potential for serious model under-specification’ which can arise from ‘studying specific elements of MCS in isolation from other organisational controls’. Accordingly, contemporary strategy-MCS studies have increasingly focused on how strategy influences the importance of various controls, in terms of both the extent and style of their use.

Simons’ (1995) typology of four types of control (commonly known as the Levers of Control), in particular, emphasise the different ways in which MCS may be used. These controls comprise beliefs systems, boundary systems, interactive controls and diagnostic controls. Given the prominence of Simons’ (1995) Levers of Control (LOC) in the recent strategy-MCS literature, further discussion of the framework is provided below.

2.4.1 Simons’ Levers of Control Framework

strategy using four basic control levers: beliefs systems to communicate and
reinforce basic values and missions of the organisation; boundary systems to
establish limits and rules within the organisation; diagnostic controls to monitor
organisational outcomes and correct deviations; and interactive controls which
stimulate dialogue and learning, allowing new strategies to emerge as participants
throughout the organisation respond to perceived opportunities and threats.

Simons (1995) suggests managers use beliefs and boundary systems to frame the
strategic domain of the organisation. In effect, one is a positive system that motivates
the workforce, whereas the other is a negative force which constrains operational
focus. Neither system is cybernetic, that is, neither relies on routine feedback of
information to correct a process. Nevertheless, by providing momentum and a
domain for organisational activity, beliefs and boundary systems form the foundation
on which traditional cybernetic MCS are oriented (Simons 1995, p. 33).

Beliefs systems are the formal systems used by top managers to define, communicate
and reinforce the basic values, purpose, and direction for the organisation. They are
created and communicated through formal documents such as credos, mission
statements, and statements of purpose (Simons 1995, p. 174), and are influenced by
analysis of the organisation’s core values (Simons 1994). Conversely, boundary
systems are influenced by management’s analysis of risks to be avoided (Simons
1994), and are used by top managers to establish explicit limits and rules which must
be respected. Accordingly, boundary systems are stated typically in negative terms or
as minimum standards, and are created through codes of business conduct, strategic
planning systems, and operating directives provided to business managers (Simons
Simons further contends that it is not the identification of controls associated with particular strategies that is important, but the distribution of management attention among controls. Diagnostic systems, which top managers monitor on an exception basis, are oriented to implementing past and present strategies. These controls are designed to tell top managers when things are wrong, or when actions are not in accordance with plans (Simons 1991, p. 61). In comparison, interactive controls are those that senior management choose to monitor personally. That is, interactive controls are formal systems used by top managers to regularly and personally involve themselves in the decision activities of subordinates (Simons 1995).

Formally stated, diagnostic controls are formal feedback systems used to monitor organisational outcomes and correct deviations from pre-set standards of performance. Used to implement intended strategies (Simons 1995, p. 65), diagnostic controls are influenced by the identification of the organisation’s critical performance variables (Simons 1994). However, any diagnostic control system can be made interactive by continuing and frequent top management attention and interest.

Interactive controls direct attention towards strategic uncertainties (Simons 1994) and allow managers to monitor emerging threats and opportunities. Accordingly, the purpose of making a control system interactive is to focus attention (Simons 1995) which, in turn, activates organisational learning, and new strategies emerge over time through the debate and dialogue that surrounds the interactive management controls (Langfield-Smith 1997, p. 233). Furthermore, by using selected control systems interactively and others diagnostically, top managers can signal where organisational attention and learning should be focused; this systematic focusing allows top
managers to guide the emergence of action plans and new strategic initiatives (Simons 1991, p. 61).

Simons (1995) suggests core values (which influence beliefs systems) and interactive control systems (which focus on strategic uncertainties) create positive and inspirational forces in the strategy implementation and renewal process. Boundary systems (which focus on risk identification and control) and diagnostic control systems (which relate to critical performance variables) are negative forces which are used to ensure compliance with organisational rules and the achievement of pre-determined performance objectives. Importantly, the four controls are deemed to be complementary, with the countervailing positive and negative forces used in tandem to achieve a dynamic tension that allows for the effective control of strategy (Simons 1995).

**Empirical Analysis of the Levers of Control Framework**

Although Simons explicitly intended the four sub-systems comprising the LOC framework to be distinct and complementary, early studies tended to treat the interactive and diagnostic use of controls, in particular, as extreme points on a single continuum. For example, Abernethy and Brownell’s (1999) study concerning the relation between strategic change, style of budget use and performance suggests that a more interactive (as opposed to more diagnostic) style of budget use contributes to improved firm performance during the formulation and implementation of strategic change. Similarly, Bisbe and Otley (2004) examine the relations between the interactive use of MCS, product innovation and firm performance. The authors note that although the interactive use (as opposed to diagnostic use) of MCS in itself does not necessarily favour innovation, the impact of innovation on firm performance is
significantly enhanced when the interactive use of MCS is included as a moderating effect.

Following such studies by Abernethy and Brownell (1999) and Bisbe and Otley (2004), which address the differences between diagnostic control and interactive control, Tuomela (2005) provides case evidence that MCS can be used for both diagnostic and interactive control purposes. Specifically, diagnostic control was primarily used for *ex post* performance measurement of intended strategies, whereas the interactive use of controls aided strategic learning by ‘nurturing intellectual discussion of underlying cause and effect relationships’ (Tuomela 2005, p. 313). Furthermore, the interactive and diagnostic uses of MCS, respectively, have implications for beliefs and boundary systems as well, through their influence on the way such systems are identified and communicated throughout the organisation.

Pursuant to the observations of Tuomela (2005), empirical investigations of how control systems are used have provided further support for the inter-dependent and complementary relations between the LOC. Henri (2006) adopted the LOC framework within a resource-based view, to assess how the interactive and diagnostic uses of MCS influence the development of competitive organisational capabilities. The results of the study indicate that by focusing organisational attention on strategic priorities and stimulating dialogue, interactive use of MCS fosters the development of capabilities for entrepreneurship, market orientation, innovativeness and organisational learning. Conversely, placing emphasis on the diagnostic use of controls creates constraints to ensure the attainment of pre-established goals (intended strategies), and may inhibit the development of such competitive capabilities.
The study does not find a significant direct or indirect (through competitive capabilities) relationship for the singular use of interactive or diagnostic controls and firm performance. However, using interactive and diagnostic controls *in combination*, to create ‘dynamic tension’, has a direct positive and significant impact on performance. Assuming the product term adopted in the study is a suitable proxy for dynamic tension, the findings suggest that ‘the ability to reach a balance between the two opposing uses of MCS which, simultaneously, try to stimulate innovation while searching for predictable achievements’ may contribute to the development of competitive capabilities under the resource-based view of a firm (Henri 2006, p. 547).

Unlike Henri (2006) who examines only interactive and diagnostic controls, Widener (2007) considered all four levers to explore the relations among the four control sub-systems. The findings demonstrate that many of the controls are inter-dependent and complementary, and that emphasis on control systems influences performance through their effect on learning and management attention. Moreover, the standardised effect of the four control systems on performance is greater than if the control systems are considered in isolation, suggesting ‘managers must consider all four controls when designing their control system’ (Widener 2007, p. 782).

Widener’s (2007) study also examines the strategic elements which influence the style of use of MCS. The findings suggest that whilst the emphasis placed on diagnostic controls and beliefs systems is driven by operational uncertainties, the emphasis placed on interactive controls appears to be driven more by competitive uncertainties. This ‘implies that the interactive control system is used to scan the external environment, while the other systems are focused more on the internal
environment’ (Widener 2007, p. 782). Further, the study suggests that both diagnostic and interactive uses of MCS are used to manage operational risk.

Simons’ LOC framework has also been extended beyond its application to the implementation and development of a firm’s business strategy, to examine how the style of use of MCS may support firms’ strategies concerning sustainability (Gond et al. 2012), corporate social responsibility (CSR) (Arjaliès & Mundy 2013), and the natural environment (Rodrigue et al. 2013). While these studies provide insights into how the use of MCS may assist organisations identify and manage both environmental threats and opportunities (Arjaliès & Mundy 2013; Rodrigue et al. 2013), the contributions are largely theoretical or descriptive in nature. Accordingly, further empirical research is required to determine the specific nature of the relations between firms’ environmental strategies and their uses of MCS.

Critical Analysis of the Levers of Control Framework

While Simons’ LOC framework for the alternate uses of MCS is widely viewed in the literature as useful and helpful (Bisbe & Otley 2004; Tuomela 2005; Henri 2006; Widener 2007; Mundy 2010), research has identified some conceptual limitations. For example, Tessier and Otley (2012) argue there is substantial ambiguity surrounding the dual role of controls (i.e., the positive and negative forces of strategy implementation) which Simons’ contends ‘create the opposing forces – the yin and yang – of effective strategy implementation’ (1995, p. 7), and suggest that the dual role of controls should not be confused with the quality of control:

The quality of controls refers to whether a control is effective, efficient, economical, etc. (or not) and whether it has unwanted consequences such as slowing down innovation, causing dysfunctional behaviour, etc. (or not). This
is different to the definition of the dual role ... where both roles are seen as desirable (Tessier & Otley 2012, p. 174 parentheses in original).

Further, Collier (2005) observes that although beliefs systems are recognised within the LOC framework, Simons inherently focuses on management’s use of formal control processes and does not account for more informal control processes such as group norms, socialisation and culture (cf. Norris & O'Dwyer 2004). Similarly, Ferreira and Otley (2009) suggest a weakness of the LOC framework is that it is strongly focused on top-management’s design and use of control systems, neglecting the operation of controls at lower hierarchical levels. This assessment echoes prior observations by Langfield-Smith (1997, p. 228), who suggests:

The continued focus on senior management’s use of controls could be misplaced. The success of a strategy may be directly influenced by activities that take place in other areas of the business ... The types of controls and the way they are used by shop floor workers and their managers may be critical to the success of the strategy.

In this respect, the control literature has drawn on Adler and Borys’s (1996) conceptualisation of forms of bureaucracy, namely, enabling versus coercive forms, to explore how senior management’s intentions for controls shape employee involvement in the strategy implementation and renewal process (e.g., Ahrens & Chapman 2004). Studies have described how the utilisation of an enabling form of control may assist employees to deal directly with the inevitable contingencies in their work (Ahrens & Chapman 2004; Wouters & Wilderom 2008), as well as serving as a knowledge-integrating mechanism for capturing collective
organisational learning and experience (Davila, Foster & Oyon 2009; Jordan & Messner 2012).

The following section begins by introducing Adler and Borys’s (1996) conceptual development of the enabling and coercive forms of bureaucracy, and its initial application to the MCS literature by Ahrens and Chapman (2004). This is followed by a broader review of studies which have explored enabling and coercive forms of control in other settings, including concurrent with Simons’ LOC framework.

### 2.4.2 Enabling versus Coercive Control Systems

Drawing on an analogy of human-technology interface design, Adler and Borys (1996) differentiate between two opposing forms of bureaucracy which may be inferred from the design and implementation of formal organisational resources and systems: ‘formalisation designed to enable employees to master their tasks, and formalisation designed to coerce effort and compliance from employees’ (Adler & Borys 1996, p. 62). According to one rationale, the user is a source of problems to be eliminated and systems are designed with a fool-proofing logic. By contrast, the other rationale is that the user is a source of skill and intelligence to be supported, and systems are designed to assist committed employees better perform their task.

The role of formal organisational systems may, therefore, be differentiated based on the design and implementation of workflow processes. This ranges from operational controls designed to deskill work processes and reduce employee discretion, to those designed to enhance users’ capabilities and leverage their skills and accumulated knowledge. In what is termed the enabling type of formalisation, ‘procedures provide organisational memory that capture lessons learned from experience’. In this respect, ‘formalisation codifies best practice routines so as to stabilise and diffuse new
organisational capabilities’ (Adler & Borys 1996, p. 69). Conversely, organisational systems reflecting a more coercive configuration establish workflow processes as a ‘substitute for, rather than a complement to commitment. Instead of providing committed employees with access to accumulated organisational learning and best-practice templates, coercive procedures are designed to force reluctant compliance and to extract recalcitrant effort’.

In their conceptual development of the enabling and coercive approaches to formalisation, Adler and Borys (1996) identify four generic features that characterise highly usable systems, consistent with an enabling approach: repair, internal transparency, global transparency and flexibility. The logic of repair recognises that ‘off-the-shelf’ organisational controls may require a certain degree of customisation within specific institutional contexts. That is to say, standardised systems developed and implemented by senior managers may not necessarily work as intended in the operational environment. From the enabling perspective ‘breakdowns and repairs signal to the organisation problems with the formal procedures and become opportunities for improvement’ (Adler & Borys 1996, p. 71). In this respect, ‘workers are not only to be trusted but are also actively encouraged to discuss practical problems with organisational rules and standards, thereby contributing to their development’ (Ahrens & Chapman 2004, p. 279). This demonstrates that managers value employees’ potential contribution to dealing with unexpected breakdowns and identifying opportunities for improvement, more than they fear the potential opportunism of their workforce. The benefit of such interactions is that operational systems come to reflect a two-way dialogue, and formalisation thus acts to capture and document collaborative learning which occurs during this process (Ditillo 2004).
In order to reap the benefits of efforts at repair, such two-way dialogue requires that all parties involved are fully informed of the underlying logic of the system being repaired. This suggests that the nature of operational systems must be fully transparent, which Adler and Borys (1996) suggest requires both a localised perspective (internal transparency) as well as an understanding of the broader system context (global transparency). Thus, internal transparency refers to the logic of organisational systems as used by employees. For example, procedures designed in a coercion logic are commonly formulated as lists of flat assertions of duties which ‘do not seek to guide the employee’s efforts so much as sanction punishment in the case of deviations’ (Adler & Borys 1996, p. 72). Conversely, enabling procedures provide users with an understanding of the underlying theory of the process by clarifying the rationale of the rules, and further ‘provide users with visibility into the processes they regulate by explicating its key components and codifying best practice routines’ (Adler & Borys 1996, p. 72). Global transparency then refers to the intelligibility for employees of the broader system within which they are working. ‘The global transparency valued in a coercive logic is decidedly asymmetrical’ (Adler & Borys 1996, p. 73). Workers have access to information only on the specific activities they are responsible for, and broader system information is distributed on a restrictive need-to-know basis. In an enabling approach, employees are provided with a wide range of contextual information designed to afford them an understanding of how their local tasks fit into the organisation as a whole (Adler & Borys 1996).

Finally, the feature of flexibility recognises that operational systems, even when customised to the institutional context, may still require further customisation to the specific task at hand. Thus, for non-routine tasks in particular, operational systems must be flexible to cope with unforeseen changes occurring during work processes.
Flexible systems encourage users to modify the interface and add functionality to suit their specific work demands’ (Adler & Borys 1996, p. 74). Whereas, under a coercive formalisation, only supervisors can authorise deviations from system procedures, ‘enabling organisational systems help employees deal flexibly with unforeseen contingencies rather than imposing artificially rigid constraints’ (Adler 1999, p. 43). Thus, an enabling approach recognises that whilst deviations from system procedures are potential risks, they also help to enrich the organisation’s capabilities by identifying opportunities for improvement (Adler & Borys 1996; Adler 1999).

**Empirical Studies on the Enabling-Coercive Bureaucracies Framework**

Based on a single case field study of a UK restaurant chain carried out over two years, Ahrens and Chapman (2004) build on Adler and Borys’s (1996) enabling and coercive forms of bureaucracy and suggest its suitability for analysing ‘more processual uses of management control systems’ (Ahrens & Chapman 2004, p. 275). Specifically, the authors illustrate how the enabling-coercive classification helps to describe how organisations balance mechanistic and organic forms of control in the simultaneous pursuit of efficiency and flexibility. Formal controls have been distinguished from informal or organic controls in organisational (Burns & Stalker 1961) and accounting literature (Chenhall & Morris 1995). Formal controls, the deliberately articulated planning systems, processes, and rules used to co-ordinate organisational activities, are widely associated with delivering efficiency under stable operating conditions (Burns & Stalker 1961; Chenhall & Morris 1995; Simons 1995). Conversely, organic controls are more fluid and responsive, characterised by informal processes involving fewer rules and standardised procedures, a free flow of information throughout the organisation, and flexibility to encourage adaptive
decision-making and foster interactions, and are traditionally thought to be beneficial for more creative, innovative, or entrepreneurial organisations (Burns & Stalker 1961; Chenhall & Morris 1995).

However, empirical studies have established that organic forms of control yield superior performance when supported by more formal control structures (Chenhall & Morris 1995; Brown & Eisenhardt 1997; Kalagnanam & Lindsay 1999), suggesting that such combinations are ‘neither so structured that change cannot occur, nor so unstructured that chaos ensues’ (Brown & Eisenhardt 1997, p. 1). Based on this observation, Ahrens and Chapman (2004, p. 276) suggest that Adler and Borys’s (1996) concept of enabling control ‘speaks directly to the issue of simultaneous use’. Specifically, the authors observe that the case organisation utilised comprehensive, formal MCS aimed at delivering standardisation and efficiency, which are related to operational management through ‘intensive discussion and analysis aimed at the flexible reconciliation of central standards with local contingencies’ (Ahrens & Chapman 2004, p. 295). In this respect, the enabling formalisation of control systems was not a move towards the decentralisation of strategic planning, but rather ‘attempts to mobilise local knowledge and experience in support of central objectives’ (Ahrens & Chapman 2004, p. 296).

Ahrens and Chapman (2004, p. 298) thus propose that ‘the concept of enabling systems presents a useful framework for attempting to resolve the traditional dichotomy between mechanistic controls aimed at efficiency and organic controls aimed at flexibility’, and suggest the suitability of the enabling-coercive classification in developing a typology for contingency-based research. Accordingly, as outlined in Figure 3, an organisation’s approach to control may vary from
informal to formal, and entail a bureaucratic stance which may be described as ranging from highly enabling to highly coercive.

Figure 3: A typology of organisations

<table>
<thead>
<tr>
<th>Type of Formalisation</th>
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<tbody>
<tr>
<td><strong>Enabling</strong></td>
</tr>
<tr>
<td><strong>Informal</strong></td>
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<tr>
<td><strong>Formal</strong></td>
</tr>
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Adapted from Adler & Borys (1996), Adler (1999)

Pursuant to Ahrens and Chapman’s (2004) initial study, a number of researchers have built upon this framework to further explore enabling and coercive control in a range of other settings. Following Adler and Borys (1996), these studies suggest that whether a control system is enabling or coercive depends on the underlying design features and implementation characteristics of repair, internal transparency, global transparency and flexibility. These include contributions theorising the broader benefits of an enabling form of control, such as fostering emergent strategy through incremental innovation (Davila et al. 2009), and facilitating large-scale collaborative creativity by simultaneously activating both intrinsic and identified forms of motivation (Adler & Chen 2011). Other researchers have drawn on observations from case studies to describe enabling and coercive forms of control in more specific
settings such as new product development (Jørgensen & Messner 2009), and the
design and implementation of performance measurement systems (Wouters &
Wilderom 2008; Jordan & Messner 2012).

Wouters and Wilderom (2008) provide case evidence of the development process for
designing and implementing enabling management control systems. Building on
Adler and Borys’ (1996) study, which proposes that users’ involvement and
professionalism contribute to enabling formalisation, the authors demonstrate that
drawing on the existing experience and professionalism of employees, as well as
allowing experimentation with performance measures, contributes to the enabling
nature of control systems. Jordan and Messner (2012) further suggest that the ‘design
features’ proposed by Adler and Borys (1996) should actually be viewed as the
outcome of an on-going interaction between different actors involved, that is, top
managers and their subordinates. ‘Whether operational managers regard a system as
enabling for their work will, to an important extent, depend on how top management
uses that system for control purposes’ (Jordan & Messner 2012, p. 546). The
facilitating role of management control can thereby be viewed as the extent to which
control systems are ‘sense-giving’ (Gioia & Chittipeddi 1991), where ‘sense is given
through the very introduction of a particular control system, but also with the help of
symbolic practices through which the role and relevance of the control system are
communicated’.

However, since most of these studies are case-based or theoretical in nature, the
ability to generalise their findings to a broader population of organisations and
contextual factors is limited. A notable exception is a study by Chapman and Kihn
(2009) who provide empirical evidence on the enabling use of budgets and firm
performance, based on a survey of large Finnish organisations. The study finds that
information system integration (ISI), conceptualised as a single database approach to data architecture, fosters three of the four design characteristics of enabling control, excluding the characteristic of flexibility. Their results also suggest several associations between an enabling approach to budgeting and various aspects of business unit performance, including financial, market and social performance. Further, while the study did not aim to analyse the overall concept of enabling control, several positive associations among the four features of an enabling approach were observed.

While the studies outlined above provide evidence based on the specific study of enabling versus coercive forms of control, a number of studies have also sought to integrate these concepts within existing MCS frameworks. The following section provides a brief review of studies which draw on both the enabling-coercive paradigm and Simons’ LOC to develop a complementary framework incorporating the two concepts.

2.4.3 Examining the Effects of the LOC and Enabling-Coercive Frameworks Concurrently

Although a number of recent studies have considered the possibility of concurrently examining the LOC and enabling-coercive frameworks, knowledge development in the area has been impeded by inconsistent conceptualisations of the enabling and coercive forms of organisational systems. For example, in their secondary analysis, Naranjo-Gil and Hartmann (2006) include the interactive and diagnostic levers as indicators of enabling and coercive MCS, respectively.10

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10 In their secondary analysis, enabling MCS are operationalised as second-order variables comprised of interactive style of use, the use of non-financial information, and the use of MCS for performance evaluation, 'as this expresses a management style which seeks delegation and participation of
A further example is evident in Mundy (2010) who provides case evidence from a ‘highly successful’ multinational financial services firm, and uses the LOC framework to explore how senior managers ‘attempt to balance controlling and enabling uses of MCS’ (Mundy 2010, p. 500). However, application of the enabling and coercive labels is at times ‘closer to Simons’ (1995) definition of positive and negative controls (i.e., as complementary, with both being useful) than concepts from Adler and Borys (1996) who argue that coercive controls are bad’ (Tessier & Otley 2012, p. 174). While this inconsistency is apparent in the first case (Case 1) presented in the paper, in the second case (Case 2) Mundy (2010) identifies examples of how Simons’ four LOC were adopted when implementing a cost reduction strategy through outsourcing, as well as the coercive nature in which the new strategy was implemented. Specifically, the coercive implementation of the outsourcing strategy led to the suppression of interactive processes and knowledge sharing between departments, which restricted ‘debate and discussion about the appropriate way to implement the strategy, or even to discuss the rationale behind the decision’ (Mundy 2010, p. 510).

Consistent with the second case of Mundy (2010), Chenhall et al. (2010) provide further case evidence of the interplay between the style of use of formal MCS, and the enabling or coercive roles that controls may perform. The authors document the transition towards the use of formal financial controls in an operating environment where more organic forms of control (Chenhall & Morris, 1995) and communication were the norm. Specifically, widespread resistance to the interactive use of formal employees, focuses on helping subordinates establish improvement opportunities for processes under their responsibility, emphasises the use of operational measures, and de-emphasises target-based performance control’ (Naranjo-Gil & Hartmann 2006, p. 30). Conversely, more coercive uses of MCS are conceptualised as diagnostic style of use, the use of financial information, and the use of MCS for resource allocation, purportedly representing a ‘more typical top-down management that focuses on central control, emphasizes its role in performance evaluation, and uses pre-set financial standards’ (Naranjo-Gil & Hartmann 2006, p. 30).
Chapter 2: Literature Review

financial controls, such as budgets and performance measurement, was observed as they were employed within a coercive configuration of control. ‘While interactive use of financial controls had the potential to achieve productive debate on how welfare and economic values may be combined and reconciled, such debate was not forthcoming as the financial controls did not have enabling features’, that is, they lacked sufficient transparency to highlight ways that budget constraints affected operations. Conversely, a formal program management system was well received by employees as it was complemented with organic decision-making processes, employed within loose structures and open communication networks. Consistent with an enabling approach, these systems were ‘highly transparent, flexible and provided details of interdependences’ between specific programs and other parts of the case firm’s operations (Chenhall et al. 2010, p. 748).

Pursuant to the case evidence by Mundy (2010) and Chenhall et al. (2010), Tessier and Otley (2012) propose a revised framework which explicitly differentiates between the dual role of controls, and the enabling or coercive roles that controls may perform. Based on this distinction, Simons’ (1995) LOC framework concerning the styles of use of formal MCS (e.g., interactive versus diagnostic) may be conceptually differentiated from the role of control systems (e.g., enabling versus coercive) (Adler & Borys 1996; Ahrens & Chapman 2004). This distinction may accordingly form the basis of contingency-based research into the broader framework of overall control packages, and in order to examine potential complementary and substitution effects among the style of use of formal MCS as well as the bureaucratic stance towards control, and their respective effect on performance outcomes.
2.4.4 Summary

A number of recent empirical studies have found Simons’ (1995) LOC framework informative in examining the use and importance of formal MCS to key decision-makers in the achievement of strategic objectives (Abernethy & Brownell 1999; Bisbe & Otley 2004; Henri 2006; Widener 2007). Simons’ framework has also proven to be informative in examining how organisations may use formal MCS to identify and manage strategic threats and opportunities in their natural environment (Gond et al. 2012; Arjaliès & Mundy 2013; Rodrigue et al. 2013). However, the limited research to date is largely theoretical or descriptive in nature, and further empirical research is required to determine the specific nature of the relations between a firm’s environmental strategies and their uses of environmental MCS, or eco-controls.

Further to the style of use of controls by senior management, recent studies into management accounting practices have drawn on Adler and Borys’s (1996) enabling and coercive forms of bureaucracy to describe how the bureaucratic stance towards control may shape operational employees’ involvement in the strategy implementation and renewal process (e.g., Ahrens & Chapman 2004; Wouters & Wilderom 2008; Jørgensen & Messner 2009).

Finally, though case-oriented and theoretical studies have identified value in the concurrent study of the LOC and enabling-coercive frameworks (e.g., Chenhall et al. 2010; Mundy 2010; Tessier & Otley 2012), additional empirical research is required to explore the potential complementary and substitution effects among the two control frameworks, and their respective effect on performance outcomes.
The final section provides an overview of the literature concerning the link between firms’ environmental management activities and their performance outcomes, in terms of both their environmental and economic performance.

2.5 Environmental and Economic Performance

Arguments in favour of adopting an environmental management system generally hinge on one of two themes: from a moral or normative perspective the obligation for green management is absolute, and whether it *pays* to be green is only partly relevant (Marcus & Fremeth 2009). Alternatively, economic arguments contend that there is considerable scope for formulating and implementing strategic initiatives that simultaneously advance corporate and environmental goals. Therefore, under certain conditions, managers can adopt environmentally-friendly practices which ultimately enhance firm competitiveness and profitability (e.g., Hart 1995; Porter & Van der Linde 1995a; Siegel 2009). Although the normative, moral perspective is compelling for many firms, stakeholders, and a broader societal contingent, the economic arguments comprising the *business case* for environmental management propose a win-win scenario for firms seeking to reduce their environmental impact.

A large body of research has sought to evaluate the business case for environmental management by examining the link between corporate environmental performance and corporate economic performance. Although the results of such studies are mixed, reviews of the literature (e.g., Ambec & Lanoie 2008; Molina-Azorín et al. 2009) and meta-analytic results (Orlitzky, Schmidt & Rynes 2003; Ambec & Lanoie 2013) suggest that studies establishing a significant positive relationship between the environmental variables and economic performance are predominant.
Ambec and Lanoie (2008) identify a range of mechanisms which link environmental and economic performance and note that the primary drivers include opportunities for increasing revenues and for reducing costs. More generally, the specific drivers of economic performance are argued to include: i) better access to certain markets; ii) differentiating products; iii) selling pollution-control technology; iv) risk management; v) relations with external stakeholders; vi) costs of materials, energy, and services; vii) cost of capital; and viii) cost of labour (Roy & Vézina 2001; Gibson & Martin 2004; Ambec & Lanoie 2008; Henri & Journeault 2008b).

However, the organisational benefits associated with improved environmental performance may, in fact, contribute to economic performance in varying degrees. Wagner (2007), reporting on the environmental drivers of economic performance, finds positive associations are strongest for image-related and market-related performance drivers, but less strong for efficiency-related and risk-related performance drivers. Therefore, the optimal level of integration of environmental concerns with other managerial functions may vary depending on what performance driver a firm wishes to address. As noted by Molina-Azorín et al. (2009, p. 1094) ‘it may be interesting for future research to further analyse … the role of mediating and control variables in the linkage between green management and financial performance’.

The level and manner in which a firm integrates environmental management into their broader operations is guided, in general, by organisational and strategic priorities, and the influence of management control. This accordingly leads to an examination of how organisational systems influence the link between environmental and economic performance.
Chapter 2: Literature Review

Arguments for a Mediating Relationship

The environmental strategy literature was first to suggest that an indirect relationship between environmental management practices and economic performance may exist, with environmental performance acting as a mediating variable. Judge and Douglas (1998) identified that the level of integration of environmental issues into the strategic planning process was positively related to both financial and environmental performance. However, using the survey results from the Judge and Douglas (1998) study, Wisner et al. (2006) identify a path alignment whereby firms that include environmental issues in their strategic planning process achieve improved environmental performance, which in turn has a positive and significant influence on economic performance. However, Wisner et al. (2006) fail to find a significant relation between the strategic planning and economic performance measures. These results conflict partially with the original results of Judge and Douglas (1998), suggesting improved economic performance is only achieved through the mediating effect of improved environmental performance.

While the conflicting results between the Wisner (2006) and Judge and Douglas (1998) studies can be explained in part by inconsistent modelling techniques, the lack of consistency may also suggest the existence of a more complex relationship, whereby additional organisational elements operate to translate a proactive environmental strategy into improved economic performance. Here, eco-control draws on the full spectrum of possible controls available to keep an organisation on track towards achieving its environmental and economic objectives.

Henri and Journeault (2010) develop an alternative mediated model to test the relation between eco-control and a firm’s environmental performance, and the
resulting impact on economic performance. The study determined that the increased use of eco-controls had a positive effect on environmental performance overall, and across all sub-groups analysed. However, a mediating effect of environmental performance on the link between eco-controls and economic performance is only observed in the limited context of: i) higher environmental exposure; ii) higher public visibility; iii) higher environmental concern; and iv) larger size.

Environmental exposure was measured using data from the Canadian National Pollutant Release Inventory (NPRI), while public ownership was used as a proxy to measure public visibility. It can, therefore, be suggested that public firms in industries with higher levels of public exposure face increased external scrutiny, which motivates them to adopt increasingly environmentally-friendly practices. Further, larger firm size may increase the likelihood that existing MCS are already in place (Bouwens & Abernethy 2000), which significantly eases the burden of transitioning to an eco-control system rather than developing new systems. Consequently, eco-control systems are likely to be adopted and integrated quicker in larger firms compared with smaller firms, and larger firms are accordingly able to see benefits from an eco-control system sooner. These suggestions are consistent with Sharma (2000) who found that the adoption of voluntary environmental strategies is significantly influenced by organisation size and the legitimation of environmental issues as part of corporate identity.

The context of higher environmental concern also requires additional consideration. Henri and Journeault (2010) measure environmental concern using the four-item instrument developed by Judge and Douglas (1998), concerning the level of integration of environmental issues into the firm’s strategic planning. This result gives a strong indication that a key element required to convert environmental
performance into improved economic performance is the explicit inclusion of
environmental issues in the strategic planning process. However, it is important to
note that adoption of eco-controls improves environmental performance in all sub-
groups, but only translates to improved economic performance under certain
conditions. This suggests that it is not the adoption of eco-controls alone which leads
to improved economic performance, but the manner in which they are used by the
firm which may be significant.

Thus, both the environmental strategy and eco-control literature give weight to the
argument that ‘it is not the pure fact of being green, but the way in which a certain
level of environmental performance has been achieved that influences whether the
correlation between environmental and economic performance is positive or
negative’ (Schaltegger & Synnestvedt 2002, p. 340). In this regard, researchers
seeking to examine whether environmental performance leads to improved economic
outcomes need to place more focus on the organisational systems implemented to
achieve environmental goals and objectives, rather than on environmental
performance alone.

2.5.1 Measuring Environmental Performance

Researchers have acknowledged the difficulties associated with developing robust
environmental performance constructs and, in particular, the ability to obtain
comprehensive objective data regarding a firm’s environmental performance.
Sources of objective environmental performance information utilised in the reviewed
studies include various forms of proprietary and third-party data, such as:
independent environmental ratings (Russo & Fouts 1997; Surroca et al. 2010;
Arjaliès & Mundy 2013), environmental awards (Klassen & McLaughlin 1996), and
compliance with environmental regulations (Epstein & Wisner 2005). Others have
drawn upon government-based pollutant release and transfer registries, including the
Dutch Emissions Registry for Industry (ER-I), the US Toxic Release Inventory
(TRI), the Canadian National Pollutant Release Inventory (NPRI), and the UK
Pollution Inventory (Klassen & Whybark 1999; Wagner 2005; Burnett & Hansen
2008; Henri & Journeault 2010). Such use of emissions-based indices is particularly
useful for studies which seek to measure environmental performance at the plant-
level, rather than firm level, and has the advantage of being output-oriented, and
officially sanctioned (Klassen & Whybark 1999) as many industries are required by
regulation to report emissions annually. However, this performance measure does not
encompass all environmental impacts. For example, non-hazardous waste and
general resource conservation are excluded (Ambec & Lanoie 2008).

Wagner (2005, p. 107) suggests indicators which measure the outcomes of firms’
environmental management activities are more suited for a description of
environmental performance than effort-based measures, such as the amount of
environmental management activities, as adopted in several studies (González-Benito
& González-Benito 2005; Montabon, Sroufe & Narasimhan 2007). One example of
an effort-based measure is provided by Montabon et al. (2007) who follow a unique
approach of identifying a firm’s use of a range of environmental management
activities through content analysis of 45 corporate environmental reports. This may
be contrasted with the approach of Wagner (2005) who compared an emissions-
based performance index and an input-based (energy and water) performance index,
normalised to production output, as proxies for different corporate strategy
orientations.
An alternative approach, adopted by a large number of studies, is the use of survey-based perceptual measures to assess environmental performance. Although most perceptual constructs share common traits, there are some variations in the approach. For example, some survey measures request respondents to rate their overall performance relative to others in their industry. Here, relative performance concerns compliance with environmental regulations, limiting environmental impact beyond compliance, preventing and mitigating environmental crisis, and educating employees and the public about the environment (Judge & Douglas 1998; Wisner et al. 2006).

The slightly more common use of survey-based perceptual measures is to develop a firm-specific environmental impact reduction index (Wagner & Schaltegger 2004; López-Gamero et al. 2009). The use of environmental impact measures specifically targets a firm’s performance with respect to: i) reducing polluting emissions and wastes; ii) the efficient use of materials and resources; iii) improving energy efficiencies; iv) reducing the use of environment-hazardous substances; and v) preventing pollution at the source (Karagozoglu & Lindell 2000). Thus, although perceptive measures are more susceptible to response bias, such measures are far more comprehensive than objective data sources such as emissions registries.

Henri and Journeault (2010) assume a broader definition of environmental performance developed by Itnitch et al. (1999), whereby environmental performance is divided into two main dimensions, namely: i) results versus processes, and ii) internal versus external. The perceptual measure, adapted largely from Sharma and Vredenburg (1998), recognises that environmental performance is a multi-dimensional concept which incorporates the following: i) environmental impact and corporate image (external/results); ii) stakeholder relations (external/process); iii)
financial impact (internal/results); and iv) process and product improvements (internal/process). Further, each of these four aspects is considered ‘necessary but not sufficient for environmental performance’ (Henri & Journeault 2010, p. 65). However, although recognising the multi-dimensional nature of environmental performance in the theoretical development of their research construct, Henri and Journeault (2010) treat the measure as uni-dimensional in their empirical testing. Therefore, this study aims to further develop environmental performance as a research construct, in order to identify and test whether variation exists within these dimensions as potential drivers of firms’ economic performance.

2.5.2 Summary

Although prior studies addressing the link between firms environmental and economic performance have produced mixed results, the majority of the research suggests that a positive relationship does exist (Orlitzky et al. 2003; Ambec & Lanoie 2008; Molina-Azorin et al. 2009; Ambec & Lanoie 2013). However, environmental initiatives may not lead to competitive benefits for all firms under all conditions (Russo & Fouts 1997; Christmann 2000; Henri & Journeault 2010), and some environmental performance outcomes are stronger drivers of economic performance than others (Wagner 2007).

Furthermore, empirical studies have suggested environmental performance acts as a mediating variable in the relations between proactive environmental strategies and economic performance (Wagner 2005; Wisner et al. 2006), and the extent of eco-controls and economic performance (Henri & Journeault 2010). However, there is limited research concerning how the use of eco-controls to implement proactive environmental strategies, in turn, influences a firm’s environmental and economic
performance. Likewise, in assessing the link between environmental performance and economic performance, further development of the environmental performance construct may contribute to an area where the results are inconclusive.

2.6 Chapter Summary

This chapter has reviewed the literature related to the concepts and variables comprising the two major streams of research pertaining to this study. Specifically, it has reviewed conceptual and empirical studies drawn from the environmental strategy and MCS literature, concerning their respective impact on firms’ environmental and economic outcomes.

The next chapter will develop a conceptual framework integrating the environmental strategy and eco-control literature, and will generate testable hypotheses based on the framework.
Chapter 3: Conceptual Framework and Hypotheses Development

3.1 Introduction

The main objective of this chapter is to provide an overview of the conceptual framework of this study, and to discuss the development of hypotheses. Insights from the resource-based view of the firm, stakeholder and contingency theories, as well as empirical findings of previous studies, are drawn on to help in hypotheses development.

In the following section (i.e., Section 3.2) an outline of the conceptual framework is provided, where firms’ economic and environmental performance are seen to be affected by the level of proactive environmental strategy, and the style of use and bureaucratic stance towards eco-controls. This is followed by discussion detailing the distinctive characteristics of proactive (as opposed to reactive) environmental strategy. Finally, Section 3.3 develops three sets of hypotheses linking: i) proactive environmental strategy to firms’ use of eco-controls; ii) the use of eco-controls on firms’ environmental performance; and iii) environmental performance’s effect on economic performance.

3.2 Conceptual Framework

3.2.1 Overview of Framework

The conceptual framework for this study, as shown in Figure 4, proposes eco-control systems to mediate the relationship between environmental strategy and
environmental performance, which, in turn, is hypothesised to affect an entity’s economic performance.

Figure 4: The conceptual model and hypotheses

The underlying conceptual foundations for this study are guided by resource-based theory, where it is argued that a firm’s formal and informal planning, management control and reporting systems are key organisational resources which may contribute to competitive advantage (Barney 1991; Grant 1991). Specifically, the implementation of an eco-control system provides management with the ability to consolidate collective learning on environmental issues into unique organisational capabilities and adapt quickly to changing opportunities (Amit & Schoemaker 1993; Day 1994; Prahalad & Hamel 1990). Therefore, consistent with Henri (2006) and
Grafton et al. (2010), it is proposed that a firm’s use of eco-controls in the implementation and renewal of proactive environmental strategies represents a capability which is valuable, distinctive and imperfectly imitable, and may form the basis of a sustained competitive advantage.

Such a proposal is consistent with the literature concerning management control, where it is assumed that strategic priorities should be supported by appropriate and effectively implemented management processes and information systems, including those providing management accounting information (Langfield-Smith 1997; Chenhall 2003; Berry et al. 2009; Tucker et al. 2009). In other words, the effective implementation of environmental strategy arguably requires a well-established, comprehensive system of management control that incorporates strategy, structures, systems, culture, and people (Epstein 1996a; Epstein & Wisner 2005).

The present framework develops several hypotheses with the aim of testing the impact of the extent of proactive environmental strategy on the use of eco-controls. For the purposes of this study, the following two dimensions of eco-controls are of focal interest:

i) The *style of use* of eco-controls; premised on the four control sub-systems identified by Simons (1995) (generally referred to as Simons’ Levers of Control). More specifically, they are the use of beliefs systems, boundary systems, diagnostic and interactive controls.

ii) The *bureaucratic stance* on eco-controls; referring to the spirit in which managers approach the use of eco-controls on a day-to-day basis, and draws
Chapter 3: Conceptual Framework and Hypotheses Development

on Adler and Borys’s (1996) conceptualisation of forms of bureaucracy, namely, enabling versus constraining forms.\textsuperscript{11}

As previously discussed in Chapter 2, the motivation for making this distinction in the conceptualisation of eco-controls is founded on the arguments set forth by Tessier and Otley (2012) who contend that prior studies have neglected to differentiate between the concept of positive and negative controls underlying Simons’ framework (i.e., as complementary, with both being useful), and the enabling versus constraining roles that controls may perform.

In this study, Simons’ (1995) LOC framework provides the grounding for studying how environmental strategic imperatives affect the style of use of eco-controls by senior managers. In particular, the study assesses the extent to which senior managers direct organisational attention by pulling on any or all of the four LOC, in order to achieve performance goals and objectives. Likewise, the conceptual framework also proposes that environmental strategy is likely to drive the bureaucratic stance towards eco-control. More specifically, Adler and Borys’s conceptualisation of enabling versus constraining control (Adler & Borys 1996; Adler 1999) is the focal construct, where management’s approach towards the implementation and use of eco-control information in decision-making (i.e., whether they would prefer eco-controls to have an enabling or a constraining effect on subordinate managers and employees generally) is seen to shape employee involvement in the strategy implementation and renewal process.

\textsuperscript{11} Adler and Borys (1996; 1999) originally use the labels enabling/coercive to describe the differing bureaucratic stances to organisational design. In the MCS literature, the labels enabling/coercive (Ahrens & Chapman 2004), enabling/controlling (Mundy 2010), and enabling/constraining (Tessier & Otley 2012) have variously been applied. This study notes that the alternate meanings of coercive and controlling have potential to cause confusion, and thus adopts the enabling/constraining terminology used by Tessier and Otley (2012).
The conceptual framework in the present study also proposes that the style of use and bureaucratic stance towards eco-controls affects environmental performance, and environmental performance, in turn, is associated with economic performance. In the next section, a more detailed discussion highlighting the distinctive characteristics of proactive (as opposed to reactive) environmental strategy is provided.

### 3.2.2 Proactive Environmental Strategy

The environmental strategic orientation of an organisation can be viewed along a continuum, ranging from highly proactive strategies to highly reactive strategies, based on their integration of environmental issues into the strategic planning and decision-making process (Judge & Douglas 1998; Perego & Hartmann 2009). Drawing on the conceptual models outlined by Hunt and Auster (1990) and Roome (1992), and empirical studies by Aragón-Correa (1998), Judge and Douglas (1998), Sharma and Vredenburg (1998), Sharma (2000), Henriques and Sadorsky (1999), Buysse and Verbeke (2003), and Banerjee et al. (2003), some of the key characteristics that differentiate the extremities of the two strategic orientations (i.e., highly proactive versus highly reactive) include: i) senior management commitment to environmental management activities; ii) resource allocation and functional coverage; iii) approaches to technological implementation and innovation; iv) stakeholder engagement; and v) the internal and external scoping of environmental issues. Table 2 provides a summary of the main differences between a highly proactive and a highly reactive environmental strategy in terms of the various dimensions inherent in an environmental management system, that is: i) information management; ii) communication; iii) decision support; and iv) steering and implementation (Schaltegger & Burritt 2000).
Table 2: Proactive and reactive environmental strategy characteristics

<table>
<thead>
<tr>
<th>Information Management</th>
<th>Highly Reactive Environmental Strategy</th>
<th>Highly Proactive Environmental Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No environmental performance objectives</td>
<td></td>
<td>• Identify short- and long-term objectives that go beyond industry norms or regulatory requirements</td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No environmental reporting / exceptions-only reporting</td>
<td></td>
<td>• Formalised internal and external reporting mechanisms</td>
</tr>
<tr>
<td>• Primarily influenced by regulatory pressures and media</td>
<td></td>
<td>• Broad coverage of internal and external stakeholders, with a reduced importance placed on environmental regulations</td>
</tr>
<tr>
<td>Decision Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Environmental management not integrated within the company</td>
<td></td>
<td>• Environmental management integrated across departments and functions</td>
</tr>
<tr>
<td>• Central authority responsible for environmental issues</td>
<td></td>
<td>• Decentralised responsibility and accountability</td>
</tr>
<tr>
<td>• Intervention in response to environmental incidents</td>
<td></td>
<td>• Anticipation and scoping of potential issues and impacts</td>
</tr>
<tr>
<td>Steering and Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Minimal support or involvement of senior management</td>
<td></td>
<td>• Senior management give high priority to and actively involved in environmental management issues</td>
</tr>
<tr>
<td>• Environmental management rationale not clearly defined</td>
<td></td>
<td>• Strong central environmental values and ethos</td>
</tr>
<tr>
<td>• Minimal resource commitment</td>
<td></td>
<td>• Flexible, open-ended funding</td>
</tr>
<tr>
<td>• Introduction of management techniques and technologies required by regulations</td>
<td></td>
<td>• Implement state-of-the-art approaches and set the standard for other businesses</td>
</tr>
<tr>
<td>• Environmental issues viewed as a source of risk</td>
<td></td>
<td>• Environmental issues viewed as a source of opportunity</td>
</tr>
</tbody>
</table>

According to the conceptual development of environmental management strategies offered by Hunt and Auster (1990) and Roome (1992), firms pursuing a more proactive environmental strategy view environmental management as a top priority, and efforts are supported with sufficient resource allocation and a senior executive who champions the program. ‘Employee training and awareness programs extend across all levels …, requirements and goals are clear, and systems that facilitate reaching those goals are built into each functional department’ (Hunt & Auster 1990, p. 12). Technology and management techniques ‘revolve around the state of the art in
environmental management’, and best management practices which set the standard for other businesses (Roome 1992, p. 19). By contrast, a more reactive environmental strategy describes organisations who have not (yet) clearly defined what the company’s environmental requirements are, or what the repercussions of poor management could be (Hunt & Auster 1990). Firms following a more reactive strategy may have never seriously considered implementing an environmental management program, have little concept of the significance of environmental imperatives, and cannot effectively react to changing environmental standards due to managerial inertia (Roome 1992).

These characteristics may be broadly compared with the organisational strategy typologies developed by Miles and Snow (1978), that is, prospectors and reactors, and Miller and Friesen’s (1982) categorisation of entrepreneurial and conservative firms. Prospector organisations are described by Miles and Snow as continually searching for opportunities, and as being the creators of change and uncertainty to which their competitors must respond. Conversely, reactor organisations are described as organisations in which senior managers frequently perceive change and uncertainty, but are unable to respond effectively due to: i) failure to articulate a viable strategy; ii) a strategy is articulated but technology, structure, and processes are not appropriately aligned; or iii) management adheres to a particular strategy-structure relationship which is no longer relevant to changing conditions (Miles & Snow 1978). Miller and Friesen (1982) describe similar polar attributes of entrepreneurial and conservative firms, within the specific context of organisational innovation. While entrepreneurial firms continuously pursue innovation to try to obtain a competitive advantage, conservative firms are likely to engage in innovation
only when seriously challenged by external influences such as competitors or shifting customer demands.

Consistent with a prospector/entrepreneurial strategy, a highly proactive environmental strategy views the natural environment as a source of opportunity (Sharma 2000), and requires broad functional coverage and increases in the level of resource commitment (Judge & Douglas 1998). A proactive stance to environmental management ‘involves anticipating future regulations and social trends and designing or altering operations, processes and products to prevent (rather than merely ameliorate) negative environmental impacts’ (Aragón-Correa & Sharma 2003, p. 73). Proactive strategies are motivated by continuous environmental improvement (Russo & Fouts 1997; Aragón-Correa 1998; Sharma & Vredenburg 1998), which requires top management commitment (Banerjee et al. 2003) and ‘the acquisition and installation of new technologies’ along with the organisation-wide learning required to develop and implement them (Russo & Fouts 1997, p. 538).

Proactive approaches to pollution prevention tend to be integrated into the administrative, entrepreneurial and engineering dimensions of a firm (Aragón-Correa 1998). Incorporating environmental aspects in the formal budget and planning systems involves setting detailed goals for environmental expenses, as well as identifying potential incomes from material scrap or recycled waste, and provisions for environmental investments such as new technologies (Henri & Journeault 2010). Further, incentive schemes need to be aligned with environmental performance objectives, including the use of environmental performance indicators in reward systems, to direct managerial attention towards environmental activities (Gabel & Sinclair-Desgagné 1993). The use of non-financial data in incentive systems is observed to be influential in aligning employee and organisational objectives in firms.
pursuing an innovation-oriented strategy (Ittner, Larcker & Rajan 1997). This supports the notion that firms attempt to link compensation policies with strategic objectives to ensure that management incentives and organisational goals are aligned.

Conversely, firms pursuing a more reactive environmental strategy share common traits with the reactor and conservative strategies identified in the organisational literature (Miles & Snow 1978; Miller & Friesen 1982). A reactive stance towards environmental management tends to be more cautious with defensive approaches that merely aim to meet legal requirements (Roome 1992), and intervention techniques which ‘are characterised by being second-best imitations with a time lag’ (Schaltegger et al. 2008, p. 445). Rather than anticipate change and actively pursue innovation, reactive firms attempt to solve problems when they arise through investments in already developed technologies and management techniques (Russo & Fouts 1997). The implementation of such non-proprietary techniques is, accordingly, less knowledge-intensive than more innovative approaches involving the redesign of products and process, or the development of new technologies. As such, the demands on the extent of eco-controls are likely to be weaker. For instance, prior MCS studies by Simons (1987) and Kober et al. (2003) indicate that firms facing lower strategic uncertainty as a result of pursuing more stable, defensive strategies place less emphasis on MCS than innovation-oriented prospector strategies.

Thus, as suggested by Shrivastava (1995b), a proactive approach to environmental management is ‘a more comprehensive and socially complex process’ than a compliance-driven reactive approach, ‘necessitating significant employee involvement, cross-disciplinary co-ordination and integration, and a forward thinking managerial style’ (Russo & Fouts 1997, p. 538). From this perspective, it can be
argued that proactive environmental strategies depend on management’s ability to draw on the complex bundle of skills and knowledge, exercised through organisational systems and processes, to co-ordinate environmental management activities and make use of their resources (Amit & Schoemaker 1993; Day 1994). Furthermore, management’s ability to consolidate the collective organisational learning into unique organisational capabilities, and adapt to quickly changing opportunities, has the potential to provide firms with a sustained competitive advantage (Prahalad & Hamel 1990).

3.3 Hypotheses Development

3.3.1 Environmental Strategy and Eco-control

For this study, the conceptualisation of the eco-control construct is based on managers’ attitudinal disposition towards the use of eco-controls, which is further distinguished into two aspects: i) the style of use of eco-controls, and ii) the bureaucratic stance towards eco-controls.

The Style of Use of Eco-Controls – Simons’ LOC

In terms of the style of use of MCS, prior empirical studies on the role of MCS in supporting business strategy have utilised Simons’ LOC framework to understand how different control sub-systems (or levers) within a larger MCS may function to support strategic planning and decision-making. The LOC framework identifies four basic control levers used by managers to implement organisational strategy

12 Simons notes that the four levers explicitly concern control systems used by managers to implement strategy, and ‘not the host of control systems used lower in the organisation to co-ordinate and regulate operating activities (e.g., quality control procedures for repetitive operations)’ (Simons 1995, p. 6).
Chapter 3: Conceptual Framework and Hypotheses Development

i) beliefs systems to communicate and reinforce basic values and missions of the organisation;

ii) boundary systems to establish limits and rules within the organisation;

iii) diagnostic controls to monitor organisational outcomes and correct deviations; and

iv) interactive controls which stimulate dialogue and learning, allowing new strategies to emerge as participants throughout the organisation respond to perceived opportunities and threats.

These control levers generally revolve around the strategic planning and analysis level, where the focus is on how information created by an organisation’s accounting and information control system is *used* by senior management to support business strategy planning and decision-making (Simons 1995; Langfield-Smith 1997; Abernethy & Brownell 1999). As discussed previously in detail in Chapter 2, the LOC are sub-systems of controls that may be distinguished from two perspectives: beliefs and boundary systems are used to guide the search for opportunities (one is used to motivate and inspire the workforce, the other is used to communicate an acceptable domain for search activity and reduce risks), whereas the diagnostic and interactive uses of controls concern the distribution of management attention among controls (with diagnostic controls being used to monitor the achievement of pre-specified goals, and interactive controls used to focus organisational attention around strategic uncertainties) (Simons 1995).

In this study, in a similar vein, the style of use of eco-controls follows that proposed by Simons’ (1995) LOC framework, and the focus is on how eco-controls are used by senior management in a strategic manner to make decisions and implement a particular environmental strategy. As argued by Henri and Journeault (2010, p. 63),...
‘eco-controls aim to help organisations measure, control and disclose their environmental performance. They are used to supply information for decision-making to ensure the attainment of environmental objectives and to provide persuasive evidence supporting the benefits of such actions’. Accordingly, given the distinctiveness of proactive versus reactive strategic approaches, it is also likely they will promote different configurations and uses of eco-controls.

In the four sub-sections below, hypotheses linking proactive strategy and each of the four LOC will be developed, and the link between each LOC and environmental performance outlined in Section 3.3.2 (Hypotheses 3a-d).

Hypothesis 1(a): Extent of Proactive Strategy and Beliefs Systems

The alignment of an organisation’s environmental strategy, structure, and processes is greatly facilitated by a widely-shared vision (Shrivastava 1995a). Within the LOC framework, beliefs systems are ‘the explicit set of organisational definitions that senior managers communicate formally and reinforce systematically to provide basic values, purpose and direction of an organisation’ (Simons 1995, p. 34). According to Simons, beliefs systems are created and communicated through explicit statements on shared values and vision, in order to support goal clarity and promote shared responsibility for organisational objectives. Such explicit statements may take the form of mission statements, vision statements, credos or statements of purpose.

A proactive approach to environmental management espouses corporate missions oriented towards long-term, global, and environmental issues (Shrivastava 1995a). Thus, a proactive stance towards environmental management would require the organisation to ‘develop an environmental ethic (or culture) at all levels of the organisation’ (Hunt & Auster 1990, p. 14), which the company and its whole
workforce are encouraged to work towards (Roome 1992). Roome (1992, p. 22) argues that ‘senior management are responsible for setting in motion organisational structures which encourage consensus-based forms of decision-making, through which employees contribute to the central vision of the environmental ethics and codes of practice by which the company, and they, operate’. In this respect, senior managers can use environmental mission statements to formally communicate desirable values, purpose and direction (Campbell & Yeung 1991), and promote environmental shared vision throughout the organisation (Arjaliès & Mundy 2013; Rodrigue et al. 2013).

Further, a proactive strategic stance entails a future-oriented management where boundary spanning is made easier when managers know and can recognise developments in the external environment that are relevant to support environmental management objectives. Widener (2007) observes that firms facing higher levels of strategic uncertainty, from both competitive and operational perspectives, place more emphasis on beliefs systems. In this respect, formal beliefs systems provide momentum and guidance to opportunity-seeking behaviour, and may be used when senior managers desire to change strategic direction or energise their workforce (Simons 1994, 1995).

On the other hand, where a reactive strategic stance presides, environmental issues are less likely to be legitimised as an integral part of the organisation’s identity (Sharma 2000). Senior management tend to provide limited support and commitment to environmental issues (Hunt & Auster 1990; Banerjee et al. 2003) and the rationale for environmental management may not be as clearly defined. Further, organisations pursuing a more reactive environmental strategy tend to focus on evaluating environmental impacts as or after they occur (Hunt & Auster 1990), with solutions to
individual environmental problems developed in response to regulatory agendas (Roome 1992; Buysse & Verbeke 2003). Accordingly, the need for an explicit set of environmental values to ‘inspire and guide organisational search and discovery’ (Simons 1995, p. 36) is less likely to be perceived as important. Formally stated:

**H1a:** The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on a beliefs system of eco-controls.

**Hypothesis 1(b): Extent of Proactive Strategy and Boundary Systems**

Boundary systems are used by top managers to communicate explicit limits and rules which must be respected. They are stated, typically, in negative terms or as minimum standards, and are created through codes of business conduct, strategic planning systems, and operating directives provided to business managers (Simons 1995, p. 174). Simons argues that although boundary systems are essentially prescriptive in nature, they allow senior managers to delegate decision-making and thereby achieve maximum flexibility and creativity. In this respect, ‘boundary systems are like brakes on a car: without them, cars (or organisations) cannot operate at high speeds’ (Simons 1995, p. 41).

In firms pursuing proactive environmental strategies, boundary systems can promote environmental awareness and help guide decision-making by increasing managers’ familiarity with the environmental issues in their area of responsibility, and providing formalised processes for dealing with them (Schaltegger & Burritt 2000). When unexpected situations arise, environmental management boundaries prevent organisational participants attempting novel, untested responses which, ‘because of poor judgement or lack of relevant benchmarks’, senior management would not
condone (Simons 1995, p. 43). Further, by communicating environmental risks to be avoided, boundary systems may be used to ensure compliance with both internal (strategic) and external (regulatory) environmental policies (Arjaliès & Mundy 2013).

Environmental boundary systems may also be used to signal purpose and direction in the strategy renewal process. Strategic boundary processes aim to prevent employees from wasting time and organisational resources by communicating those activities deemed acceptable and those considered off-limits (Mundy 2010). Accordingly, proactive firms may use boundary systems which ‘help to direct activities to a meaningful end-point, preventing employees from seeking continual improvements beyond optimal and timely solutions’ (Mundy 2010, p. 501) by limiting innovation efforts within a specified range of activities. Thus, in many ways, environmental boundary systems can help guide organisational freedom and entrepreneurial behaviour within proactive firms, whilst also managing environmental risks and minimising wastage of the organisation’s resources. Stated formally:

**H1b:** The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on a boundary system of eco-controls.

**Hypothesis 1(c): Extent of Proactive Strategy and Diagnostic Use of Eco-controls**

Diagnostic control systems are feedback systems that monitor organisational outcomes and correct deviations from pre-set standards of performance. Such controls are useful to track progress towards defined goals, and monitor the success of intended strategies, that is, to compare actual performance against pre-set targets (Simons 1995; Abernethy & Brownell 1999). The ability to use a given control
diagnostically requires: i) the ability to measure the outputs of a process; ii) the existence of pre-determined standards against which actual results can be compared; and iii) the ability to correct deviations from standards (Simons 1995, p. 59).

Firms adopting more reactive strategies typically view environmental issues as threats (Sharma 2000), and possibly may not even address environmental issues in the absence of regulations (Buysse & Verbeke 2003). Environmental objectives may have not (yet) been developed explicitly, or have not been integrated in the overall business strategy (Hunt & Auster 1990; Perego & Hartmann 2009). Thus, a more reactive stance towards environmental management is associated with resolving problems as they occur rather than developing a comprehensive environmental management program (Hunt & Auster 1990; Roome 1992). Conversely, firms pursuing more proactive strategies identify short- and long-term objectives that go beyond industry norms or regulatory requirements (Sharma & Vredenburg 1998), and implement state of the art environmental management techniques (Roome 1992). Accordingly, it may be suggested that firms pursuing proactive environmental strategies face higher operational uncertainties and risks, compared with taking a more reactive stance, which Widener (2007) observes is associated with a greater emphasis on the diagnostic use of controls.

Through its emphasis on the monitoring and reporting of key performance data, the diagnostic use of eco-controls contributes to the information management process of eco-control (Arjaliès & Mundy 2013; Rodrigue et al. 2013). Henri and Journeault (2008a) report that firms pursuing proactive strategies place greater importance on the measurement of both financial and non-financial environmental performance indicators (EPIs). Specifically, proactive firms place greater importance on EPIs to provide evidence about: i) the environmental performance of their operations; ii)
management’s efforts to influence the organisation’s environmental performance; and iii) broad environmental condition indicators that provide information about the local, regional, national, or global condition of the environment. Thus, unlike reactive firms whose scope of environmental monitoring is generally limited to practices ‘required to be undertaken in fulfilment of environmental regulations or in response to isomorphic pressures within the industry as standard business practices’, firms undertaking a more proactive strategy are likely to engage in monitoring practices ‘across all dimensions relevant to their range of activities’ (Sharma & Vredenburg 1998, p. 733).

Furthermore, the proactive management of an organisation’s environmental impact often leads to environmental management responsibilities being decentralised and integrated across all departments and functions, rather than delegated to a separate supporting team composed of specialist staff (Judge & Douglas 1998; Schaltegger & Burritt 2000). The diagnostic use of eco-controls allows organisations to achieve environmental goals without the constant oversight of senior management, as diagnostic controls are typically monitored by delegates and only reviewed by top management on an exception basis when targets are not achieved (Simons 1995). Thus, with its focus on exception-basis reporting, the diagnostic use of eco-controls contributes to the efficient use of senior management attention and provides localised decision support concerning the collection and monitoring of critical environmental performance indicators (EPIs).

In terms of the steering and implementation of environmental strategy, Perego and Hartmann (2009) observe that firms pursuing a more proactive environmental strategy rely on environmental performance indicators (EPIs), as part of their broader employee performance measurement systems, to align decisions and motivate
employees’ efforts towards the attainment of environmental objectives. In this respect, the cybernetic nature of diagnostic controls provides feedback on historical performance against pre-set environmental objectives and standards and, if appropriately designed, may form the basis of employee evaluation and reward systems (Simons 1995; Schaltegger & Burritt 2000).

In summary, firms pursuing a more proactive environmental strategy are likely to place greater emphasis on the diagnostic use of controls in order to facilitate the information management, decision support, and steering and implementation processes of eco-control. In this respect, the diagnostic use of eco-controls facilitates the decentralisation of environmental monitoring responsibilities, and the collation of environmental performance information against pre-set goals and objectives. Furthermore, environmental performance feedback may be integrated into employee incentive schemes to motivate employees and align decision-making with organisation-wide environmental goals and objectives. Stated formally:

**H1c: The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on the diagnostic use of eco-controls.**

Hypothesis 1(d): Extent of Proactive Strategy and Interactive Use of Eco-controls

The interactive use of a control system has the following four defining characteristics (Simons 1995, pp. 96-97): information generated by the control system: i) is a recurrent and important agenda item addressed by senior management; ii) receives frequent and regular attention at all levels of the organisation; iii) is interpreted and discussed among organisational departments and functions; and iv) is a catalyst for the continual challenge and debate of underlying data, assumptions, and action plans.
Likewise, the interactive use of eco-controls may be used to stimulate search and learning, ‘allowing new strategies to emerge as participants throughout the organisation respond to perceived opportunities and threats’ (Simons 1995, p. 91).

Proactive environmental strategies involve the anticipation and scoping of potential issues and negative impacts of products and processes (Aragón-Correa & Sharma 2003). The interactive use of controls allows senior management to involve themselves regularly and personally in the decision activities of subordinates, and to focus attention and force dialogue throughout the organisation. Such involvement may be reflected by management’s perceived opportunities to redesign their product and/or production methods or develop new technologies in order to minimise their environmental impact. Thus, by reflecting signals sent by top managers, the interactive use of eco-controls can ‘stimulate new ideas and initiatives, and guide the bottom-up emergence of strategies’ (Henri 2006, p. 533).

Further, firms pursuing a more proactive strategy generally view environmental issues as a source of opportunity and pursue continuous environmental improvement and innovation beyond industry standards and regulatory compliance, in an attempt to gain a competitive advantage (Sharma & Vredenburg 1998; Sharma 2000). Widener (2007, p. 782) observes that the emphasis placed on the interactive use of controls is driven by an organisation’s perception of its competitive uncertainties, which ‘implies that the interactive control system is used to scan the external environment, while the other systems are more focused on the internal environment’. Similarly, the interactive use of eco-controls can ‘provide frameworks, or agendas, for debate, and motivate information gathering outside routine channels’ (Simons 1995, p. 96). They can focus organisational attention on strategic uncertainties pertaining to environmental management activities, and help senior management
evaluate the environmental and economic impacts of specific products, strategic business units and industry mixes (in diversified firms) (Schaltegger et al. 2008). In this respect, proactive firms may use eco-controls more interactively to reveal and debate emergent strategies and identify opportunities for innovation in relation to environmental management activities (Simons 1995; Arjaliès & Mundy 2013; Rodrigue et al. 2013).

Conversely, managers without a strategic vision, or without the urgency to create a strategic vision, have little to gain from using control systems interactively (Simons 1994). Firms pursuing a more reactive strategy, which are generally characterised by minimal involvement or support of senior management and lack of a clearly-defined rationale for environmental management activities, are accordingly likely to place less reliance on the interactive use of eco-controls. Some support for this argument is provided by Henri and Journeault (2008a) who observe that proactive firms use EPIs to motivate continuous improvement and provide data for internal decision-making more than reactive firms do.

Accordingly, the following hypothesis concerning the link between proactive environmental strategies and the interactive use of eco-controls is proposed:

H1d: The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on the interactive use of eco-controls.

The Bureaucratic Stance towards Eco-controls – Adler & Borys

Adler and Borys (1996) draw an analogy with human-technology interface design to differentiate two opposing forms of bureaucracy – ‘formalisation designed to enable employees to master their tasks, and formalisation designed to coerce effort and
compliance from employees’ (Adler & Borys 1996, p. 62). Following this reasoning, organisational systems can thus be designed with either an ‘open’ or ‘closed’ interface, depending on whether senior managers wish to promote employee experimentation, knowledge-sharing and innovation surrounding organisational objectives, versus ensuring efficacy and goal achievement by enforcing strict adherence to hierarchically-determined procedures and action plans (Adler & Borys 1996; Adler 1999).

These concepts were largely drawn into the MCS literature by Ahrens and Chapman (2004), who demonstrate how the enabling-constraining classification may be used ‘to analyse the ways in which organisations simultaneously pursue efficiency and flexibility through their management control systems’ (Ahrens & Chapman 2004, p. 275). Specifically, Ahrens and Chapman suggest that an enabling approach towards control allows organisations to seek a balance between mechanistic formal controls, aimed at delivering efficiency under stable operating conditions, and more organic forms of control, aimed at delivering flexibility to encourage adaptive decision-making and foster interactions (e.g., Burns & Stalker 1961; Chenhall & Morris 1995). Further, an enabling stance towards eco-control is represented by the four integrated design principles of repair, internal transparency, global transparency, and flexibility (Adler & Borys 1996; Adler 1999; Ahrens & Chapman 2004; Chapman & Kihn 2009).

As argued above, given the distinctiveness of proactive versus reactive strategic approaches, it is also likely they will promote different configurations and uses of eco-controls. Further to this, it is also argued that proactive versus reactive environmental strategies require different levels of employee involvement in their implementation and renewal. In the sub-section below, hypotheses linking proactive
environmental strategy and the bureaucratic stance towards eco-control will be
developed, with the link between an enabling stance towards eco-control and
environmental performance also developed in Section 3.3.2 (Hypothesis 4).

**Hypothesis 2: Extent of Proactive Strategy and Bureaucratic Stance towards Eco-
controls**

A proactive stance towards environmental management requires senior management
to balance the sometimes competing needs of maintaining formalised structures to
ensure the effective implementation of pre-determined goals and objectives (i.e., top-
down, intended strategies), whilst simultaneously providing support and guidance for
employees’ involvement in the pursuit of continuous improvement (i.e., bottom-up,
emergent strategies). Accordingly, the effective implementation of proactive
strategies requires eco-control systems which promote both efficient outcomes, to
ensure compliance with internal and external environmental policies, whilst allowing
sufficient flexibility to elicit localised contributions to improve current work
processes and identify new opportunities.

A number of studies have identified that, in certain contexts, management controls
may be used to simultaneously achieve mechanistic approaches to decision support
whilst also supporting more organic patterns of communication (Simons 1990;
Brown & Eisenhardt 1997; Chapman 1998). Further to this, through building on the
enabling-constraining framework provided by Adler and Borys (1996), a growing
body of case-oriented research has provided evidence of organisations using an
enabling approach to management control to simultaneously pursue both efficiency
and flexibility (e.g., Ahrens & Chapman 2004; Jørgensen & Messner 2009). It has
further been argued that an enabling approach to control supports the activation of
both identified and intrinsic forms of motivation (Adler & Chen 2011) and
incremental innovation throughout the organisation (Davila et al. 2009). Combined, these arguments suggest that an enabling approach to eco-control is not only supportive, but may in fact be requisite for the effective implementation of more proactive environmental strategies.

Further to the above strategy-structure alignment arguments, which suggest an enabling form of eco-control to be desirable for firms pursuing more proactive environmental strategies, the process of integrating environmental issues into the strategic planning and decision-making processes of an organisation may in itself contribute to an enabling form of control. Chapman and Kihn (2009) use the ‘single database’ concept of data architecture to demonstrate how the design and structure of information systems, along with efforts to systematise and co-ordinate record keeping, can contribute to an enabling approach to management control. Specifically, the authors observe that information system integration, which includes having fully-integrated information systems that contain both financial and non-financial data, was seen to positively influence all the design principles of enabling control except flexibility. Accordingly, an organisation’s ability to integrate environmental issues into formal strategic planning and decision-making process may also contribute to the development of an enabling approach to eco-control.

For example, the existence of a clear policy statement urging environmental awareness, and the linking of environmental goals with other corporate goals, promotes global transparency by providing employees with intelligibility of the broader system within which they are working (Adler & Borys 1996), and demonstrates the importance of the achievement of environmental objectives in contributing to the firm’s overall performance (Hunt & Auster 1990; Schaltegger et al. 2008). In addition, providing employees with training on environmental issues,
policies and procedures contributes to the development of both internal and global transparency, helping employees incorporate and leverage environmental systems in their daily practice (Adler 1999). Through outlining the key components of environmental management activities, along with the underlying rationale for their application, employees are provided with both a localised perspective of their individual responsibilities, as well as a broader perspective of how their local tasks fit into the organisation as a whole (Adler & Borys 1996).

The existence of a formalised continuous improvement program is further analogous to the ‘repair’ of environmental policies and procedures. The pursuit of continuous environmental improvement, including programs to redesign wasteful products and processes to reduce their environmental impact, requires both senior management involvement to outline performance goals and targets (Hunt & Auster 1990; Banerjee et al. 2003), as well as high levels of employee involvement to identify and implement opportunities to meet those goals (Hart 1995). From this perspective, operational staff are likely to be encouraged to seek out and suggest improvements to current solutions, whilst simultaneously ensuring that current performance standards are achieved. Thus, consistent with an enabling form of bureaucracy, firms pursuing more proactive strategies are likely to outline environmental policies and procedures as best management practices which are not viewed as static, but rather as templates to be constantly improved on (Adler & Borys 1996).

In summary, the above arguments suggest that firms pursuing more proactive strategies are likely to adopt enabling eco-control structures which allow them to simultaneously pursue the joint objectives of efficiency and flexibility. Further to this, the process of incorporating environmental issues into formal strategic planning and decision-making processes may also contribute to the development of the
underlying design principles reflective of an enabling form of control. Stated formally:

**H2: There is a positive association between proactive environmental strategy and the adoption of an enabling stance towards eco-control.**

### 3.3.2 The Use of Eco-Controls and Environmental Performance

Environmental performance is the result of an organisation’s management of its environmental impacts. Thus, at the conceptual level, the benefits of environmental management are diverse and may be argued to include: lower liabilities and cost of regulatory compliance due to a reduction in risk of environmental accidents (Sharma & Vredenburg 1998; Epstein & Wisner 2005); benefits attributable to improved eco-efficiency, such as improvements in relative efficiency and profitability achieved by reducing costs through waste reduction and improvements to operations (Porter & Van der Linde 1995a; King & Lenox 2002; Burnett & Hansen 2008); and a range of internal and external competitive organisational benefits including increased capacity for product and process innovations and organisation-wide learning among employees, as well as improvements in company reputation or goodwill and relationships with both internal and external stakeholders (Hart 1995; Russo & Fouts 1997; Sharma & Vredenburg 1998; Aragón-Corra & Sharma 2003).

The broader MCS literature contends that appropriate design of MCS potentially influences the link between strategy and firm performance (Langfield-Smith 1997; Chenhall 2003). However, while those studies examine MCS globally, this study focuses on the integration of environmental concerns within MCS, termed eco-controls. This suggests that the effect of eco-controls, being a specific application of
MCS, may accordingly be observable at an intermediary level of performance, namely, environmental performance (Henri & Journeault 2010).

Eco-control is expected to foster environmental performance by: i) focusing organisational attention toward environmental concerns; ii) providing information for decision-making on strategic and operational issues; and iii) providing feedback (Henri & Journeault 2010, p. 67). Providing goals and feedback enhances environmental performance by clarifying expectations, reducing ambiguity associated with tasks relating to environmental strategies, and providing a coherent reflection of environmental priorities (Chenhall 2005). Where eco-control is used to monitor compliance with environmental policies, goals and regulations, it supports the attainment of pre-established environmental goals, and closely monitors deviations from regulations (Simons 1990, 1995). Further, by providing feedback regarding the differences between environmental goals and outputs, eco-control can be used as a database to facilitate single-loop learning on environmental issues (Abernethy & Brownell 1999; Henri & Journeault 2010).

Further, empirical studies have identified how ‘the creation of a permanent, institutionalised, internal management process based on environmental accounting and reporting’ (Schaltegger et al. 2008, p. 437) can contribute to environmental performance, both in terms of environmental impact and associated organisational benefits. Epstein and Wisner (2005) observe that environmental performance, in terms of compliance with regulations, is positively associated with management commitment as well as various environmental controls, including plans and procedures, measurement systems and reward systems. Furthermore, Henri and Journeault (2010) report that increased use of specific eco-controls, including EPIs, budgeting, and employee reward systems, improves environmental performance.
across all firm sub-samples, including after controlling for a range of ‘other’ environmental management practices.

Firms in possession of a formal environmental management system may also perceive impacts well beyond pollution abatement, and see a critical positive impact on many dimensions of operations performance (Melnyk et al. 2003). For example, Ferreira et al. (2010) find that the increased use of environmental management accounting (EMA), an aspect of eco-controls, has a positive association with process innovation. Further, a formalised approach to environmental management has been associated with the development of unique organisational capabilities such as environmental awareness development and organisational learning, continuous environmental improvement, integration of stakeholder interests, as well as improvement to production processes, product quality and company reputation (Masanet-Llodra 2006; Montabon et al. 2007; Perez et al. 2007).

While evidence suggests that firms may achieve improved environmental performance through the increased use of specific eco-controls, this study is concerned with how information created by an organisation’s eco-control system is used by senior management to support environmental strategic planning and decision-making. Simons (1995) contends the four LOC, comprising beliefs systems, boundary systems, diagnostic use, and interactive use, are complementary and jointly contribute to the effective implementation of business strategy. However, empirical studies have provided inconsistent evidence concerning the performance outcomes of the various levers independently (e.g., Abernethy & Brownell 1999; Bisbe & Otley 2004; Henri 2006), and few studies have considered the effect of all four levers collectively (e.g., Tuomela 2005; Widener 2007; Mundy 2010). Furthermore, the style of use of MCS within the context of environmental performance, as an
intermediary level of firm performance, is not clear. Nevertheless, for the following reasons, the style of use of eco-controls may also prove influential in determining a firm’s environmental outcomes.

**Hypothesis 3(a): Beliefs Systems and Environmental Performance**

Emphasis on control systems influences performance through the effect on learning and management attention (Widener 2007). The degree of management attention or commitment signals to the employees the importance of a strategic initiative, and also gives internal credibility to the environmental initiatives which must be undertaken to improve performance (Epstein & Roy 1998). Further, where control is exerted through having a shared beliefs system or a common set of core values, it helps to align the decision-making of the employees with the mission of the organisation (Simons 1994). Accordingly, having a strong sense of internal mission increases employee commitment to the organisation, and also lessens uncertainties about appropriate courses of action to take (Campbell & Yeung 1991; Epstein & Wisner 2005).

Organisation-wide commitment to environmentally-responsible decision-making is likely to be facilitated by a ‘fit’ between employees’ personal values and the values promoted by an organisation (Campbell & Yeung 1991; Norris & O'Dwyer 2004). From this perspective, beliefs systems are also argued to play a vital role in fostering employee motivation through the development of social identification with group objectives (Adler & Chen 2011). This premise is consistent with Ramus and Steger (2000), who demonstrate that employees who perceive strong signals of organisational and supervisory encouragement are more likely to develop and implement creative ideas that positively affect the natural environment.
The emphasis placed on environmental beliefs systems is, therefore, predicted to improve employee morale, encourage innovation and have a positive influence on the motivation of employees to achieve the firm’s environmental goals.

*H3a: The emphasis firms place on a beliefs system is positively associated with environmental performance.*

Hypothesis 3(b): Boundary Systems and Environmental Performance

Boundary systems are, typically, used to delineate minimum standards, set limits on the behaviours of organisational members and provide credible sanctions for violations of proscribed rules and procedures (Simons 1995). Therefore, the emphasis placed on an environmental boundary system may have varied influence on the proposed dimensions of environmental performance.

Boundary systems represent the ‘the structure of last resort’ and ‘attempt to specify behaviours that are to be avoided at all costs’ (Speklé 2001, p. 435). Likewise, environmental boundary systems may be regarded as a suitable means for describing environmental risks that should be avoided, and setting limits around environmental plans and activities (Simons 1995; Arjaliès & Mundy 2013). Therefore, it may be argued that organisations that emphasise boundary systems to manage environmental risks are likely to perceive benefits associated with decreases in environmental accidents and increases in compliance with both internal (strategic) and external (regulatory) environmental policies.

However, the positive versus negative reinforcement of environmental objectives may have an impact beyond ensuring compliance with pre-identified standards of behaviour. Unlike beliefs systems which are used by senior management to provide guidance and momentum to opportunity-seeking behaviour, boundary systems are
used to establish limits and discourage excessive search behaviour (Simons 1995; Mundy 2010). Therefore, where boundary systems are used to enforce compliance and accountability, they may, in fact, hinder continuous improvement by suppressing debate and the seeking of alternate options (Mundy 2010), and discouraging employee-driven innovation (Ramus & Steger 2000). Further, the emphasis placed on boundary systems to clarify unacceptable areas of activity ‘may be perceived as unnecessary or even suggest that employees cannot be trusted’, and could damage social ties and the development of shared values (Chenhall et al. 2010, p. 743). In this way, boundary systems may diminish employee motivation and commitment, and, therefore, restrict the potential range of environmental performance outcomes a firm can achieve.

In summary, environmental boundary systems are likely to be an effective tool in reducing the risk of environmental accidents and achieving pre-defined, minimum performance standards. However, it can be suggested that boundary systems have the potential to place negative pressure on some of the more intangible benefits of improved environmental performance such as employee morale, as well as limiting opportunities for employee-driven learning and innovation. Accordingly, the relation between environmental boundary systems and environmental performance is not clear, and the associated hypothesis is presented in the null form:

**H3b: The emphasis firms place on a boundary system is significantly associated with environmental performance.**

**Hypothesis 3(c): Diagnostic Use of Eco-controls and Environmental Performance**

The diagnostic use of controls is regarded as improving organisational performance outcomes through monitoring progress towards defined goals, allowing firms to
correct deviations from pre-set standards of performance (Simons 1995; Abernethy & Brownell 1999). However, recent empirical studies have provided mixed results concerning the outcomes of the diagnostic use of MCS.

Widener (2007) observes that firms placing a greater emphasis on the diagnostic use of controls are more amenable to organisational learning, suggesting that ‘the diagnostic system is the mechanism by which the employees learn of the new strategy and, consequently, the new goals and objectives with which to align behaviour’ (Widener 2007, p. 782). Contrastingly, Henri (2006) finds that, by creating constraints to ensure compliance with pre-established objectives (intended strategies), the diagnostic use of controls exerts negative pressure on the competitive capabilities of market orientation, entrepreneurship, innovativeness and organisational learning, thus inhibiting their development.

Accordingly, when considered in isolation from the effects of the other control levers, the diagnostic use of eco-controls may have mixed effects on the proposed dimensions of environmental performance. Through identifying the gaps between past plans and current performance, the diagnostic use of eco-controls may contribute to environmental performance by highlighting where corrective action is required to ensure compliance with internal and external performance targets (Arjaliès & Mundy 2013). Further, through evaluating performance indicators and correcting deviations, it is predicted that the diagnostic use of eco-controls facilitates single-loop learning (Argyris 1977; Argyris & Schön 1978) concerning effective ways of managing the environmental impact of a firm’s operations. The diagnostic use of eco-controls, therefore, contributes to improved performance through the management of critical performance variables, which may, in turn, lead to: i) decreased costs from waste reduction, resource conservation and regulatory
compliance, and ii) improvements in relative efficiency and productivity resulting from incremental process improvements and innovations.

However, the results from Henri (2006) suggest that the diagnostic use of eco-controls may place negative pressure on some of the broader dimensions of environmental performance. In particular, emphasis on the diagnostic use of eco-controls to implement intended strategies may suppress double-loop learning (Fiol & Lyles 1985), characterised by deeper inquiry and questioning of ‘the very basis upon which strategies have been constructed’ (Simons 1995, p. 106). This may, in turn, inhibit higher-order organisational learning surrounding environmental management activities, and the development of capabilities for product and service innovations required to maintain a sustained competitive advantage.

Based on the above arguments, the hypothesised relation between the diagnostic use of eco-controls and environmental performance is presented in the null form:

\[ H3c: \text{The emphasis firms place on the diagnostic use of eco-controls is significantly associated with environmental performance.} \]

Hypothesis 3(d): Interactive Use of Eco-controls and Environmental Performance

The interactive use of eco-controls requires that environmental information generated by the control system is interpreted and discussed among organisational departments and functions, and provides a catalyst for the continual challenge and debate of underlying assumptions and action plans (Simons 1995). Through engaging managers in ‘scanning and seeking behaviours’ the interactive use of controls can support the exploration of new ideas and experiences (Widener 2007, p. 765). In this respect, interactive processes may lead to increased knowledge about effective ways of managing environmental activities, including the potential to re-design existing...
procedures or identify new opportunities to reduce the environmental impact of operations.

Abernethy and Brownell (1999) report that organisations facing strategic change achieve superior performance where MCS, specifically budgets, are used interactively. In a similar vein, Bisbe and Otley (2004) observe that the relation between innovation and performance is more positive as the interactive use of MCS increases. In other words, ‘the interactive use of MCS helps translate creativity into effective innovations and enhanced performance’ (Bisbe & Otley 2004, p. 729). Likewise, the interactive use of eco-controls in particular may contribute to improved environmental performance through supporting opportunity-seeking behaviour in relation to product and process innovations, and the development of new pollution prevention technologies.

Further, Simons (1990, 1991) specifically singles out the interactive use of MCS as a facilitator of organisational learning. When used interactively, eco-controls stimulate dialogue between senior management and employees, creating a forum to express views and opinions as well as knowledge-sharing, which may lead to higher-order, organisational learning (Simons 1995; Langfield-Smith 1997). Support is provided by Henri (2006) who, guided by the resource-based view, observes that by focusing organisational attention on strategic priorities and stimulating dialogue, the interactive use of MCS fosters the development of competitive organisational capabilities, including market orientation, entrepreneurship, innovativeness and organisational learning.

In addition, although the interactive use of eco-controls can be regarded as increasing the cost of control, due to its emphasis on discussion and management attention
Chapter 3: Conceptual Framework and Hypotheses Development

(Tuomela 2005), empirical evidence suggests that the positive influence of interactive use on performance outweighs the costs (Widener 2007). Therefore, through directly involving themselves in the decision-making activities of subordinates and focusing organisational attention around strategic uncertainties, the interactive use of eco-controls by senior management is predicted to have a positive relation with environmental performance. Stated formally:

**H3d: The emphasis firms place on the interactive use of eco-controls is positively associated with environmental performance.**

Hypothesis 4: Bureaucratic Stance towards Eco-controls and Environmental Performance

Adler (1999) suggests formalised processes and procedures can benefit businesses as they can simplify and provide directions in complex situations. However, they may also entail a host of negative consequences such as rigidity, employee alienation, and low commitment. Prior literature has drawn on Adler and Borys’s (1996) concept of enabling bureaucracy to describe how organisational systems may be formulated to ‘help committed employees do their jobs more effectively’ (Adler & Borys 1996, p. 83), and hence contribute to the achievement of organisational objectives.

Chapman and Kihn (2009), for example, observe numerous positive relations between the four design features of enabling control, and measures of firms’ financial, market and social responsibility performance. Other studies have suggested the benefits of an enabling form of control to include: enhanced validity and acceptance of the system, thereby increasing employee buy-in to organisational objectives (Wouters & Wilderom 2008; Chenhall et al. 2010); providing the means to overcome incompleteness of performance indicators during periods of strategic
change (Wouters & Wilderom 2008; Jordan & Messner 2012); supporting both identified and intrinsic forms of motivation, promoting creativity, and aiding bottom-up, incremental innovation (Davila et al. 2009; Adler & Chen 2011); the capture and documentation of localised knowledge and organisational learning (Ahrens & Chapman 2004; Ditillo 2004); and allowing organisations to better manage tensions between efficiency and flexibility (Ahrens & Chapman 2004; Jørgensen & Messner 2009).

The design characteristics of internal and global transparency have, in particular, been identified as significantly contributing to the benefits of an enabling form of control (Ahrens & Chapman 2004; Wouters & Wilderom 2008). ‘By enhancing organisational members’ understanding of their particular operational tasks in the context of the wider organisational objectives, enabling systems equip users to deal with emerging contingencies in ways that fit both local and central agendas’ (Ahrens & Chapman 2004, p. 281). Thus, from an environmental management perspective, improving the transparency of eco-controls aids role clarity by providing employees with a detailed understanding of how specific environmental performance standards are to be achieved, as well as a broader appreciation of how environmental management activities contribute to the overall performance of the organisation.

Through ensuring eco-controls are transparent and promoting awareness of employees’ accountability for environmental management activities, environmental processes and procedures can be implemented in a flexible way, with employees treating them as a means rather than an end when carrying out their work (Jordan & Messner 2012). Here, the flexibility of eco-controls allows greater employee discretion, which is helpful in making timely decisions and responding to unexpected events as they arise. The ability of employees to repair eco-control systems may also
be instrumental in facilitating organisational learning surrounding environmental management activities. Adler (1999, p. 37) notes that ‘staff too can be repositories of valuable expertise, and they can serve as an effective channel for diffusing lessons learned in one part of the organisation to others’. In this respect, environmental management processes and procedures begin to reflect a two-way dialogue, and formalisation acts as a knowledge integration mechanism to capture and document collaborative learning and incremental innovation (Davila et al. 2009).

Accordingly, in their enabling form, eco-control systems ‘can make transparent the organisation’s goals and progress towards these goals, thereby fostering mutual commitment and inducing identified motivation … promote accountability and facilitate co-ordination across different [organisational] participants … [and] give organisational members flexibility in how they use the system and opportunities to adapt and improve it’ (Adler & Chen 2011, p. 75). Formal eco-control systems designed in this way can thus enable workers and operational management to pursue the objectives of efficiency and flexibility simultaneously (Ahrens & Chapman 2004; Wouters & Wilderom 2008), thereby contributing to the achievement of pre-determined environmental performance objectives while simultaneously providing a supportive framework for incremental innovation and the identification of new opportunities for improvement. Stated formally:

**H4: An enabling stance towards eco-control is positively associated with environmental performance.**

### 3.3.3 Environmental Performance and Economic Performance

The purpose of the final dependent variable is to assess the effectiveness of aligning the strategy-structure-performance construct from an environmental
perspective, and thus addresses the degree to which economic goals and objectives have also been achieved. Accordingly, for this study, economic performance is specifically concerned with the incremental change in a firm’s economic performance as a result of its environmental management activities.

The following sub-section develops the hypothesis linking improvements in a firm’s environmental performance to an overall measure of economic performance:

**Hypothesis 5: Environmental Performance and Economic Performance**

Generally speaking, outcomes of environmental management which act as drivers of economic performance include opportunities for increasing revenues, and opportunities for reducing costs (Ambec & Lanoie 2008). For example, Porter and Van der Linde (1995a) argue that pollution is a waste of resources and represents unnecessary costs for the firm. Accordingly, costs can be reduced by exploiting ecological efficiencies such as waste reduction, energy conservation and improved utilisation of raw materials, thereby contributing to improvements in overall economic performance (e.g., King & Lenox 2002; Burnett & Hansen 2008).

A focus on improved environmental performance may also assist firms to improve their management of risk, and thus reduce the outlays associated with accidents, lawsuits and boycotts (Reinhardt 1999). Furthermore, superior environmental performance has been argued to provide the basis for creating a competitive advantage and the opportunity to increase revenues by providing reputational benefits, which result in social legitimacy, accessing new ‘green’ markets (Hart 1995) and increasing sales (Russo & Fouts 1997).
Further to the direct opportunities for increasing revenues or decreasing costs, studies have increasingly identified how integrating environmental concerns into operational activities may contribute to the development of unique organisational resources and capabilities, including those related to stakeholder integration, organisational learning, innovation, human capital and culture (Sharma & Vredenburg 1998; Christmann 2000; Aragón-Correa et al. 2008; Henri & Journeault 2010; Surroca et al. 2010). Furthermore, evidence suggests that such organisational capabilities, when viewed in line with environmental outcomes, may lead to a competitive advantage and improved economic performance (Christmann 2000; Aragón-Correa et al. 2008; López-Gamero et al. 2009; Surroca et al. 2010).

However, the influence of each driver may not be uniform. Wagner (2007) reports a generally positive, yet varying, association which is strongest for image-related and market-related performance drivers, but less strong for efficiency-related and risk-related performance drivers. This suggests that improved environmental performance may provide economic benefits primarily from improved reputation and culture, relations with internal and external stakeholders, and increased market share or access to new ‘green’ markets, and, to a lesser extent, as a direct result of a firm reducing their environmental impact from reduced material or production costs or reductions in the cost of regulatory compliance. Still, Wagner’s (2007) findings support the presence of an overall positive relation between environmental performance and economic performance.

**H5: Environmental performance is positively associated with economic performance.**
3.4 Chapter Summary

The conceptual framework presented in this chapter is built on the theoretical perspectives of the resource-based view, and proposes that eco-controls are a key organisational resource which mediates the relationship between environmental strategy and environmental performance, which, in turn, is seen to affect an entity’s economic performance. Furthermore, two distinct dimensions concerning the use of eco-controls are a focal interest of this study. Specifically, the style of use and the bureaucratic stance towards eco-controls are considered.

This framework serves as a basis for answering the research questions outlined in Chapter 1. Thus, to address the gaps in the literature identified in Chapter 2, hypotheses were developed which articulate the relations between the various components of the constructs in the research model. These hypotheses will be empirically tested in Chapter 5. The next chapter will outline the methodology adopted in carrying out the empirical part of the research.
Chapter 4: Survey Research Design and Method

4.1 Introduction

In this chapter, explanations of: i) the selection criteria and data sampling method; ii) the type of data to be analysed; iii) the appropriate statistical technique for estimation of the research model; and iv) issues concerning the sample size and statistical power of results are provided.

Section 4.2 outlines the sampling frame and selection criteria used to identify the respondent sample. Section 4.3 discusses the use of a mixed-mode questionnaire-survey for data collection, including strategies employed to enhance response rates and testing for non-response bias. Section 4.4 outlines the design of the research instrument, and provides a summary of the definition and measurement of the research constructs adopted for this study.

Section 4.5 summarises the preliminary data analysis, and Section 4.6 discusses the use of confirmatory factor analysis (CFA) for evaluating the reliability and validity of the measurement scales. Finally, Section 4.7 describes the statistical method, namely, structural equation modelling (SEM), used to analyse the conceptual model, prior to addressing issues concerning sample size and parameters for assessing model fit.

4.2 Sampling Frame and Selection Criteria

One of the primary advantages of survey-based research is the ability to draw on large samples from a given population, such that inferences made about the samples are also valid for the population. The primary sampling frame for this study consists of medium- to large-sized organisations operating within Australia. While prior
empirical studies in the environmental management field have commonly focused on a single industry with high environmental exposure, such as oil and gas (Sharma & Vredenburg 1998; Sharma 2000), chemicals (Christmann 2000) or manufacturing (Perego & Hartmann 2009; Henri & Journeault 2010), this study adopts a cross-sectional sample to capture variance in eco-control uses both across and within industries. Further, consistent with prior studies, the strategic business unit (SBU), in the case of multi-divisional firms, and the firm level, in the case of individual companies, are identified as the appropriate level to survey (Christmann 2000; Perego & Hartmann 2009).

Sample selection procedures were as follows: first, the largest 2,000 organisations operating in Australia (based on revenue) are initially identified from the IBISWorld Database. Consistent with the eco-control literature, organisations with 100 employees or more, and reporting annual revenue over $20 million (Henri & Journeault 2008a; Perego & Hartmann 2009; Henri & Journeault 2010) are selected. These criteria are intended to ensure that the organisations are large enough for organisational and strategic variables to apply (Miller 1987) and that management control systems are sufficiently developed (Bouwens & Abernethy 2000). Second, prior studies have suggested that surveying one person about overall organisational practices in very large firms is problematic. Thus, following Fullerton and McWatters (2002) and Widener (2007), firms reporting revenue over $2 billion are also excluded from this study. Third, firms belonging to the Finance and Insurance (n=114) and Government Administration and Defence (n=9) industries were also removed to maximise the likelihood that the resulting sample exhibits the variation in

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the independent variables necessary to test the proposed hypotheses (Van der Stede, Young & Chen 2005).

Telephone calls were used to identify the senior manager responsible for environmental management activities (Pondeville et al. 2013), as well as confirming the individual’s contact details and preferred method of delivery. Based on these phone calls, a further 188 firms were excluded from the study. Reasons for exclusion included: the firm was no longer trading, was under administration, or had been acquired via takeover; senior managers were based outside of Australia; or, company policy precluded participation in surveys. The final distribution list comprised 1,120 firms. Of these, 891 firms opted to receive the survey invitations via email, with the remaining 229 opting to receive postal invitations.

4.3 Definition and Measurement of the Individual Constructs

A review of the MCS strategy literature reveals that the disparate conceptualisations of management controls have impeded the integration of research findings (Langfield-Smith 1997; Chenhall 2003; Tucker et al. 2009). Langfield-Smith (1997, p. 228) suggests that future researchers ‘develop consistent classifications for controls and other contingent variables, and use established classifications of strategy’. Where possible, the survey questionnaire adopts measurement scale items drawn from prior studies, adapted as necessary to the specific application of environmental management. A discussion of the measurement scale items for each variable is outlined below, and in Chapter 5 the reliability of each variable is discussed. The final survey instrument is provided in Appendix A.
4.4.1 Firm Environmental Strategy

The study adopts a definition of environmental strategy in line with Banerjee (2002, p. 181) and Perego and Hartmann (2009, p. 400) as the organisation-wide recognition of the legitimacy and importance of the biophysical environment, and the integration of environmental issues into the strategic planning process.

Environmental strategy ($ENV\_STGY$) is initially measured using 13 items. The scale includes 8 items adopted by Perego and Hartmann (2009), and an additional 3 items developed by Banerjee et al. (2002; 2003). A further 2 self-developed items are included, drawing on themes identified during a review of the environmental strategy literature. All items are evaluated on 7-point Likert scales ranging from ‘Strongly Disagree’ to ‘Strongly Agree’.

4.4.2 Style of Use of Eco-controls

Eco-control is defined as ‘the creation of a permanent, institutionalised, internal management process based on environmental accounting and reporting’ (Schaltegger et al. 2008, p. 437). Since eco-control is a non-prescriptive environmental management system, which may be implemented in varying degrees within a firm, this study seeks to capture that variation in terms of the style of use of eco-controls and the bureaucratic stance towards the use of eco-controls.

For this study, the style of use of eco-controls draws on Simons’ (1995) Levers of Control framework to assess senior management’s use of beliefs systems, boundary systems, interactive and diagnostic approaches. Beliefs systems ($BELIEF$) are

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14 Items developed for this study include item 10, the formalisation of a continuous improvement program for environmental policies and procedures, and item 12, assessing what has worked for competitors prior to moving into new markets for environmental goods and services (a reverse score observation contrasting the reactive approach to item 11). See Appendix A for the complete instrument.
defined as the extent to which senior management communicates an environmental values system to motivate their workforce, and is measured using a 4-item scale adapted from Widener (2007). Boundary systems (BOUND) are defined as the extent to which senior management employs a code of conduct to set minimum environmental standards to control their workforce, and is also measured using a 4-item scale adapted from Widener (2007). All items are evaluated on 7-point Likert scales ranging from ‘Strongly Disagree’ to ‘Strongly Agree’.

The diagnostic use of controls (DIAG) is defined as the extent to which senior management use environmental controls to track progress towards previously defined goals and objectives, and interactive use (INTERACT) as the extent to which senior management use environmental controls to enable discussion and debate on common issues and potential solutions to strategic uncertainties. Though several studies (e.g., Abernethy & Brownell 1999; Bisbe & Otley 2004; Henri 2006; Bisbe, Batista-Foguet & Chenhall 2007; Widener 2007) have developed measures for Simons’ (1995) interactive and diagnostic style of use of controls, measures for this study are adapted from Henri (2006) and Widener (2007), as their measurement is consistent with the resource-based view theoretical framework, which underpins the present study.15 Specifically, DIAG is measured using a 5-item scale and INTERACT using a 6-item scale assessing the extent to which senior management relies on eco-controls, evaluated on 7-point Likert scales ranging from ‘Not at All’ to ‘A Great Extent’.

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15 Widener (2007) in fact combines the interactive and diagnostic use measurement scales of Henri (Henri 2006) as a single construct representing diagnostic use only. For this study, measurement of interactive and diagnostic use are consistent with the original approach of (Henri 2006), with one additional item drawn from Widener (2007) for each scale. An alternative 3-item scale consistent with Widener’s (2007) approach to measuring interactive use is also included for comparative analysis.
4.4.3 Bureaucratic Stance on Eco Controls

The bureaucratic stance on the use of eco-controls concerns senior management’s approach towards the implementation and use of eco-control information in the decision-making activities of subordinate managers and employees generally. Accordingly, the construct draws on Adler and Borys’s (1996) and Adler’s (1999) initial conceptualisations of enabling versus constraining forms of bureaucracy along with contributions from the accounting literature which examine the enabling-constraining classification within a management control setting (i.e., Ahrens & Chapman 2004; Wouters & Wilderom 2008; Chapman & Kihn 2009; Jørgensen & Messner 2009).

Consistent with Adler and Borys (1996), enabling control ($\text{ENABLE}$) is conceptualised as a higher-order factor, with four latent indicators associated with the underlying design characteristics of flexibility ($\text{FLEX}$), internal transparency ($\text{INTERNAL}$), global transparency ($\text{GLOBAL}$), and repair ($\text{REPAIR}$). Further, given the concept of enabling control addresses how control systems are ultimately used by the workforce, the construct was designed to capture broader employee interactions with control systems, rather than solely addressing their use by senior management.

Pre-validated scale items measuring the overall concept of enabling control were not available at the time of developing the survey instrument, thus new scales were developed based on a review of the literature. In doing so, this study responds to a call from the literature for future empirical studies to further develop the operationalisation of these constructs (Naranjo-Gil & Hartmann 2006). Following the recommendations outlined by Churchill (1979) and DeVellis (2003), an initial pool of items was generated based on Adler and Borys (1996) and Adler (1999),
concerning the design characteristics of enabling versus constraining forms of bureaucracy, and also on the instrument developed by Chapman and Kihn (2009) which specifically focuses on the enabling versus constraining use of budgets.16 This initial pool was further revised through discussions with research supervisors to ensure the relevance of each item in relation to its underlying construct.

The final scale comprised a total of 16 items across 4 sub-scales. Individually, \textit{REPAIR} and \textit{INTERNAL} were each measured using a 4-item scale, \textit{GLOBAL} using a 5-item scale, and \textit{FLEX} using a 3-item scale. To ensure consistency with other measurement scales adopted for this study, the items required respondents to indicate the degree to which they agreed or disagreed with statements concerning the ways employees interact with their organisation’s eco-controls. Accordingly, all items were evaluated on 7-point Likert scales from ‘Strongly Disagree’ to ‘Strongly Agree’.

\textbf{4.4.4 Environmental Performance}

Environmental performance (\textit{ENV_PERF}) is measured using a 13-item scale developed by Sharma and Vredenburg (1998) to measure the \textit{competitive organisational benefits} flowing from the adoption of proactive environmental strategies. Sharma and Vredenburg’s (1998) organisational benefits scale was later adapted by Henri and Journeault (2010) to measure environmental performance, as an intermediary level of performance mediating the link between the use of eco-controls and economic performance.

\begin{itemize}
\item[16] Although the instrument designed by Chapman and Kihn (2009) does incorporate items addressing each of the four underlying design characteristics, its focus specifically addressed the use of budgets by operational managers and was thus deemed too limited in scope for the present study. Further, the authors assess the four design traits individually and do not assess the overall concept of enabling control.
\end{itemize}
Using a 7-point Likert scale, ranging from ‘Not at All’ to ‘A Great Extent’, respondents were asked to indicate the extent to which their organisation’s environmental management practices have led to a range of competitive organisational benefits. Such benefits include: reduced costs or improvements in operations resulting from changes to reduce the environmental impact of process/production methods, increases in innovation and organisation-wide learning, as well as improvements in employee morale, company reputation or goodwill, and relationships with stakeholders such as local communities, regulators, and environmental groups.

4.4.5 Economic Performance

The extant literature has predominantly used subjective perceptions of economic performance (Judge & Douglas 1998; Wisner et al. 2006; Aragón-Correa et al. 2008; López-Gamero et al. 2009; Henri & Journeault 2010) as it is perceived that managers are more open to offering their perceptions rather than to offering precise quantitative data. Further, whereas financial measures once constituted the entirety of performance measurement, they are now seen as just one set of measures to assess corporate performance (Epstein & Roy 2001).

This study assesses economic performance (ECON_PERF) as the degree to which economic goals and objectives have been achieved. In doing so, the study adopts a modified version of a scale developed by Govindarajan et al. (Gupta & Govindarajan 1984; Govindarajan & Gupta 1985; Govindarajan & Fisher 1990) which measure the effectiveness of strategy implementation across 10-12 dimensions. To avoid overlap with the environmental performance measure detailed in the previous section, the scale is reduced to six items concerning sales volume, cost control, cash flow from
operations, operating profit, return on investment, and market share. Further, items measuring $ECON\_PERF$ assess performance against management expectations, rather than on an absolute scale, with respondents requested to rate their performance for the previous twelve months on a 7-point Likert scale ranging from ‘Very poor Performance’ to ‘Excellent Performance’.

4.4.6 Demographics

The questionnaire-survey also outlined a number of items concerning the demographic characteristics of the respondents and their organisations. Items concerning the participating organisation include:

i) size of the organisation (number of full-time equivalent employees)

ii) business ownership structure (ASX publicly listed, proprietary company or government enterprise, and Australian-owned or foreign-owned), and

iii) primary industry sector

A further eight questions related to demographic information about respondents and their direct involvement in the organisation’s environmental management activities, including:

i) current position

ii) length of service in current position

iii) length of service with the organisation

iv) highest qualification

v) age group

vi) gender

vii) proportion of work time dealing with environmental management activities, and
whether their involvement in environmental activities was increasing or decreasing

4.4 Preliminary Analysis of the Data

Prior to the main analysis of the survey data, preliminary analysis was undertaken to minimise distortions that may have been caused by inaccuracy in entering data, missing data, and outliers (Tabachnick & Fidell 2007; Pallant 2010). Measures were taken to exclude meaningless data by including steps to identify and control for speeders and flat-liners in the response set. Furthermore, effort was made to assess the fit of the sample data with the statistical assumptions of the chosen multivariate analysis technique (Tabachnick & Fidell 2007; Hair et al. 2010; Kline 2010). Each of these issues is discussed further below.

4.5.1 Data Preparation and Screening

Data screening and cleaning were executed in several steps. First, the mixed-mode survey design required the two sources of data to be compiled into a single data set. To aid data entry and reduce coding errors, postal responses were manually entered into the Qualtrics online survey tool. The collated data set was downloaded from the Qualtrics online survey tool as a .sav file extension, for analysis using the integrated SPSS and AMOS statistical software package (version 21.0). The second step was to prepare a codebook (Pallant 2010) defining and labelling each of the variables, and assigning unique identifiers to each of the responses (see Appendix C). Finally, responses to negatively-worded items were transformed, creating new variables with reverse scores while retaining the original, unchanged data (Pallant 2010).
To ensure accuracy and reliability of the data set, the data were screened for two potential causes of error. The first issue related to screening for the accuracy of the data. This involves examination of the univariate descriptive statistics, using SPSS *Frequencies* for categorical variables and *Descriptives* for all continuous variables, to ensure means and standard deviations for continuous variables are plausible, and all values for both discrete and continuous variables are within their defined range. Next, the data were checked for invalid respondents not meeting the original sample selection criteria, or having insufficient experience within their organisation to provide adequately informed responses to the questionnaire items. The characteristics checked were the company size, position and tenure of the respondent.

### 4.5.2 Speeders and Flat-liners

*Speeders* are respondents who complete the survey too quickly (i.e., in less than 30%-50% of the median completion time), and are likely not reading or answering the questions appropriately. The same is true for *flat-liners*, respondents who mark each answer for a given variable, or questionnaire section, with the same value (who, incidentally, are often also *speeders*). These respondents may have read the questions, but have likely not given substantial consideration to their answers. 17

Respondents taking less than 30% of the median time were automatically excluded from the sample. Respondents taking between 30% - 50% of the median time were manually examined for logical consistency (i.e., appropriate responses to reverse-coded items) and mitigating factors which may have contributed to the low response time (such as the number of incomplete items and unanswered questions) before being omitted from the final sample.

17 Survey completion times were only available for respondents from the email group using the Qualtrics online survey tool. Accordingly, hardcopy postal responses may only be examined for the presence of flat-liners.
Flat-liners were identified using two methods: First, by visual examination of the data undertaken during the data screening process and, secondly, by measuring the variance of the scale items for each latent construct (i.e., with zero variance indicating a common response for all items). Extreme cases of flat-liners, including cases which failed to display logical consistency between item responses, were omitted from the final sample.

4.5.3 Incomplete or Missing Data

Two types of missing data were identified: items that could be objectively determined by the researcher, and those that could not. Missing data for the Organisational Details section of the survey questionnaire (including the number of employees, ownership structure, and industry sector) were cross-referenced against the original distribution list obtained from IBISWorld for accuracy, and to inform unanswered items. Other missing data related to items measuring key variables which were not answered by the respondent. This could be due to a variety of reasons such as failure to complete the whole questionnaire, overlooking answer fields, or privacy and non-disclosure concerns.

Following Hair et al. (2010), 9 cases with excessive levels of missing data (>10%) were identified and subsequently removed using list-wise deletion. However, all variables were within the 15% missing values margin, therefore, no item deletion was required. For the remaining dataset, 114 (0.8%) out of 14,807 data points were identified as missing.

According to Tabachnick and Fidell (2007, p. 62) the pattern of missing data is more important than the amount missing. Accordingly, two separate diagnostic tests are applied during the third step to determine the level of randomness of missing data.
using SPSS Missing Value Analysis. First, independent sample t-tests were used to compare the means of two sub-samples (observations with missing data and those with valid values) to determine whether significant differences exist (Tabachnick & Fidell 2007). Although some differences are expected to occur by ‘chance’ (Hair et al. 2010, p. 49), the t-test results failed to identify either a large number or a systematic pattern of differences between the two samples. Second, Little’s (1988) overall test of randomness was applied to determine whether the missing data can be classified as missing completely at random (MCAR). Given the null hypothesis for Little’s test states that the data are MCAR, the insignificant test statistic ($\chi^2 = 653.256, df = 637, p = 0.319$) suggests the missing data were, in fact, MCAR.

For missing data classified as MCAR, the literature suggests that modelling-based imputation approaches provide the best replication of original distribution of values with least bias, and do not result in significant data loss (Tabachnick & Fidell 2007; Hair et al. 2010; Kline 2010). Accordingly, the Expectation Maximisation (EM) treatment, available in SPSS, was used to estimate and impute values for the missing data.

### 4.5.4 Outliers

For this study, outliers were assessed from the univariate perspective, using minimum-maximum values, standard deviations and means of each of the variables (Tabachnick & Fidell 2007). Detecting univariate outliers involved plotting histograms and boxplots using SPSS so that extreme points could be established.
(Pallant 2010). Each outlier was checked against the data records to verify a genuine score. The decision then needed to be made regarding removing or changing the value of the outlier (Tabachnick & Fidell 2007). Pallant (2010) suggests considering the value of the mean and the 5% trimmed mean (the recalculated mean after the top and bottom 5% of cases have been removed). The outlier only needs to be considered further when the two mean values are very different. Given that these values did not differ greatly, the outliers were retained.

4.5.5 Normality of the Data

Evaluating both the univariate and multivariate normality of the data is an essential precursor to the use of multivariate analysis techniques, such as SEM with maximum likelihood estimation used in the present study, to ensure the validity of all ensuing statistical tests (Hair et al. 2010; Kline 2010).

Univariate Normality

Univariate normality may be assessed by either statistical or graphical methods, and, in many instances it is advisable to employ both methods in order to ascertain a clear picture of the distribution of the data. For graphical assessment, frequency histograms were plotted against a normal distribution overlay and expected normal probability plots (Q-Q Plot) were used to visually assess the normality of the distribution for each scale item (Tabachnick & Fidell 2007; Pallant 2010).

Statistical assessment of univariate normality was performed by obtaining the descriptive statistics for skewness and kurtosis in SPSS. A common test for assessing the statistical significance of skewness and kurtosis is to determine the ratio of the value of either index over its standard error, which may then be interpreted as a z-test of the null hypothesis of no skew or kurtosis, respectively. The most commonly used
critical values are +/-2.58 (.01 significance level) and +/-1.96, corresponding to a 0.05 error level (Tabachnick & Fidell 2007; Hair et al. 2010). However, Kline (2010) suggests that even slight departures from normality could be statistically significant in large samples. Thus, an alternative is to interpret the absolute values of skewness or kurtosis. Here, a skewness value >3.0 is considered ‘extremely’ skewed, absolute values of kurtosis >10.0 suggest a problem, and kurtosis >20 a serious problem (Kline 2010, p. 63).

All items were within the acceptable normality parameters for SEM suggested by Kline (2010). As demonstrated by the descriptive statistics (see Appendix C), the majority of items fell within +/-1 for both skewness and kurtosis, and all items scored within the more lenient range of +/-2. Thus, consideration of the combined statistical and graphical representations of item distributions suggested acceptable univariate normality.

**Multivariate Normality**

In addition to the standard univariate tests of skewness and kurtosis, Mardia’s statistic (Mardia 1985) is used in the analysis of the quantitative data to assess multivariate normality. Mardia's statistic tests multivariate non-normality based on functions of skewness and kurtosis, and should have a critical ratio of less than 3 to accept that the assumption of multivariate normality is not violated (Tabachnick & Fidell 2001).

To adjust for lack of multivariate normality, the Bollen-Stine bootstrap procedure is typically used (Bollen & Stine 1992; Tabachnick & Fidell 2007; Hair et al. 2010), enabling statistical significance to be assessed based solely on the sample data, and
avoiding reliance on statistical assumptions about the population.\footnote{In fact, Nevitt and Hancock (2001) found that for sample sizes of at least 200, the bootstrapping approach (in AMOS) was superior to use of the Satorra-Bentler scaled $\chi^2$ (Satorra & Bentler 1994) in correcting for non-normality.} In fact, Nevitt and Hancock (2001) found that for sample sizes of at least 200, the bootstrapping approach (in AMOS) was superior to use of the Satorra-Bentler scaled $\chi^2$ (Satorra & Bentler 1994) in correcting for non-normality.

Accordingly, in the instance of multivariate non-normality in the data set, significance levels of the chi-square goodness-of-fit statistic ($\chi^2$) are reported based on the Bollen-Stine bootstrapping modified p-values ($BSp$).

### 4.5 Assessing Measurement Scale Reliability

In SEM, the ability to incorporate latent variables into the analysis allows researchers to better represent theoretical constructs by using multiple measures of a concept, and thereby reduce the measurement error of that concept (Hair et al. 2010). In this approach, a researcher may adopt a measurement instrument, such as a questionnaire-survey, which incorporates multiple observations of the varied meanings and/or dimensions of several specific theoretical constructs. The intent is for the collective set of observations to represent the specific concept better than would be possible by a single observation alone.

The extent to which a measurement scale provides adequate representation of the theoretical construct must, therefore, be assessed prior to the examination of any potential relations outlined in the hypothesised conceptual model.
4.6.1 Confirmatory versus Exploratory Factor Analysis

Factor analysis is the process of determining whether sets of observed variables comprise common underlying dimensions that define theoretical constructs or factors (latent variables). The practical difference between confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) is whether the researcher seeks to confirm that a set of specific observations define those constructs or factors, or explore which observations share common underlying dimensions (Schumacker & Lomax 2004; Hair et al. 2010).

CFA belongs to the family of SEM techniques that allow for the investigation of causal relations among latent and observed variables in a priori specified, theory-derived models. With CFA the researcher must specify both the number of factors that exist, and which factor each observed variable will load on before the results can be computed, that is, the statistical technique does not assign variables to factors (Hair et al. 2010). Thus, CFA can identify the fit of the data to the specific, theory-derived measurement model (where items load only on the factors they were designed to measure), and point to the potential weakness of specific items.

Conversely, EFA is not generally considered a member of the SEM family (Kline 2010). Factors obtained from EFA are derived from statistical results, not from theory (Hair et al. 2010), and the researcher does not have an a priori specified theoretical model to be tested. Further, while EFA is thought to provide useful preliminary analysis, particularly in the absence of sufficient detailed theory, exploratory analysis does not provide an explicit test of uni-dimensionality of a measurement scale (Gerbing & Anderson 1988).
As the items in the questionnaire-survey adopted for this study were either derived from prior research or based on pre-established theory, the aim was to confirm whether the items actually belonged to their specified latent variable, as predicted. Consequently, CFA rather than EFA is used to evaluate whether measurement scale items adequately represent their theoretical latent variables.

### 4.6.2 One-factor Congeneric Models

A one-factor congeneric measurement model is a type of measurement model where a single latent construct is measured by several observed variables. This form of CFA model does not impose any constraints, except that the set of indicators all load on the same factor (Kline 2010) according to *a priori* expectations. Accordingly, both the unique factor loadings and error variances are unconstrained, and subsequently estimated in the model. This allows for the relative contribution of indicator variables to the measurement of latent constructs, and recognises that measurement error is likely to vary for each indicator (Holmes-Smith 2012). The use of congeneric measurement models in SEM is useful for assessing the role of measurement error in the model, assessing and improving the item and composite reliability of variables, and reducing a number of observed variables into a single latent variable (Kline, 2005).

For a one-factor congeneric model to be accepted, the indicator variables must all be valid measures of the one latent trait (Holmes-Smith 2012). As such, model fit indices can be used to assess the uni-dimensionality of a measurement scale (see

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21 This approach may be contrasted to parallel measurement models, whereby indicators are constrained to have equal loadings on the latent variable and equal error variances (Kline 2010). Accordingly, each indicator is assumed to be an equally accurate measure of the unobservable latent construct. This method is appropriate where the researcher is confident of measurement error invariance, or when predicated by the intended use of factor analysis results, such as the computation of unit-weighted composite indicators.
Section 4.7.4 for a discussion of fit indices). A one-factor congeneric model with acceptable fit can thus be viewed as establishing *construct validity*, since it evaluates the extent to which a set of measured items actually reflects the theoretical latent construct.

According to Holmes-Smith (2012), standardised residual covariances (the item-pair residual covariances divided by their estimated standard error) are the soundest method for identifying the source of model mis-specification in models demonstrating unacceptable fit. In large samples, critical values may be interpreted as a z-score which suggests that values +/-1.96 indicate a good fit at a 0.05 significance level. Larger values for standardised residual covariances indicate a mis-specification of the item pair (Kline 2010; Holmes-Smith 2012). Having identified the mis-specified indicator(s), theoretical and empirical inferences are used to guide the re-specification of the model, until an acceptable level of fit is achieved.

### 4.6.3 Reliability and Validity of Constructs

Confidence in SEM findings depends on the rigorous assessment of a measurement instrument’s validity and reliability. Although much emphasis in the reporting of SEM analysis surrounds the testing of interrelations hypothesised in the conceptual model, if the measurement scales used to quantify the latent variables of interest do not have good psychometric properties the results will be meaningless (Kline 2010). Shook et al. (2004, p. 400) note that low reliability and validity may cause structural relations to appear insignificant, regardless of whether the link exists, and call for more careful attention to measurement issues in future SEM studies.

Reliability and validity are distinct but closely-related conditions. Reliability refers to the consistency between multiple measurements of a variable, and concerns the
degree to which scores in a particular sample are free from random measurement error. Measurement scale validity concerns the soundness of the inferences that may be drawn from the analysis of theoretical constructs, specifically, whether a scale measures the construct it purports to measure (Hair et al. 2010; Kline 2010).

Using SEM techniques, a researcher can estimate a number of model-based measures of reliability and validity. A discussion of the approaches adopted for this study is outlined below.

**Model-based Measures of Reliability**

Model-based measures of reliability may be used to assess either the reliability of a single observation or the reliability of a set of observations, as acceptable indicators of a theoretical latent construct. The following measures of reliability were performed to assess scale reliability for this study:

**Squared Multiple Correlation**

Squared Multiple Correlations (SMC), sometimes referred to as *item reliability*, *communality*, or *variance extracted*, represent how much variation in an item is explained by its latent construct (Hair et al. 2010). These values indicate how well the observed items serve as measures of their latent variables, and are scaled from 0 to 1 (Schumacker & Lomax 2004). SMC is directly related to *convergent validity* (discussed below), and, ideally, should exceed 0.50 – that is, more than 50% of the variance in the item is explained by its latent construct. However, standardised loading thresholds as low as 0.50 may be acceptable (Hair et al. 2010; Holmes-Smith 2012), which would equate to a SMC of 0.25.
Average Variance Extracted

Average Variance Extracted (AVE) reflects the overall amount of variance in a set of indicators accounted for by the latent construct, calculated as the mean variance extracted for the items loading on single factor. An AVE of 0.50 or greater is generally adopted as a good rule of thumb suggesting adequate convergence. If AVE is less than 0.50, the variance due to measurement error is greater than the variance captured by the construct, and the validity of the individual indicators, as well as the construct, is questionable (Fornell & Larcker 1981, p. 46).

Cronbach’s Alpha

Cronbach’s Alpha is a widely-used measure of scale reliability, calculated from the pairwise correlations between scale items reflecting on a single latent construct. A threshold of 0.70 is commonly applied, although values above 0.80 are preferable and a lower value of 0.60 may be applied in exploratory research (Nunnally 1978; DeVellis 2003; Hair et al. 2010).

Limitations associated with the use of Cronbach’s Alpha include sensitivity to missing data and a positive relation to the number of items on a scale. Furthermore, it does not allow for the impact of measures being congeneric rather than parallel (i.e., unequal factor loadings and unequal measurement errors). Accordingly, if a model is congeneric then Cronbach’s Alpha is a lower bound estimate of true reliability (Hair et al. 2010; Holmes-Smith 2012). Despite these limitations, Cronbach’s Alpha is the most commonly-reported reliability coefficient in the literature (Henri 2007; Kline 2010) and is thus included in this study for comparative purposes.
Construct Reliability

Construct reliability is similar to the AVE measure, which is a more conservative measure of the shared variance between a set of items loading on a latent construct (Fornell & Larcker 1981; Hair et al. 2010). High construct reliability indicates that the indicator measures all consistently represent the same latent construct, that is, they are *internally consistent*. Unlike Cronbach’s Alpha, which is also a measure of internal consistency, construct reliability is advantageous because it draws on the standardised loadings and measurement error for each item (Fornell & Larcker 1981; Henri 2007). A construct reliability coefficient of 0.70 or higher suggests good reliability, with estimates between 0.60 and 0.70 considered acceptable provided other indicators of model validity are acceptable (Hair et al. 2010).

Model-based Approaches to Validity

Construct validity is the extent to which a scale or set of measures accurately represents the hypothetical construct that it intends to measure (Kline 2010). Thus, the assessment of construct validity concerns whether scale items: i) measure the underlying theoretical construct, and ii) are conceptually and empirically distinct from scale items intended to measure other interrelated but distinct theoretical constructs (Hair et al. 2010; Kline 2010).

Convergent Validity

Convergent validity is measured as the extent to which a scale item, or observation, correlates highly with other items designed to measure the same theoretical construct. Items that are indicators of a specific construct should converge, or share a high proportion of variance in common (Hair et al. 2010). Accordingly, the observed relation between a scale item and its latent construct (the factor loading) is
informative in demonstrating convergent validity. Ideally, standardised estimates should be 0.7 or higher (as a standardised loading of 0.71 equates to an item reliability score [SMC] of approximately 0.5), with a lower threshold of 0.5 sometimes suggested (Hair et al. 2010; Holmes-Smith 2012). At minimum, all factor loadings should be statistically significant from zero (Anderson & Gerbing 1988).

**Discriminant Validity**

Discriminant validity is the extent to which a construct, or latent variable, is novel and unique, and not a sub-dimension of another variable within the model. Given many of the latent variables in this study are highly interrelated, two different methods are used to establish discriminant validity.

**AVE Method**

Fornell and Larcker (1981) suggest an appropriate test of discriminant validity between latent constructs is to compare the AVE values (as described above) for any pair of constructs with the square of the correlation estimate between these two constructs. The variance-extracted values should be greater than the squared correlation estimate, based on the logic that the latent construct should explain more of the variance in its own item measures than it shares with another construct (Hair et al. 2010).

**Multi-trait Matrix**

A multi-trait matrix is used to provide additional evidence of discriminant validity. The diagonal of the matrix contains the best estimate of reliability for each latent construct, used to establish internal consistency or reliability. The remainder of the table (i.e., all values which lie below the diagonal) presents the correlation matrix for pairs of variables. In order to demonstrate that the dimensions are distinct, entries in
the reliability diagonal should be higher than the correlations that occupy the same row and column (Churchill 1979).

4.6 Structural Equation Modelling

Structural Equation Modelling (SEM) is a statistical technique consisting of a set of multivariate procedures that allows for the simultaneous analysis of multiple relations between directly observable and/or unobservable (latent) variables (Shook et al. 2004; Smith & Langfield-Smith 2004; Henri 2007). A latent variable (also termed latent constructs or factors) is a theoretical concept which itself is not directly observable, but rather is measured indirectly using a set of observed variables (also termed measures, indicators or manifest variables) (Schumacker & Lomax 2004; Byrne 2009; Hair et al. 2010) gathered through surveys, tests, or direct observation. Unlike multiple regression analysis, which allows for the analysis of a single dependent variable and several independent variables within a single equation, SEM allows for the estimation of multiple and interrelated dependent relations between variables (Henri 2007; Hair et al. 2010). Furthermore, SEM provides the ability to include latent variables in these structural relations while accounting for measurement error in the estimation process (Schumacker & Lomax 2004; Hair et al. 2010), thus providing a more holistic approach to model building.

4.7.1 Sample Size for Structural Equation Modelling

SEM is regarded as a large sample technique. What is ‘large enough’, however, is less straightforward, with several factors affecting sample size requirements. For example, Kline (2010) suggests a ‘typical’ sample size is about 200 cases – although 200 may be too small when analysing a complex model or sample distributions are severely non-normal. Monte Carlo simulation studies suggest that maximum
likelihood (ML) estimators in SEM may provide stable results with a sample size as small as 150 (Gerbing & Anderson 1985), but, as a general rule, samples of 200 are required to produce parameter estimates of any confidence (Boomsma 1982; Gerbing & Anderson 1985; Hair et al. 2010). ‘With <100 cases, almost any type of SEM may be untenable unless a very simple model is evaluated’ (Kline 2010, p. 12).

An alternative rule of thumb concerns the sample size in terms of the ratio of cases (N) to the number of model parameters that require estimation (q) (Kline 2010). However, there exists a general lack of consistency regarding the minimum number of cases per parameter (Smith & Langfield-Smith 2004). While ratios of 15:1 and between 10:1 and 5:1 were advanced for research using ML estimators, increasingly, the observation that ‘more is better’ has become the prevailing view (Schumacker & Lomax 2004; Hair et al. 2010; Kline 2010). At least five cases per parameter estimate (including error terms as well as path coefficients) does appear to be the conventional baseline (Bentler & Chou 1987).

Finally, statistical power analysis concerns the ability to detect and reject a poor model (Hair et al. 2010), and may be conducted to estimate the desired sample size necessary to achieve adequate power to carry out planned hypothesis tests. Factors influencing power include the statistical significance criterion used in the study, the magnitude of the effect, and the sample size used to detect the effect. While there is no ideal level of statistical power, 0.80 is generally recommended as an adequate power (Cohen 1992; MacCallum, Browne & Sugawara 1996).

In summary, although sample sizes of less than 200 are common in management accounting research (Smith & Langfield-Smith 2004; Henri 2007), based on the complexity of the research model, estimates of the number of parameters in the
model and the associated degrees of freedom, a minimum sample of 200 can be deemed prudent for the present study.

4.7.2 A Two-step Approach to Modelling

This study adopts an analysis approach consistent with Anderson and Gerbing (1988) who advocate a two-step approach to modelling, whereby a measurement model is assessed prior to the specification of a structural model, which may then be used to test the hypothesised relations outlined in the conceptual framework. The two-step approach to modelling is generally regarded as more advantageous than a one-step approach, where there is no separation of measurement concerns from the structural concerns (Anderson & Gerbing 1988; Hair et al. 2010; Kline 2010). Where both models are estimated simultaneously, interpretation of the analysis is problematic in the presence of mis-specifications. For example, it would be difficult for a researcher to establish whether a poor fitting model is the result of errors in the measurement of latent constructs, or due to weak relations between those constructs.

The Measurement Model

The initial analysis of the measurement model allows for the assessment of both reliability and validity of measurement scales adopted for each theoretical construct, as well as an overall assessment of how well the specified model reproduces the observed sample data.

For this study, analysis of the measurement model involves three steps: first, as outlined in Section 4.6, a one-factor congeneric models is developed for each theoretical latent construct to assess both single-item and measurement scale reliability (Kline 2010; Holmes-Smith 2012). If an acceptable fit is not achieved, mis-specified indicator(s) are identified and the initial model respecified in one of
four ways: relate the indicator to a different factor; delete the indicator from the model; relate the indicator to multiple factors; or correlate the error terms (Anderson & Gerbing 1988). Second, consistent with the *partial aggregation* approach to modelling\(^{22}\) (Bagozzi & Heatherton 1994), composite measures representing the underlying factor structure of each theoretical latent construct are computed and assessed for both convergent and discriminant validity (Hair et al. 2010; Kline 2010); Finally, a full-model CFA is used to test the hierarchical representation of the partial aggregation model (Bagozzi & Heatherton 1994) and compare the overall measurement theory against reality, as represented by the sample data (Anderson & Gerbing 1988; Hair et al. 2010; Kline 2010).

The Structural Model

The second step is to specify the structural model as a basis for assessing the hypothesised relations outlined in the theoretical model (Anderson & Gerbing 1988). However, the specification of an *a priori* research model does not mean that SEM analysis need be restricted to an exclusively confirmatory approach (Kline 2010). Jöreskog (1993) distinguishes between three different approaches to the assessment of structural equation modelling: i) strictly confirmatory; ii) alternate models; and iii) model generating. The *model generating* approach, adopted in this study, is the most common (Kline 2010) and is often used in social sciences ‘where *a priori* models often do not adequately fit the data’ (Shook et al. 2004, p. 401).

The model generating approach begins with the specification of an initial tentative model. If the initial model does not fit the data, the model is re-specified and tested

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\(^{22}\) See Section 4.7.3 for further discussion of representing latent constructs in SEM.
again using the same data (Jöreskog 1993). Thus, model re-specification involves \textit{ex post} analysis of the conceptual model, by seeking to improve model fit through adding or removing paths among constructs. Anderson and Gerbing (1988) argue that re-specification decisions should not be based on statistical considerations alone. Rather, consideration of theory and content reduces the possibility of exploiting sampling error to achieve satisfactory goodness of fit (Anderson & Gerbing 1988; Shook et al. 2004; Smith & Langfield-Smith 2004). As summarised by Kline (2010, p. 8), ‘the goal of this process is to \textit{discover} a model with three properties: it makes theoretical sense, it is reasonably parsimonious, and its correspondence to the data is acceptably close.’

For the present study, assessment of the structural model occurs in two stages: the first stage involves the specification of the full structural model, based on the conceptual model and hypothesis development outlined in Chapter 3. Following the specification of the full structural model, model trimming is used to derive a parsimonious, well-fitting base model (Kline 2010) to form the basis of hypothesis testing. In this respect, model trimming involves removing insignificant paths from the structural model. Given the two models are \textit{hierarchical} or \textit{nested}, a chi-square difference test is performed to test the statistical significance of the decrement of overall fit as insignificant paths are removed. A non-significant chi-square difference means the more parsimonious model (the one in which the path has been dropped) is

\footnotesize{23} In a \textit{strictly confirmatory} application, a single model is specified that is accepted or rejected based on its correspondence to the data. The testing of \textit{alternate models} refers to situations where several alternative (or competing) models are available, and the particular model with acceptable correspondence to the data is selected (Jöreskog 1993).

\footnotesize{24} Having established acceptable measurement, the factor loadings on latent variables estimated in the measurement model should change only trivially, if at all, when the structural model(s) are estimated (Anderson & Gerbing 1988). Factor loadings which change appreciably result in \textit{interpretational confounding} (Burt 1976), and may be evidence of model mis-specification.
preferred (Kline 2010). This process continues until all remaining paths are statistically significant, or a significant chi-square difference test result is obtained, indicating the fit of the simpler (trimmed) model is significantly worse than for the more complex model. Having arrived at a parsimonious well-fitting base model, the testing of the proposed hypotheses includes the assessment of the level of significance of each path in the proposed structural model, as well as the overall goodness-of-fit of the entire model against the fit statistics outlined below in Section 4.7.4.

However, the existence of a well-fitting model does not ensure that the model is the only model which may provide an acceptable reproduction of the sample data (MacCallum et al. 1993; Little et al. 2002; Kline 2010). The second stage of the structural model assessment involves the generation of alternate structural models based on both theoretical and empirical re-specification of the original conceptual model. As such, a model generating process is used to assess the validity of the structural relations presented during the hypothesis testing stage, and also to explore the finer relations existing between the underlying dimensions represented in the sample data.

### 4.7.3 Representing Latent Constructs in SEM

Smith and Langfield-Smith (2004, p. 58) observe that ‘much of the research in management accounting that uses multiple regression analysis or path analysis uses composite measures and acknowledges the degree of measurement error through the assessment of reliability (often Cronbach’s Alpha).’ However, the measure of the

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25 See Anderson and Gerbing (1988) for a comprehensive approach to model building and trimming using sequential chi-square difference tests.

26 For example, although it is common for studies to use Cronbach’s Alpha with a cut-off value of 0.70 or higher as acceptable evidence of internal reliability, composite variables constructed from
degree of reliability is not incorporated explicitly into the statistical analysis to adjust directly the latent variables.' This approach, termed a *total aggregation* model, further fails to represent the unique properties of sub-dimensions, if any (Bagozzi & Heatherton 1994). Conversely, the *total disaggregation* approach specifies each individual scale item as an indicator of their respective factor or latent variable, with a measurement error term estimated for each item. This approach, though providing the most detailed level of analysis of a construct, is highly sensitive to measurement error and it becomes increasingly difficult to obtain satisfactory model fits as the sample size and number of items per factor increase (Bagozzi & Heatherton 1994).

Within these two extremes, the *partial aggregation* approach to modelling (Bagozzi & Heatherton 1994) involves parcelling item sub-scales into composite measures in order to condense observed variables into a smaller number of indicator items, and thereby improve overall model parsimony and increase the likelihood of achieving an acceptable model fit (Hair et al. 2010; Kline 2010). Furthermore, a partial aggregation approach retains the underlying factor structure of a construct, whereby each dimension is represented by a composite measure with an associated error term. Further, a uni-dimensional construct is represented as a latent variable reflected by a single composite indicator with an error term.

The primary problem with single-item measures is that they are under-identified, and their factor loadings and error terms cannot be estimated within the model (Hair et al. 2010). However, because the reliability of the composite scale can be determined, it is possible to estimate these values in advance and incorporate the results into the scales with a corresponding Alpha of less than 1.0 will inherently incorporate some degree of measurement or random error.
structural equation model. Specifically, the error term is set (fixed) to 1.0 minus the best estimate of reliability, multiplied by the observed scale variance (Kline 2010):

\[ e_x = \sigma_x^2 (1 - r_x) \]

Further, because the factor must be scaled, the unstandardised loading of the latent construct on its single composite indicator is fixed to equal 1.0 (Kline 2010). The direct effect of the latent factor can thus be estimated, whilst controlling for random measurement error in its single indicator.

### 4.7.4 Assessing Model Fit

Since SEM has no single statistical test that can be used to assess the ‘strength’ of a model’s predictions, ‘several fit indices must be used together to assess goodness-of-fit’ (Smith & Langfield-Smith 2004, p. 55). To some extent, ‘the use of multiple indices assures readers that authors have not simply picked a supportive index’ (Shook et al. 2004, p. 401). However, the researcher should also be able to justify the choice of particular fit indices (Henri 2007).

Smith and Langfield-Smith (2004) and Henri (2007) observe that the most commonly-reported indices in management accounting research are the chi-square statistic (\( \chi^2 \)), comparative fit index (CFI), goodness-of-fit index (GFI), root mean-square error of approximation (RMSEA), normed fit index (NFI), and adjusted goodness-of-fit index (AGFI). NFI is inflated by more complex models and was omitted for the purpose of this study in favour of the Tucker-Lewis index (TLI), which, to some degree, takes into account model complexity (Hair et al. 2010). Furthermore, TLI along with the CFI and RMSEA are superior at detecting models with mis-specified factor loadings (Hu & Bentler 1998). The standardised root mean-square residual (SRMR) was also utilised as it has been found to be the most
sensitive goodness-of-fit index for detecting mis-specified relations between latent constructs (Hu & Bentler 1998). Finally, GFI and AGFI were reviewed for holistic purposes, but not reported in the study findings as their descriptive power is noted to be comparatively weaker (Hu & Bentler 1998) leading to a decline in their usage (Hair et al. 2010).

The researcher must not only select the appropriate fit indices, but must also choose between different threshold values. Rules of thumb, not significance tests, are used in determining acceptable fit levels because the underlying sampling distributions for these indices are unknown (Shook et al. 2004). However, research has challenged the use of a single cut-off value and treating thresholds as ‘golden rules’ (Hair et al. 2010; Kline 2010). Following these precautions, this study adopts a ‘healthy perspective on fit statistics’ (Kline 2010) and assesses model fit against both desired and acceptable threshold values.

Table 3: Summary of model fit measures adopted for this study

<table>
<thead>
<tr>
<th>Name</th>
<th>Abbrev</th>
<th>Desired level</th>
<th>Acceptable level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square</td>
<td>$\chi^2$</td>
<td>$p &gt; 0.05$</td>
<td></td>
</tr>
<tr>
<td>(with associated degrees of freedom and probability of significant difference)</td>
<td>$(df, p)$</td>
<td>(or, $BSp &gt; 0.05$ for multivariate non-normal data)</td>
<td></td>
</tr>
<tr>
<td>Normed Chi-square</td>
<td>$\chi^2/df$</td>
<td>$1.0 &lt; \chi^2/df &lt; 2.0$</td>
<td>$1.0 &lt; \chi^2/df &lt; 3.0$</td>
</tr>
<tr>
<td>Root Mean-square Error of Approximation</td>
<td>RMSEA</td>
<td>RMSEA &lt; 0.05</td>
<td>RMSEA &lt; 0.08</td>
</tr>
<tr>
<td>(with 90% confidence intervals and p-value for the test of close-fit)</td>
<td>PCLOSE &gt; 0.05</td>
<td>LO 90 = 0</td>
<td>$&gt; 0.10$ may indicate a serious problem</td>
</tr>
<tr>
<td>Tucker-Lewis Index</td>
<td>TLI</td>
<td>TLI &gt; 0.97</td>
<td>TLI &gt; 0.95</td>
</tr>
<tr>
<td>Comparative Fit Index</td>
<td>CFI</td>
<td>CFI &gt; 0.97</td>
<td>CFI &gt; 0.95</td>
</tr>
<tr>
<td>Standardised Root Mean-square Residual</td>
<td>SRMR</td>
<td>SRMR &lt; 0.06</td>
<td>SRMR &lt; 0.08</td>
</tr>
</tbody>
</table>
Table 3 presents the fit statistics and goodness-of-fit criteria that were used in this study. A non-significant $\chi^2$ statistic, high values for CFI and TLI, and low values for Normed $\chi^2$, SRMR and RMSEA are associated with better fitting models. Such guidelines are judiciously applied within the overall view that, above all else, the desire to achieve good fit should never compromise the theory being tested (Hair et al. 2010; Kline 2010). A more detailed discussion of each criterion, and their corresponding levels of acceptable fit, is provided in Appendix B.

4.7 Use of a Survey Questionnaire

A cross-sectional survey was developed and administered to collect data for testing the conceptual framework of this study. This is consistent with prior studies in environmental strategy (Aragón-Correa 1998; Judge & Douglas 1998; Sharma & Vredenburg 1998; Aragón-Correa et al. 2008) and also eco-control (Henri & Journeault 2008a; Perego & Hartmann 2009; Henri & Journeault 2010; Pondeville et al. 2013). Questionnaire-surveys are often used for large-scale data collection, as they allow researchers to survey a large sample at a relatively low cost. Further, the use of survey data is common in management-oriented research where information concerning internal processes and systems, generally unobservable to outsiders, is required (Van der Stede et al. 2005). The instrument was developed based on a review of the literature, with measurement scale items drawn from prior studies, where possible (see Section 4.4).

4.3.1 Pre-testing and Instrument Validation

Dillman et al. (2008) suggest that obtaining feedback on a complete draft of the questionnaire from different people, where each one has some specialised knowledge of the questionnaire, helps evaluate both the questions and the questionnaire.
Accordingly, prior to distribution, the instrument was validated using a pre-test on five academic experts, from three universities, who collectively had extensive research experience in the fields of management accounting, environmental and sustainability accounting for management control, and the use of questionnaire-surveys for data collection. Feedback was also sought from an industry expert representative of the intended respondent sample (i.e., Senior Environmental Managers), who assessed the individual questions and the overall instrument for comprehensibility, clarity, ambiguity, face validity (Dillman et al. 2008) and relevance to the research setting (Van der Stede et al. 2005). Based on the feedback, a number of structural modifications were made to the research instrument, as well as the shortening, reordering and rewording of numerous scale items.

4.3.2 Mixed-mode Survey Design

Though postal surveys have been standard procedure in organisational research, email or web-based surveys have become increasingly common in recent years (Fielding, Lee & Blank 2008). However, Dillman et al. (2008) suggest that implementing mixed-mode surveys can reduce coverage error, improve response rates, and reduce non-response error. Accordingly, this study adopts a mixed-mode survey design whereby respondents were given the option to receive the questionnaire-survey via either email or postal delivery.

The postal group was sent a package including a personalised cover letter printed on Deakin University letterhead outlining the study and requesting their participation, a colour 4-page survey instrument printed on a single A3 bi-fold flyer, and a pre-paid

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27 Pre-testing with the latter group, industry experts, is particularly useful as it increases the likelihood that the survey uses terminology common or appropriate to the field, and thus decreases the likelihood that respondents will decline to respond due to out-dated or unsuitable language (Van der Stede, Young & Chen 2006).
return envelope. In each instance, the package was addressed to the relevant individual identified during the phone call inquiry stage. Where a specific contact could not be identified, the questionnaire-survey was addressed to the Senior Environmental Manager. Six weeks following the original distribution, a follow-up reminder was sent to a random sample of 110 firms who had not responded. A copy of the survey questionnaire and the cover letter are provided in Appendix A.

The online survey was developed using Qualtrics online survey research suite, designed to closely imitate the visual layout and question order sequence of the paper version to minimise response method bias. A unique hyperlink to the survey was generated for each participant, and embedded in a personalised invitation email requesting their participation. While the invitation email could be forwarded within the organisation, each hyperlink was designated as single use to prevent multiple responses from the same organisation. Two follow-up reminder emails were sent at two-week intervals, followed by a third postal reminder sent to non-respondents from the email group who had not visited the survey web page (i.e., they had not activated the hyperlink in their invitation email). This strategy sought to ensure that respondents who may have not received the email invitations at all (due to spam filtering or failure to forward emails within the organisation), or who were unwilling to click on web links from unfamiliar sources, were not omitted from the survey coverage.

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28 www.qualtrics.com
4.3.3 Strategies to Enhance Response Rate

Drawing on Dillman et al.’s (2008) *Tailored Design Method* and insights obtained from a review of the literature, the following strategies were adopted to maximise response rates:

– consulting experienced researchers and industry experts to ensure plain, simple and understandable language in the instrument.

– developing an up-to-date mailing list of targeted organisations and individual recipients, through prior contact of potential recipients.

– adopting the mixed-mode design and offering recipients a choice of their preferred mode of delivery.

– including a personalised covering letter/email with the questionnaire-survey.29

– avoiding design and formatting traits which may lead to invitation emails being flagged as junk-mail.

– offering an incentive to participate, that is, advising that a tree would be donated to Landcare Australia for every completed survey returned.

4.3.4 Non-Response Bias

Surveys with low response rates can at times produce biased samples which are not representative of the entire target population. To determine whether such non-response bias exists, most management accounting studies compare the characteristics of early and late respondents (Van der Stede et al. 2005). For this approach, a similarity in the characteristics of the two respondent groups suggests

29 The covering letter explained briefly the purpose of the study and advised that the questionnaire had been approved by Deakin University’s Human Research Ethics Committee (see Appendix A for the full letter).
that a non-response bias is unlikely. For the current study, independent sample \( t \)-tests were performed using SPSS version 21.0 to compare the mean values of each variable, for two sub-samples comprising the first 20% and last 20% of respondents. Insignificant differences at the 0.05 significance level indicate the absence of an obvious non-response bias.

### 4.8 Chapter Summary

This chapter has outlined the research design and method used to test the hypotheses generated in Chapter 3. The study utilises quantitative methods through the administration of a mixed-mode questionnaire-survey. The sample design, including the sampling size, frame and selection criteria, was outlined, resulting in a distribution sample of 1,120 medium- to large-sized organisations operating within Australia.

The instrument development process has been described, including steps taken to minimise measurement errors and enhance response rates. Where possible, variables in the questionnaire were measured using pre-existing instruments to improve the comparability of the findings of this study with prior research.

The preliminary analysis of the sample data, to assess the statistical assumptions of the chosen multivariate analysis technique, was described, before introducing SEM as the main statistical technique for data analysis. A two-step approach to modelling is adopted, whereby analysis of the measurement model is undertaken to assess the reliability and validity of measurement scales, prior to specifying the structural model as a basis for testing the hypothesised relations outlined in the conceptual model. The results of the quantitative study and formal hypothesis testing are presented below in Chapter 5.
5.1 Introduction

The overall purpose of this chapter is to present and discuss the key findings of the survey. In particular, the results of the tests of the various hypotheses associated with the conceptual model outlined in Chapter 3 are provided.

The following section (i.e., Section 5.2) deals with the sample characteristics, and describes the profile of the respondents and that of their organisations. Section 5.3 provides an overview of the descriptive findings, followed by Section 5.4 where the results of hypotheses testing are reported, including an examination of the psychometric properties of the measures in terms of reliability and validity for each construct. Finally, Section 5.5 outlines the model generating process used to assess the validity of the relations identified during hypothesis testing.

5.2 Sample Characteristics

5.2.1 Response Rate and Non-Responses

The research questionnaire was distributed to 1,120 medium- to large-sized organisations operating in a cross-section of industries in Australia. Of the distributed sample, 21 were undeliverable and a further 33 firms indicated they were either unable or unwilling to participate. A total of 241 responses (22.6%) were received, with 20 cases removed for the following reasons: cases identified as speeders and/or flat-liners ($n = 10$); cases with significant levels of missing data (i.e., $>10\%$ missing data, $n = 9$); and one case where the respondent had a tenure within their organisation of less than 3 months (only 2 weeks), and was deemed to have
insufficient experience to make informed responses. The final response sample was, therefore, 221, representing 20.7% of the organisations surveyed.30

Table 4: Questionnaire-survey response rate

<table>
<thead>
<tr>
<th>Surveys</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributed</td>
<td>1,120</td>
</tr>
<tr>
<td>Less</td>
<td></td>
</tr>
<tr>
<td>Undeliverable or unwilling to participate</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td><strong>1,066</strong></td>
</tr>
<tr>
<td>Responses received</td>
<td>241 (22.6%)</td>
</tr>
<tr>
<td>Less</td>
<td></td>
</tr>
<tr>
<td>Usable responses due to speeders/flat-liners, missing data, or insufficient experience</td>
<td>20</td>
</tr>
<tr>
<td>Final Sample</td>
<td><strong>221 (20.7%)</strong></td>
</tr>
</tbody>
</table>

The response rate compares satisfactorily with the 10% to 25% range reported in similar recent MCS and eco-control studies (e.g., Henri 2006; Widener 2007; Henri & Journeault 2010; Pondeville et al. 2013). Moreover, an absolute sample exceeding 200 cases (Hair et al. 2010; Kline 2010) and a ratio of 5.7 (6.5) cases per parameter estimated (Bentler & Chou 1987) for the full (trimmed) structural model was obtained, which is adequate to test the proposed conceptual model. Further, based on MacCallum, Browne and Sugawara (1996), this study has adequate statistical power (i.e., 0.83 (0.86) the full (trimmed) structural model).

To examine for non-response bias, a comparison of mean responses on all latent variables was undertaken, comparing the early and late respondents. Table 5 outlines the results of independent sample t-tests conducted to compare the mean values of each variable, for two sub-samples comprising the first 44 (circa 20%) and last 44 (circa 20%) respondents. No significant differences are observed between early and late respondents.

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30 The response rates were calculated as the percentage of usable returned questionnaires in relation to the number of questionnaires sent, after adjusting for questionnaires which were undeliverable or the firm was either unwilling or unable to participate.
late respondent sub-samples, suggesting the absence of any obvious non-response bias in the sample.

Table 5: Independent sample $t$-test to check non-response bias

<table>
<thead>
<tr>
<th>Variables</th>
<th>$t$</th>
<th>$p$</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV_STGY</td>
<td>.863</td>
<td>.390</td>
<td>.179</td>
<td>.208</td>
</tr>
<tr>
<td>BELIEF</td>
<td>.179</td>
<td>.858</td>
<td>.045</td>
<td>.254</td>
</tr>
<tr>
<td>BOUND</td>
<td>.906</td>
<td>.367</td>
<td>.205</td>
<td>.226</td>
</tr>
<tr>
<td>DIAG</td>
<td>.390</td>
<td>.697</td>
<td>.118</td>
<td>.303</td>
</tr>
<tr>
<td>INTERACT</td>
<td>.830</td>
<td>.409</td>
<td>.220</td>
<td>.265</td>
</tr>
<tr>
<td>REPAIR</td>
<td>.651</td>
<td>.517</td>
<td>.125</td>
<td>.192</td>
</tr>
<tr>
<td>INTERNAL</td>
<td>.160</td>
<td>.873</td>
<td>.040</td>
<td>.249</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>.149</td>
<td>.882</td>
<td>.027</td>
<td>.183</td>
</tr>
<tr>
<td>FLEX</td>
<td>.664</td>
<td>.509</td>
<td>.129</td>
<td>.194</td>
</tr>
<tr>
<td>ENV_PERF</td>
<td>.355</td>
<td>.723</td>
<td>.070</td>
<td>.197</td>
</tr>
<tr>
<td>ECON_PERF</td>
<td>1.880</td>
<td>.064</td>
<td>.474</td>
<td>.252</td>
</tr>
</tbody>
</table>

Further, Table 6 and Table 7 below provide summaries of the demographic characteristics of the respondent organisations compared to the distribution sample. Panel B of Table 6 demonstrates that ownership structure of the final sample is broadly consistent with the distribution sample. Further, Table 7 outlines the division of respondent organisations among industry sectors, compared to the distribution sample overall. The results indicate no negative response bias for organisations in high-risk industries. In fact, many industries which are generally regarded as having a higher environmental impact (Agriculture, Forestry and Fishing; Mining; Manufacturing; Electricity, Gas and Water Supply; and Construction) are well represented in the final sample. Comparatively, Retail Trade, an industry with a relatively low direct environmental impact, has substantially lower representation in the final sample (0.9%) compared with the distribution sample overall (9.6%). This suggests that caution must be made in generalising the results of this study to all industries in the sampling frame.
Independent sample $t$-tests were also used to compare mean values for the postal ($n=62$) and online ($n=159$) responses. The results (unreported) indicate non-significant p-values, supporting the test of mean invariance between the two sub-samples. The findings support the absence of method response bias between the online and postal response groups.

5.2.2 Demographic Characteristics

The primary sampling frame for this study consists of medium- to large-sized organisations operating within Australia. Within this frame, a further criteria of organisations with 100 employees or more, and reporting annual revenue over $20 million and less than $2 billion were applied to ensure that the variables of interest could be observed.

Table 6: Organisation size (number of employees) and ownership structure

<table>
<thead>
<tr>
<th>Variables</th>
<th>Final Sample</th>
<th>Distribution Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>%</td>
</tr>
<tr>
<td>Panel A: Number of Employees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 100 31</td>
<td>8</td>
<td>3.6%</td>
</tr>
<tr>
<td>101-500</td>
<td>87</td>
<td>39.4%</td>
</tr>
<tr>
<td>501 - 2000</td>
<td>71</td>
<td>32.1%</td>
</tr>
<tr>
<td>2001 - 10000</td>
<td>43</td>
<td>19.5%</td>
</tr>
<tr>
<td>10,000 +</td>
<td>12</td>
<td>5.4%</td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>100%</td>
</tr>
<tr>
<td>Panel B: Ownership Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASX Publicly Listed</td>
<td>64</td>
<td>29.0%</td>
</tr>
<tr>
<td>Government</td>
<td>26</td>
<td>11.8%</td>
</tr>
<tr>
<td>Proprietary</td>
<td>131</td>
<td>59.2%</td>
</tr>
<tr>
<td>Totals</td>
<td>221</td>
<td>100%</td>
</tr>
<tr>
<td>Australian-Owned</td>
<td>123</td>
<td>55.7%</td>
</tr>
<tr>
<td>Foreign-Owned</td>
<td>98</td>
<td>44.3%</td>
</tr>
<tr>
<td>Totals</td>
<td>221</td>
<td>100%</td>
</tr>
</tbody>
</table>

31 Indicates self-reported values from questionnaire-survey respondents. However, corroborating evidence suggested all firms represented in the final sample have 100 or more employees (FTE). All other self-reported demographic characteristics were consistent with the company information provided by IBISWorld.
As shown in Panel A of Table 6, the majority of the respondent organisations (75.1%) had 2,000 or fewer employees. Notably, eight respondents indicated that their organisation has fewer than 100 employees (FTE). Each case was cross-checked against the original distribution list provided by IBISWorld and their corporate website. The corroborated evidence suggested each firm, in fact, had more than 100 employees, thus supporting their inclusion in the final sample.

Panel B of Table 6 provides the self-reported ownership structure of both the final and distribution sample. The items indicate that the three forms of ownership structure sampled, ASX publicly listed (29%), Government ownership (11.8%), and Proprietary ownership (59.2%), are proportionately represented in the final and distribution sample, and Australian-owned firms (55.7%) slightly outweigh foreign-owned firms (44.3%) in the respondent sample.

Table 7: Distribution of respondent organisations among industry sectors

<table>
<thead>
<tr>
<th>Industry (ANZSIC)</th>
<th>Final Sample</th>
<th>Distribution Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>69</td>
<td>31.2%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>30</td>
<td>13.6%</td>
</tr>
<tr>
<td>Construction</td>
<td>22</td>
<td>10.0%</td>
</tr>
<tr>
<td>Property and Business Services</td>
<td>19</td>
<td>8.6%</td>
</tr>
<tr>
<td>Mining</td>
<td>19</td>
<td>8.6%</td>
</tr>
<tr>
<td>Transport and Storage</td>
<td>13</td>
<td>5.9%</td>
</tr>
<tr>
<td>Electricity, Gas and Water Supply</td>
<td>11</td>
<td>5.0%</td>
</tr>
<tr>
<td>Health and Community Services</td>
<td>10</td>
<td>4.5%</td>
</tr>
<tr>
<td>Education</td>
<td>8</td>
<td>3.6%</td>
</tr>
<tr>
<td>Cultural and Recreational Services</td>
<td>5</td>
<td>2.3%</td>
</tr>
<tr>
<td>Agriculture, Forestry and Fishing</td>
<td>5</td>
<td>2.3%</td>
</tr>
<tr>
<td>Accommodation, Cafés and Restaurants</td>
<td>4</td>
<td>1.8%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Personal and Other Services</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td>Communication Services</td>
<td>2</td>
<td>0.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>221</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Table 7 shows that the respondent organisations represent a reasonably proportionate sample of the overall distribution group. The Manufacturing (31.2%), Wholesale Trade (13.6%), and Construction (10.0%) industries have the largest representation in the sample, followed by Mining (8.6%), Property and Business Services (8.6%), Transport and Service (5.9%), and Electricity, Gas and Water Supply (5.0%). Comparatively, the remaining eight industries combined represent a total 17.2% of the final sample.

Table 8: Respondent's position, tenure and responsibility for environmental management activities within their organisation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported Position</td>
<td>n</td>
</tr>
<tr>
<td>Executive Director</td>
<td>8</td>
</tr>
<tr>
<td>CEO / CFO / Financial Controller</td>
<td>6</td>
</tr>
<tr>
<td>General Manager - Environment / Sustainability</td>
<td>31</td>
</tr>
<tr>
<td>- Other</td>
<td>6</td>
</tr>
<tr>
<td>Manager - Environment / Sustainability</td>
<td>86</td>
</tr>
<tr>
<td>- Other</td>
<td>29</td>
</tr>
<tr>
<td>Environmental Co-ordinator / Officer / Adviser</td>
<td>34</td>
</tr>
<tr>
<td>Miscellaneous (e.g., Mgmt. accountant, communications)</td>
<td>15</td>
</tr>
<tr>
<td>Did not respond 32</td>
<td>6</td>
</tr>
<tr>
<td>Totals</td>
<td>221</td>
</tr>
</tbody>
</table>

Proportion of work time spent on environmental management activities:

<table>
<thead>
<tr>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>2</td>
</tr>
<tr>
<td>1 - 19%</td>
<td>69</td>
</tr>
<tr>
<td>20 - 39%</td>
<td>44</td>
</tr>
<tr>
<td>40 - 59%</td>
<td>14</td>
</tr>
<tr>
<td>60 - 79%</td>
<td>20</td>
</tr>
<tr>
<td>80 - 100%</td>
<td>69</td>
</tr>
<tr>
<td>Did not respond 32</td>
<td>3</td>
</tr>
<tr>
<td>Totals</td>
<td>221</td>
</tr>
</tbody>
</table>

Tenure (n=215) | Job | Organisation |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average (years)</td>
<td>4.6</td>
<td>8.4</td>
</tr>
<tr>
<td>Median (years)</td>
<td>3.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

32 Respondents comprising the ‘miscellaneous’ and ‘did not respond’ categories were included in the final sample as, although the questionnaire was distributed to the Senior Environmental Manager, it is anticipated that firms perusing a more reactive environmental strategy may not have formulated a formalised approach to environmental management, and therefore may not have assigned a specific role to perform this function.
As outlined in Table 8, 23% of respondents reported their position as being at the General Manager level or higher, with a further 52% listing Manager as their current position. Of further interest to this study, 67% of respondents specifically stated Environment or Sustainability in their job title, with a high proportion also indicating Health, Safety, Quality and/or Risk as being included in their responsibilities.

Table 8 also reports that more than two-thirds of the respondent sample spent 20% or more of their work time dealing with environmental management activities. Further to the respondents’ involvement in environmental management activities, 64% indicated their level of involvement was increasing, with a further 26% indicating their involvement was not changing, or steady.

Finally, respondents reported an average (median) tenure of 4.6 (3.0) years in their current position, and 8.4 (6.0) years in their current organisation. Collectively, the respondent characteristics suggest the survey respondents were at an appropriate position and experience within the organisation to provide informed and accurate responses.

### 5.3 Descriptive Statistics

Figure 5 presents the research model and hypothesised relations for the present study. Full descriptive statistics for measured variables are presented in Appendix C. For each variable the range, mean and standard deviation are presented, along with the skew and kurtosis statistics and associated standard error. Some key observations of the descriptive statistics for the main variables are as follows.
Environmental Strategy

Of the thirteen items measuring firms’ integration of environmental concerns into organisational decision-making processes (ENV_STGY), the respondent firms placed stronger importance on:

– a clear policy statement urging environmental awareness in every business area (mean 5.91);
– a formal reporting position between employees with environmental management responsibilities and senior management (mean 5.56); and
– a formalised continuous improvement program for environmental policies and procedures (mean 5.24).

Conversely, the respondent firms indicated a lesser emphasis on:

– engaging in a continuous dialogue with local communities and environmental organisations (mean 4.39); and
– exploring markets for environmental products and services (mean 4.36).
Chapter 5: Survey Results and Analysis

Style of Use of Eco-controls

Beliefs system (BELIEFS)

The item statistics reveal that the respondent firms placed strong emphasis on an environmental mission statement to communicate core environmental values (mean 5.46). However, responses were comparatively lower for the extent to which employees were:

– aware of the organisation’s core environmental values (mean 4.71); and
– inspired by the organisation’s environmental mission statement (mean 4.04).

Boundary system (BOUND)

Similarly, the respondent firms placed strong emphasis on a formal system which communicates environmental risks that should be avoided (mean 5.24). However, employee awareness of such systems was comparatively lower (mean 4.54).

Diagnostic use and Interactive use

Overall, the descriptive results indicate a more or less balanced emphasis of the diagnostic use (DIAG) and interactive use (INTERACTIVE) of eco-control (overall mean values are 4.39 for interactive use, compared to 4.84 for diagnostic use). This finding is consistent with the views in prior research that the two styles of use are complementary and inter-dependent (Henri 2006; Widener 2007). Individual item statistics also reveal senior management emphasises the diagnostic use of controls specifically to:

– monitor results (mean 5.06); and
– review key performance measures (mean 5.04).

Emphasis placed on the interactive use of controls largely focuses on the use of eco-controls to:
enable discussion in meetings of superiors, subordinates and peers (mean 4.57); and to provide a common view of the organisation (mean 4.42).

Bureaucratic Stance towards Eco-control

The descriptive statistics further suggest that many organisations have designed their eco-control systems with enabling qualities (ENABLE), as evidenced by mean values on the higher end of the scales across all four sub-dimensions. Employees generally appear to be acknowledged as potential sources of localised knowledge and expertise on environmental issues, with repairs on existing eco-controls (REPAIR) facilitated through allowing employees to:

- identify problems and suggest improvement opportunities (mean 5.07); and
- adapt established guidelines to real work processes (mean 4.94).

The internal transparency of eco-controls (INTERNAL) appears to be largely affected through:

- outlining of key components of environmental management activities and providing best practice routines (mean 4.96); and
- increasing employees’ knowledge of environmental management activities in their area (mean 4.93).

Global transparency (GLOBAL) is predominantly achieved by using eco-controls to help communicate the organisation’s environmental goals and objectives (mean 5.17).

Comparatively, the respondent organisations appear less inclined to allow flexibility in the implementation of eco-controls (FLEX), with overall mean scores lower in comparison to the other three design traits of an enabling approach to bureaucracy.
This finding is qualitatively consistent with prior studies which have observed difficulties in the flexible use of MCS (Chapman & Kihn 2009; Jordan & Messner 2012). Specifically, Jordan and Messner (2012) observe that a flexible use of MCS may be more difficult to sustain once top management signals an increased importance of their use.

Environmental and Economic Performance

Environmental management practices within respondent organisations appear to have predominantly led to environmental outcomes in terms of:

- a perceived improvement in overall business reputation or goodwill (mean 5.04);
- increased knowledge about effective ways of managing operations (mean 4.66);
- process innovations (mean 4.45); and
- organisation-wide learning among employees (mean 4.42).

In relation to economic performance, no item was rated below 4.5, suggesting that, in general, the respondents perceived their organisation’s performance to be reasonably satisfactory compared to the goals set for the past 12 months. Specifically, the respondents indicated highest performance for market share (mean 5.01), sales volume (mean 4.83) and cash flow from operations (mean 8.82), respectively.

5.4 Tests of Hypotheses

The hypothesised relations depicted in Figure 5 were tested using SEM, allowing for the simultaneous estimation of multiple and interrelated dependent relations between variables (Henri 2007; Hair et al. 2010), as well as providing for a holistic assessment of overall model fit. Data collected from the survey were analysed with AMOS 21.0.0, with the default maximum likelihood estimation technique.
5.4.1 Step One: Analysis of the Measurement Model

One-factor Congeneric Models

A one-factor congeneric model was developed for each of the seven first-order latent constructs (i.e., ENV_STGY, BELIEF, BOUND, DIAG, INTERACT, ENV_PERF, and ECON_PERF), and one second-order latent construct (i.e., ENABLE, as represented by its four underlying first-order traits of REPAIR, INTERNAL, GLOBAL, and FLEX), based on the a priori measurement theory outlined in Chapter 4 (Section 4.4). Where a single-factor solution was not supported, indicating that a given measurement scale does not provide for the acceptable measurement of a theoretical latent construct, insights from the extant literature and empirical examination were used to develop and test alternate factor structures. A discussion of the CFA model development is outlined in the sub-sections below, with the detailed model diagrams, parameter estimates, and fit statistic summaries provided in Appendix D.

Environmental Strategy

A one-factor model for environmental strategy is initially estimated with thirteen items reflective of the single latent construct ENV_STGY. The model yielded a poor fit across all model fit statistics adopted for this study ($\chi^2=276.640, df=65, p<.000, CFI=.852, TLI=0.822, RMSEA=.112$), suggesting the overall test of a one-factor solution for the observed data should be rejected. Further, examination of the parameter estimates, implied correlations, co-variances and standardised residual co-variances suggests that three items, STGY_11, STGY_12 and STGY_13, exhibit low levels of common variance with the remaining scale items. The three items were removed from the model, and excluded from further analysis.
The measurement scale for environmental strategy adopted for this study was based on Perego and Hartmann (2009), who draw on a pool of items originally developed by Banerjee et al. (2002; 2003). In their conceptual development of corporate environmentalism, Banerjee et al. (2002; 2003) draw distinctions between the integration of environmental strategy into strategic planning processes, or environmental corporate strategy (ECS), and the overall importance placed on preserving the environment and the diffusing of such values company-wide (which was labelled internal environmental orientation (IEO)) (Banerjee et al. 2003). Following this logic, a two-factor solution is specified based on the theoretical typologies outlined by Banerjee et al. (2002; 2003) and the remaining items classified as indicators of either ECS or IEO.

The critical focus of ECS is that environmental concerns are not treated as ex post issues after strategic plans are made, but as ex ante concerns to be incorporated within corporate strategic planning. Further, this integration occurs at higher levels of the firm, where strategies regarding entering new businesses, choice of technology, operational locations, and research and development investments are generally made (Banerjee et al. 2003, p. 107). Following these principles, items STGY_2, STGY_3, STGY_4, STGY_5 and STGY_9 are specified as a one-factor model. Standardised factor loadings exceed the preferred 0.70 cut-off value for all items except STGY_9 (0.48), which is below the 0.50 threshold and was subsequently omitted from the model. Fit statistics for the re-specified model are within the acceptable levels adopted for this study, and the average variance extracted exceeds 0.50, indicating adequate convergence. A holistic view of the model fit estimates, therefore, suggests the re-specified ECS measurement model should be accepted.
The remaining five items from the original scale, STGY_1, STGY_6, STGY_7, STGY_8 and STGY_10, relate to the structures and processes adopted by firms to diffuse environmental management principles and responsibilities firm-wide. A one-factor model for the latent construct \textit{IEO} is specified, reflected by the five proposed indicator items. The initial model specification exhibits reasonable fit, but an examination of the parameter estimates reveals a low standardised factor loading for STGY_8 (0.52). Given that the item pertains to an organisation’s dialogue with local communities and environmental organisations regarding the environmental aspects of its operations, it may be more appropriately classified as relating to the \textit{external} as opposed to \textit{internal} environmental orientation of the firm. The item (STGY_8) is thus removed to maintain the \textit{face validity} of the construct. Model fit statistics for the re-specified model are within acceptable levels, parameter estimates are statistically significant, and standardised loadings exceed the preferred 0.70 cut-off value. Thus, the re-specified measurement model for \textit{IEO} constitutes an acceptable reproduction of the observed data, and is accepted.

**Style of Use of Eco-Controls**

Initial model specifications for the latent constructs \textit{BELIEF}, \textit{BOUND}, and \textit{DIAG} demonstrated acceptable levels of model fit, with standardised loadings exceeding the preferred value of 0.70 for all scale items excluding BOUND_1 ($\chi^2=121.839$, $df=9$, $p<.000$, $CFI=.914$, $TLI=0.857$, $RMSEA=.239$). Hence, all items exhibit satisfactory convergent validity, and the three models are, respectively, accepted.

The proposed model for \textit{INTERACT} initially exhibited poor model fit, with all model fit statistics outside acceptable thresholds ($\chi^2=121.839$, $df=9$, $p<.000$, $CFI=.914$, $TLI=0.857$, $RMSEA=.239$). Item loadings for each of the six theorised indicators were significantly significant ($p<.001$), with standardised loadings all exceeding
Items INTERACT_1 and INTERACT_2 were observed to have standardised residual co-variance of 1.989, indicating a potential source of mis-specification within the model. The content of the items (‘Enable discussion in meetings’ and ‘Enable continual challenge and debate’) appear to overlap, and INTERACT_2 is subsequently removed from the model. Further consideration of modification indices suggested co-varying the error terms for INTERACT_1 and INTERACT_3 would further improve the overall model fit. The final specification yields satisfactory levels of fit across all model fit statistics, and is accepted.

**Bureaucratic Stance towards Eco-control**

The latent construct ENABLE is conceptualised as a higher-order factor regressed against four latent indicators representing the underlying traits of REPAIR, INTERNAL, GLOBAL, and FLEX. Assessment of each of the four first-order latent traits as one-factor congeneric models proved problematic, as too few items were generated during the scale development stage. Further, preliminary analyses indicated a number of items to be poor measures of their theoretical construct, and were required to be omitted. Thus, to overcome problems associated with model identification, a simultaneous CFA model encompassing all four first-order traits is evaluated.

A CFA model is constructed with a total of 16 items reflected against the four first-order factors REPAIR, INTERNAL, GLOBAL, and FLEX. Initial model fit is poor ($\chi^2$=337.403, df=98, $p<.000$, $CFI=.868$, $TLI=0.838$, $RMSEA=.105$), suggesting considerable model mis-specification. Assessments of parameter estimates reveals

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33 A one-factor congeneric model with three indicators is just-identified ($df=0$) (Kline 2010), which precludes the calculation of probabilities including most model fit statistics, as well as the implementation of bootstrapping procedures.

34 A simultaneous CFA measurement model with two or more factors, and two or more indicators per factor, is identified where: i) each indicator loads on a single factor, ii) measurement errors are independent, and iii) the factors are assumed to co-vary (Kline 2010).
REPAIR_3, GLOBAL_5 and FLEX_3 exhibit non-significant factor loadings, and are removed from the model. REPAIR_4 yields a non-hypothesised negative factor loading, inconsistent with the initial \textit{a priori} expectation, and is thus also omitted from the model. The revised model demonstrates a notably improved level of fit ($\chi^2=169.033$, $df=48$, $p<.000$, $CFI=.926$, $TLI=0.898$, $RMSEA=.107$), but requires further re-specification. Inspection of the standardised co-variance residuals and modification indices suggests GLOBAL_4 and INTERNAL_4 as further causes of model mis-specification, and both items are omitted. All remaining items exhibit significant factor loadings, and standardised loadings exceed 0.60 which is deemed acceptable for a newly-developed scale. Finally, model fit statistics for the re-specified measurement model indicate an acceptable reproduction of the observed data, and the model is accepted.

\textbf{Environmental Performance}

Initial estimation of \textit{ENV_PERF}, as reflected by the thirteen indicators included in the measurement instrument, exhibits unacceptable levels of model fit across all indices ($\chi^2=533.987$, $df=65$, $p<.000$, $CFI=.914$, $TLI=0.699$, $RMSEA=.181$). Further, appraisal of parameter estimates, inter-item correlations, and standardised residual co-variances suggest the overall test of a one-factor solution for the observed data should be rejected.

An examination of the original scale items suggests the questions may be classified according to two distinct themes identified in the environmental management literature. First, items 1 to 8 indicate improvements to overall resource productivity (Porter & Van der Linde 1995a), commonly termed eco-efficiency, and include benefits such as lower production costs, higher operational efficiency and productivity, process innovations, and higher quality products. Conversely, items 9
Chapter 5: Survey Results and Analysis

to 13 are more consistent with the unique organisational capabilities and competitive benefits associated with the resource-based view of the firm (Barney 1991; Hart 1995). This includes the capabilities for stakeholder integration, higher-order learning, and continuous innovation (Sharma & Vredenburg 1998), and may result in product innovations and organisation-wide learning, as well as improvements in employee morale, company reputation or goodwill, and relationships with stakeholders such as local communities, regulators, and environmental groups. A two-factor solution is specified based on the preceding theoretical rationale, rather than purely data-driven, exploratory techniques.

A new dimension comprising the eco-efficient environmental outcomes, labelled ECO_EFF, is proposed with items OUTCOME1-8 inclusive reflected against the latent construct. The initial model specification demonstrates unacceptable model fit ($\chi^2=17.638$, $df=20$, $p<.000$, $CFI=.861$, $TLI=0.806$, $RMSEA=.186$). Inspection of inter-item correlations and standardised residual co-variances indicates OUTCOME_3, OUTCOME_6 and OUTCOME_8 significantly contribute to the model mis specification, and the items are omitted. OUTCOME_1 and OUTCOME_2 also exhibit a statistically significant standardised residual co-variance (2.604), and the modification indices suggested co-varying the error terms would further improve the overall model fit. Given both items measure a common domain (Byrne 2009) (i.e., they both relate to a reduction in costs), it is reasonable to suggest there may be a correlation between the two items that is not explained by ECO_EFF alone. The revised model provides a satisfactory level of fit, and is accepted.

The remaining five items (OUTCOME_9 - 13 inclusive) are used to model a second dimension representing the competitive benefits flowing from the development of unique organisational capabilities, and is labelled CAPABILITY. The initial
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specification yields mediocre fit ($\chi^2=21.747$, $df=5$, $p<.001$, $CFI=.963$, $TLI=0.926$, $RMSEA=.123$), and modification indices suggest co-varying the error terms for items OUTCOME_12 and OUTCOME_13. The two items concern improvements to overall business reputation and relationships with stakeholders, which may be regarded as external firm benefits, whereas the remaining three items relate to innovation, organisational learning, and employee morale, which may be better regarded as internal benefits (Henri & Journeault 2010). Accordingly, co-varying the error term has theoretical support, and fit statistics for the re-specified model demonstrate acceptable fit.

**Economic Performance**

The initial one-factor model for ECON_PERF, comprised of six indicators reflected against a single latent construct, demonstrates poor fit ($\chi^2=97.506$, $df=9$, $p<.000$, $CFI=.914$, $TLI=0.857$, $RMSEA=.211$) and is subsequently rejected. All factor loadings are significant, and standardised loading exceeded the preferred 0.70 cut-off. Examination of the standardised co-variance residuals and modification indices indicated disturbances in the estimated model with respect to items ENV_PERF_6 and ENV_PERF_3. Both items were ultimately eliminated, with the remaining four observations deemed adequate to represent the intent of the theoretical construct.  

The final model specification demonstrated acceptable fit across all fit statistics, and the ECON_PERF measurement model is accepted.

**Computing Composite Measures**

As outlined in Chapter 4, this study adopts a partial aggregation approach to representing latent constructs in SEM (Bagozzi & Heatherton 1994). Accordingly,

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35 The remaining items are comparable to those adopted to measure economic performance by Henri and Journeault (2010) and Henri (2006), for example.
each dimension of a theoretical latent construct is represented by composite measure. This process serves to condense observed variables into a smaller number of indicator items, and thereby reduce model complexity.

Given acceptable fit of a one-factor congeneric model suggests that all indicator variables are valid measures of the one latent trait (Holmes-Smith 2012), factor score regression weights (re-scaled to 1.0) are used to compute a single weighted composite measure for each dimension of a single latent construct. A total of thirteen dimensions, representing eight theoretical latent constructs, were identified in the sample data. The descriptive statistics for each composite measure are presented in Table 9.

Table 9: Descriptive statistics for composite measures

<table>
<thead>
<tr>
<th>Variables</th>
<th>Min.</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness Statistic</th>
<th>Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Std. Error</th>
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<tbody>
<tr>
<td>ecs_c</td>
<td>1.29</td>
<td>7.00</td>
<td>5.02</td>
<td>1.28</td>
<td>-.723</td>
<td>.164</td>
<td>.181</td>
<td>.326</td>
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<tr>
<td>ieo_c</td>
<td>1.19</td>
<td>7.00</td>
<td>5.39</td>
<td>1.24</td>
<td>-1.124</td>
<td>.164</td>
<td>1.111</td>
<td>.326</td>
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<td>-.711</td>
<td>.164</td>
<td>.130</td>
<td>.326</td>
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<tr>
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<td>7.00</td>
<td>4.68</td>
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<td>-.568</td>
<td>.164</td>
<td>.035</td>
<td>.326</td>
</tr>
<tr>
<td>diag_c</td>
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<td>7.00</td>
<td>4.90</td>
<td>1.47</td>
<td>-.852</td>
<td>.164</td>
<td>.011</td>
<td>.326</td>
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<tr>
<td>interact_c</td>
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<td>.164</td>
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<td>-.464</td>
<td>.164</td>
<td>.111</td>
<td>.326</td>
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</tbody>
</table>

Examination of the mean scores in Table 9 suggests that the respondent organisations, on average, report high levels of integration of environmental concerns into organisational decision-making processes, with more advanced levels in establishing an internal environmental orientation (ieo_c) compared to the
inclusion of environmental issues in the corporate strategic planning process (ecs_c) (overall mean values are 5.02 for ecs_c, compared to 5.39 for ieo_c). Consistent with the item descriptive statistics, the respondent organisations, on average, placed equal emphasis on the use of beliefs (belief_c) and boundary (bound_c) systems, respectively, and senior management appear to rely slightly more on the diagnostic use of eco-controls (diag_c, mean 4.90) compared with the interactive use of eco-controls (interact_c, mean 4.35). Further, the respondent organisations, on average, report that environmental management practices have led to greater improvements in the development of unique organisational capabilities (capability_c, mean 4.47), compared with overall improved eco-efficiency (eco_eff_c, mean 4.27).

Item descriptive statistics for kurtosis and skewness indicate that the composites are all negatively skewed, which is consistent with the observed means exceeding the theoretical mid-point of 4.0. Further consideration of the data indicates that the values are within the tolerable levels of univariate normality recommended by Kline (2010), with absolute values of skewness or kurtosis less than 1.0 for all composite measures, excluding ieo_c, which is still within the more lenient threshold of 3.0.
Table 10: Multi-trait matrix demonstrating convergent and discriminant validity of composite measures

<table>
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<th></th>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
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<th>(13)</th>
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<td>.111</td>
<td>.239</td>
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<td>.658</td>
<td>.091</td>
<td>.033</td>
<td>.163</td>
<td>.059</td>
<td>.063</td>
<td>.137</td>
<td>.092</td>
<td>.107</td>
<td>.099</td>
<td>.088</td>
<td>.134</td>
<td>.160</td>
</tr>
</tbody>
</table>

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)

The first column presents the Average Variance Extracted (AVE) for each construct. For the remainder of the table, the diagonal of the matrix (in bold) presents the Composite Reliability for each composite variable, calculated using factor loadings and error variances obtained during CFA analysis. Values below the reliability diagonal comprise the Pearson’s bivariate correlation coefficients and level of significance (***, **: Significant at p-value <0.01, 0.05), whereas, values above the reliability diagonal present the square of the correlation estimate between these two constructs (n=221).
Reliability

The assessment of reliability concerns the degree to which measured variables are free from random measurement error, and thereby constitute acceptable indicators of their proposed theoretical latent constructs. Reliability at the single item level was initially assessed through a series of one-factor congeneric models, outlined in the sub-section above. Alongside considerations of overall model fit, the standardised loadings of individual items were compared against the desired cut-off of 0.70 (as a standardised loading of 0.71 equates to an item reliability score (SMC) of approximately 0.50, that is, more than 50% of the variance in the item is explained by its latent construct), with items exhibiting standardised loadings below 0.5 candidates for omission from the model. Further, the first column of Table 10 presents the average variance extracted (AVE), reflecting the overall amount of variance in a set of indicators, for each first-order dimension used to form the composite measures. The AVE for all dimensions exceeds the recommended 0.50 threshold (Fornell & Larcker 1981), with the majority exceeding the more stringent 0.60 level.

Further, numerous model-based measures of reliability exist to examine the internal consistency of a set of observations comprising a measurement scale. For this study, the ‘reliability diagonal’ of the multi-trait matrix presented in Table 10 shows that the construct reliability (CR) coefficient for all composite measures exceeds the desired 0.70 level (Hair et al. 2010), with the majority also exceeding the more stringent 0.80 level. Accordingly, the measures may be regarded as internally consistent, suggesting that the proposed indicator measures all consistently represent the same latent construct.
Given the measurement models discussed in the previous sub-section are congeneric, Cronbach’s Alpha may be considered a lower-bound estimate of true reliability (Holmes-Smith 2012). Still, the Cronbach’s Alpha for all measurement scales (reported in Appendix D) exceed the desired 0.80 threshold, with the exception of REPAIR and FLEX which both exceed 0.70 and are deemed acceptable given they both pertain to newly-developed scales for this study (Nunnally 1978; DeVellis 2003; Hair et al. 2010).

Taken together, the results demonstrate that more variance in the items is explained by their latent constructs than by random measurement error, and that the proposed measurement scales are, therefore, reliable predictors of their respective latent variables.

**Convergent and Discriminant Validity**

The multi-trait matrix presented in Table 10 further provides evidence concerning both the convergent and discriminant reliability of composite measures.

Convergent validity is assessed by the correlation among items which make up the measurement scale for a theoretical construct. Specifically, Table 10 demonstrates that the AVE for each composite measure exceeds 0.50, and, further, that the CR for each construct is greater than its AVE (Fornell & Larcker 1981; Hair et al. 2010), thus indicating that convergent validity was supported by the data in this study.

In contrast to convergent validity, which is a measurement within constructs, discriminant validity is concerned with measurement between constructs. An examination of Table 10 reveals that although many items are highly related, no construct-to-construct correlation for *theoretically distinct* measures exceeds 0.80. Further, the AVE estimates for each pair of constructs are greater than the square of
the correlation estimate between these two constructs (Fornell & Larcker 1981; Hair et al. 2010), and CR values in the reliability diagonal are higher than the correlations that occupy the same row and column (Churchill 1979). Therefore, discriminant validity could be ascertained for all theoretically distinct measures.

The figures in Table 10 may further be interpreted as supporting the specification of the research model presented in Figure 5, in relation to the bureaucratic stance towards the use of eco-controls. The research model proposes that the latent construct ENABLE is a higher-order construct, with the four underlying dimensions of REPAIR, INTERNAL, GLOBAL and FLEX representative of the four respective design characteristics of an enabling approach to eco-control. An examination of rows 7 to 9 indicates that discriminant validity cannot be established for the composite measures repair_c, internal_c and global_c. Thus, the failure to establish the discriminant validity of the three measures supports the contention that they are all dimensions of a single latent trait, that is, ENABLE. However, the fourth dimension, flex_c, does meet the relevant criteria for establishing discriminant validity. While this result does not preclude the composite measure being specified as an indicator of its latent construct ENABLE, the finding is unexpected in terms of the theoretical framework outlined in Chapter 3. Therefore, further assessment of the overall measurement theory using a full model confirmatory factor analysis is required.

**Full Model Confirmatory Factor Analysis**

Having established acceptable measurement scale reliability, along with both convergent and discriminant validity of the composite indicators, a full model confirmatory factor analysis (CFA) is used to test the hierarchical representation of
the partial aggregation model (Bagozzi & Heatherton 1994) and compare the overall measurement theory against reality, as represented by the sample data (Anderson & Gerbing 1988; Hair et al. 2010; Kline 2010).

The initial measurement model specification demonstrated unacceptable fit ($\chi^2=171.449$, $df=42$, $BSp<0.000$, $CFI=0.947$, $TLI=0.902$, $RMSEA=0.118$), and was subsequently rejected. Inspection of the standardised residual co-variances indicates $global_c$ and $flex_c$ as potential sources of model mis-specification with a critical-value of 1.95 (being only marginally within the recommended +/-1.96 threshold). Model modification indices suggested co-varying the error terms would further improve the overall model fit. Given both items measure a common domain (Byrne 2009) (i.e., they are both sub-dimensions of the second-order construct ENABLE, and thus relate to employees’ involvement in eco-control processes), it is reasonable to suggest there may be a correlation between the two items that is not explained by the proposed model. The model is, therefore, re-specified with the error terms for $global_c$ and $flex_c$ assumed to co-vary, as depicted in Figure 6.

The re-specified model demonstrates reasonable fit as both TLI and CFI exceed the desired 0.97 level ($CFI=0.984$, $TLI=0.970$), RMSEA is less than 0.08 and has a significant p-value to accept the test of close fit ($RMSEA=0.065$, 90% CI: 0.043-0.087, $p-value=0.118$), and the normed-$\chi^2$ is greater than 1.0 and less than 2.0 ($\chi^2/df=1.937$). The $\chi^2$ overall test of model fit is significant at the 0.05 level ($\chi^2=79.398$, $df=41$, $BSp=0.037$), but insignificant at the 0.01 level. However, the $\chi^2$ statistic is sensitive to sample size, tending to be inflated (statistically significant) in samples above 200 (Schumacker & Lomax 2004), and the presence of large correlations in the model (Kline 2010). Given all other fit indices adopted for this study meet the desired criteria, a conservative interpretation of the $\chi^2$ test is adopted
and the re-specified measurement model is accepted as an adequate representation of the sample data.

Figure 6: Final full CFA measurement model

Table 11 provides a summary of both un-standardised and standardised factor loadings for the re-specified measurement model, along with the item reliability (SMC) for each composite indicator. The results indicate that all factor loadings are significantly different from zero (p<0.001), with the majority of the standardised loadings exceeding the preferred 0.70 level. Exceptions are the standardised loadings for composite measures, flex_c (0.546) and eco_eff_c (0.664), which, respectively, exceed the lower threshold of 0.50 and, therefore, demonstrate satisfactory convergent validity to support the acceptance of the measurement model.
### Chapter 5: Survey Results and Analysis

#### Table 11: Parameter estimates for full CFA measurement model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV_STGY</td>
<td>ecs_c</td>
<td>1.058</td>
<td>0.073</td>
<td>14.56</td>
<td>***</td>
<td>0.827</td>
<td>0.684</td>
</tr>
<tr>
<td>ENV_STGY</td>
<td>ieo_c</td>
<td>1.090</td>
<td>0.068</td>
<td>16.00</td>
<td>***</td>
<td>0.882</td>
<td>0.779</td>
</tr>
<tr>
<td>BELIEF</td>
<td>belief_c</td>
<td>1.160</td>
<td>0.062</td>
<td>18.61</td>
<td>***</td>
<td>0.942</td>
<td>0.887</td>
</tr>
<tr>
<td>BOUND</td>
<td>bound_c</td>
<td>1.203</td>
<td>0.065</td>
<td>18.61</td>
<td>***</td>
<td>0.942</td>
<td>0.887</td>
</tr>
<tr>
<td>DIAG</td>
<td>diag_c</td>
<td>1.443</td>
<td>0.071</td>
<td>20.36</td>
<td>***</td>
<td>0.985</td>
<td>0.971</td>
</tr>
<tr>
<td>INTERACT</td>
<td>interact_c</td>
<td>1.343</td>
<td>0.068</td>
<td>19.67</td>
<td>***</td>
<td>0.968</td>
<td>0.938</td>
</tr>
<tr>
<td>ENABLE</td>
<td>repair_c</td>
<td>1.074</td>
<td>0.052</td>
<td>20.47</td>
<td>***</td>
<td>0.989</td>
<td>0.979</td>
</tr>
<tr>
<td>ENABLE</td>
<td>internal_c</td>
<td>1.131</td>
<td>0.059</td>
<td>19.09</td>
<td>***</td>
<td>0.953</td>
<td>0.909</td>
</tr>
<tr>
<td>ENABLE</td>
<td>global_c</td>
<td>0.973</td>
<td>0.053</td>
<td>18.28</td>
<td>***</td>
<td>0.931</td>
<td>0.867</td>
</tr>
<tr>
<td>ENABLE</td>
<td>flex_c</td>
<td>0.606</td>
<td>0.070</td>
<td>8.71</td>
<td>***</td>
<td>0.546</td>
<td>0.299</td>
</tr>
<tr>
<td>ENV_PERF</td>
<td>eco_eff_c</td>
<td>0.853</td>
<td>0.087</td>
<td>9.80</td>
<td>***</td>
<td>0.664</td>
<td>0.441</td>
</tr>
<tr>
<td>ENV_PERF</td>
<td>capability_c</td>
<td>0.998</td>
<td>0.074</td>
<td>13.52</td>
<td>***</td>
<td>0.919</td>
<td>0.845</td>
</tr>
<tr>
<td>ECON_PERF</td>
<td>econ_perf_c</td>
<td>1.159</td>
<td>0.062</td>
<td>18.76</td>
<td>***</td>
<td>0.946</td>
<td>0.894</td>
</tr>
<tr>
<td></td>
<td>covar (e9, e10)</td>
<td>0.219</td>
<td>0.030</td>
<td>7.26</td>
<td>***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(***: Significant at p-value <0.01)

Failing to reject the full CFA measurement model, based on the statistical criteria adopted for this study, suggests that each of the composite indicators is an acceptable measure of a single underlying construct. Thus, the construct can then function as a predictor or predicted variable in a structural equation model, while taking into account measurement error in the measures of the construct (Bagozzi & Heatherton 1994).

#### 5.4.2 Step Two: Analysis of the Full Structural Model

In this section the measurement model will be used as the foundation to assess the conceptual representation of the relations among constructs. Having established the reliability and validity of measurement scales for each construct, the structural model described in this section focuses on path analysis to test the various structural relations between constructs. Accordingly, the testing of the proposed hypotheses
includes the assessment of the level of significance of each path in the proposed structural model, as well as the overall goodness-of-fit of the entire model.

Figure 7: Full structural model diagram for hypothesis testing

<table>
<thead>
<tr>
<th>Environmental Strategy</th>
<th>Eco-control Systems</th>
<th>Environmental Performance</th>
<th>Economic Performance</th>
</tr>
</thead>
</table>

Figure 7 describes the full structural model diagram for the testing of hypotheses, as outlined in the theoretical model. Composite indicators and a partial aggregation approach are used to represent latent constructs (Bagozzi & Heatherton 1994), and the error term of single-item measures is set (fixed) to 1.0 minus the best estimate of reliability, multiplied by the observed scale variance (Kline 2010). Each structural equation also contains an error term that indicates the portion of the latent dependent variable that is not explained by the latent independent variables in that equation. Further, according to Simons (1995), the four LOC are thought to be inter-dependent and complementary. Thus, consistent with the empirical analysis of Widener (2007), paths are added between each of the four levers. Specifically, the model includes a
path from \textit{BELIEF} to \textit{BOUND}, \textit{DIAG} and \textit{INTERACT}, respectively, and also from \textit{BOUND} to \textit{DIAG}, \textit{DIAG} to \textit{INTERACT} and \textit{INTERACT} to \textit{BOUND}.

As shown in Table 12, the full model demonstrates reasonable fit. Both TLI and CFI exceed the desired 0.97 level; RMSEA is less than 0.08; and the normed-$\chi^2$ is greater than 1.0 and less than 2.0. However, a significant $\chi^2$ test of overall model fit at the 0.05 level ($\chi^2=96.851$, $df=52$, $BSp=0.042$) suggests the model could be improved.

Following the specification of the full structural model, model trimming is used to derive a parsimonious, well-fitting base model (Kline 2010) to form the basis of hypothesis testing. The results for this step are presented in Table 12. In the first trimmed model (Trimmed 1), insignificant paths (at the 0.05 level) for un-hypothesised relations between the four LOC variables are removed. Specifically, paths from \textit{BELIEF} to \textit{DIAG} and \textit{INTERACT} are removed, as well as those from \textit{BOUND} to \textit{DIAG}, and from \textit{INTERACT} to \textit{BOUND}. An insignificant $\chi^2$ difference test indicates that the model has not been overly trimmed (Kline 2010).

Inspection of Table 12 indicates that emphasis on the environmental boundary system is associated with the emphasis placed on a beliefs system, and not with environmental strategy. Further, emphasis placed on the diagnostic use is primarily associated with the interactive use of eco-controls and does not have a significant relation with environmental performance. Accordingly, in the final trimmed model (Trimmed 2) the insignificant paths from \textit{ENV\_STGY} to \textit{BOUND} and from \textit{DIAG} to \textit{ENV\_PERF} are removed. The model trimming results in an insignificant $\chi^2$ difference, which indicates that the model has not been overly trimmed (Kline 2010).
Table 12: Summary of full structural model trimming and alternate models

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>Base Model</th>
<th>Trimmed 1</th>
<th>Trimmed 2</th>
<th>Alt. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV_STGY</td>
<td>BELIEF</td>
<td>0.907 ***</td>
<td>0.913 ***</td>
<td>0.917 ***</td>
<td>0.916 ***</td>
</tr>
<tr>
<td>ENV_STGY</td>
<td>BOUND</td>
<td>0.191</td>
<td>0.149</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ENV_STGY</td>
<td>DIAG</td>
<td>0.841 ***</td>
<td>0.782 ***</td>
<td>0.783 ***</td>
<td>0.783 ***</td>
</tr>
<tr>
<td>ENV_STGY</td>
<td>INTERACT</td>
<td>0.051</td>
<td>0.356 ***</td>
<td>0.353 ***</td>
<td>0.357 ***</td>
</tr>
<tr>
<td>ENV_STGY</td>
<td>ENABLE</td>
<td>0.833 ***</td>
<td>0.832 ***</td>
<td>0.830 ***</td>
<td>0.830 ***</td>
</tr>
<tr>
<td>BELIEF</td>
<td>BOUND</td>
<td>0.596 ***</td>
<td>0.632 ***</td>
<td>0.775 ***</td>
<td>0.775 ***</td>
</tr>
<tr>
<td>BELIEF</td>
<td>DIAG</td>
<td>-0.036</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>BELIEF</td>
<td>INTERACT</td>
<td>0.277 *</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>BOUND</td>
<td>DIAG</td>
<td>-0.074</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>DIAG</td>
<td>INTERACT</td>
<td>0.568 ***</td>
<td>0.524 ***</td>
<td>0.526 ***</td>
<td>0.523 ***</td>
</tr>
<tr>
<td>INTERACT</td>
<td>BOUND</td>
<td>-0.002</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>BELIEF</td>
<td>ENV_PERF</td>
<td>0.367 ***</td>
<td>0.365 ***</td>
<td>0.407 ***</td>
<td>---</td>
</tr>
<tr>
<td>BOUND</td>
<td>ENV_PERF</td>
<td>-0.202 *</td>
<td>-0.202 *</td>
<td>-0.218 *</td>
<td>---</td>
</tr>
<tr>
<td>DIAG</td>
<td>ENV_PERF</td>
<td>0.149</td>
<td>0.142</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>INTERACT</td>
<td>ENV_PERF</td>
<td>0.213 *</td>
<td>0.229 *</td>
<td>0.320 ***</td>
<td>---</td>
</tr>
<tr>
<td>ENABLE</td>
<td>ENV_PERF</td>
<td>0.224 **</td>
<td>0.220 **</td>
<td>0.230 **</td>
<td>---</td>
</tr>
<tr>
<td>ENV_PERF</td>
<td>ECON_PERF</td>
<td>0.191 ***</td>
<td>0.190 ***</td>
<td>0.194 ***</td>
<td>0.162</td>
</tr>
</tbody>
</table>

Alternative model specification

| BELIEF    | ECON_PERF | --- | --- | --- | 0.254 |
| BOUND    | ECON_PERF | --- | --- | --- | -0.115 |
| DIAG     | ECON_PERF | --- | --- | --- | -0.220 |
| INTERACT | ECON_PERF | --- | --- | --- | 0.160  |
| ENABLE   | ECON_PERF | --- | --- | --- | -0.057 |

Model Fit

| $\chi^2$  | 96.85 | 103.12 | 105.35 | 220.92 |
| df        | 52    | 56     | 58     | 57     |
| BS-p-value| 0.042 | 0.047  | 0.052  | 0.000  |
| $\chi^2$/df | 1.863 | 1.841  | 1.816  | 3.876  |
| RMSEA     | 0.063 | 0.062  | 0.061  | 0.114  |
| TLI       | 0.973 | 0.973  | 0.974  | 0.909  |
| CFI       | 0.982 | 0.981  | 0.981  | 0.933  |

$\chi^2$ difference test

| $\chi^2$ difference (df) | 6.26 (4) | 2.23 (2) | N/A |
| p-value                  | > 0.05   | > 0.05   | N/A |

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)

This table presents the results of the full structural equation model. The trimmed model (Trimmed 1) removes insignificant paths for un-hypothesised relations between the LOC variables. The second, final trimmed model (Trimmed 2) is guided by theory and empirical results and removes the insignificant paths from environmental strategy to the boundary system and from diagnostic use of eco-controls to environmental performance.
Finally, an alternative model (Alt. 1) is presented which trims the mediating effects of $ENV\_PERF$. This model allows the eco-control systems to directly affect economic performance ($ECON\_PERF$), whilst controlling for the hypothesised direct effect of $ENV\_PERF$ on $ECON\_PERF$. None of the alternate path specifications are significant, indicating that neither the style of use or bureaucratic stance towards eco-controls have a significant direct effect on a firm’s economic performance. Further, the alternate model yielded a poor fit across all model fit statistics, indicating that the mediating stance of environmental performance proposed in the conceptual model provides a better representation of the structural relations present in the sample data.

In summary, the results in Table 12 indicate that the second trimmed model (i.e., Trimmed 2) is a better fitting model than the base model, and demonstrates acceptable fit with an insignificant $\chi^2$ ($\chi^2=105.348$, $df=58$, $BSp=0.052$), a normed-$\chi^2=1.816$, a $CFI=0.981$, a $TLI=0.974$, and $RMSEA=0.061$ ($90\% CI 0.042-0.079$, $p$-value=0.160). The alternate model (i.e., Alt. 1) is not better fitting than the trimmed base model, and is thus rejected. A model diagram depicting the significant paths for the trimmed base model is provided in Figure 8, with a summary of both standardised and unstandardised parameter estimates, along with squared multiple correlations (SMC) for endogenous variables, provided below in Table 13.
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Figure 8: Trimmed structural model diagram depicting significant paths

Table 13: Parameter estimates for trimmed structural model

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>ENV_STGY → BELIEF</td>
<td>1.009</td>
<td>0.065</td>
<td>15.614</td>
<td>***</td>
<td>0.917</td>
<td>0.842</td>
</tr>
<tr>
<td>H1b</td>
<td>ENV_STGY → BOUND</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>H1c</td>
<td>ENV_STGY → DIAG</td>
<td>1.073</td>
<td>0.82</td>
<td>13.045</td>
<td>***</td>
<td>0.783</td>
<td>0.613</td>
</tr>
<tr>
<td>H1d</td>
<td>ENV_STGY → INTERACT</td>
<td>0.451</td>
<td>0.101</td>
<td>4.469</td>
<td>***</td>
<td>0.353</td>
<td>0.693</td>
</tr>
<tr>
<td>H2</td>
<td>ENV_STGY → ENABLE</td>
<td>0.892</td>
<td>0.066</td>
<td>13.463</td>
<td>***</td>
<td>0.830</td>
<td>0.689</td>
</tr>
<tr>
<td>--</td>
<td>BELIEF → BOUND</td>
<td>0.806</td>
<td>0.057</td>
<td>14.110</td>
<td>***</td>
<td>0.775</td>
<td>0.601</td>
</tr>
<tr>
<td>--</td>
<td>DIAG → INTERACT</td>
<td>0.490</td>
<td>0.070</td>
<td>6.960</td>
<td>***</td>
<td>0.526</td>
<td></td>
</tr>
<tr>
<td>H3a</td>
<td>BELIEF → ENV_PERF</td>
<td>0.302</td>
<td>0.109</td>
<td>2.786</td>
<td>0.005</td>
<td>0.407</td>
<td>0.516</td>
</tr>
<tr>
<td>H3b</td>
<td>BOUND → ENV_PERF</td>
<td>-0.155</td>
<td>0.081</td>
<td>-1.915</td>
<td>0.056</td>
<td>-0.218</td>
<td></td>
</tr>
<tr>
<td>H3c</td>
<td>DIAG → ENV_PERF</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>H3d</td>
<td>INTERACT → ENV_PERF</td>
<td>0.205</td>
<td>0.071</td>
<td>2.907</td>
<td>0.004</td>
<td>0.320</td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>ENABLE → ENV_PERF</td>
<td>0.175</td>
<td>0.074</td>
<td>2.349</td>
<td>0.019</td>
<td>0.230</td>
<td></td>
</tr>
<tr>
<td>H5</td>
<td>ENV_PERF → ECON_PERF</td>
<td>0.261</td>
<td>0.104</td>
<td>2.518</td>
<td>0.012</td>
<td>0.194</td>
<td>0.037</td>
</tr>
</tbody>
</table>

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)
The Squared Multiple Correlations (SMC) (Table 13) for each endogenous variable pertaining to the various dimensions of eco-controls exceeds 50% (range 60.1% - 84.2%), and also compares favourably to comparative studies evaluating the LOC dimensions (cf. Widener 2007, range 21.4% - 59.1%) and the concept of enabling control (cf. Chapman & Kihn 2009, range 3.1% - 5.5%). At 3.7%, the reported SMC for \textit{ECON_PERF} is substantially less than that of other endogenous variables in the model. However, the values for both \textit{ENV_PERF} and \textit{ECON_PERF} are comparable to those reported by Henri and Journeault (2010), for example (47.1% and 1.7%, respectively), in their study of the structural relations between firms’ use of eco-controls, and the corresponding effect on environmental and economic performance.

**Discussion of Hypothesis Testing**

A summary of the structural model results for the trimmed model (Trimmed 2) is presented in Table 13, and provides evidence on the hypothesised relations along with observed significant paths between the four LOC variables. Further, the estimated correlations associated with the trimmed structural model are presented in Table 14 to aid further discussion. In the following sub-sections, the finding on each hypothesised relation is interpreted in turn.

Table 14: Estimated correlations for trimmed structural model

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{ENV_STGY}</td>
<td>(1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{BELIEF}</td>
<td>(2)</td>
<td>0.917***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{BOUND}</td>
<td>(3)</td>
<td>0.711***</td>
<td>0.775***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{DIAG}</td>
<td>(4)</td>
<td>0.783***</td>
<td>0.718***</td>
<td>0.557***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{INTERACT}</td>
<td>(5)</td>
<td>0.766***</td>
<td>0.702***</td>
<td>0.545***</td>
<td>0.803***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{ENABLE}</td>
<td>(6)</td>
<td>0.830***</td>
<td>0.762***</td>
<td>0.590***</td>
<td>0.650***</td>
<td>0.636***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>\textit{ENV_PERF}</td>
<td>(7)</td>
<td>0.655***</td>
<td>0.639***</td>
<td>0.409***</td>
<td>0.578***</td>
<td>0.634***</td>
<td>0.616***</td>
<td>1</td>
</tr>
<tr>
<td>\textit{ECON_PERF}</td>
<td>(8)</td>
<td>0.127*</td>
<td>0.124*</td>
<td>0.079</td>
<td>0.112*</td>
<td>0.123*</td>
<td>0.119*</td>
<td>0.194***</td>
</tr>
</tbody>
</table>

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)
Environmental Strategy and Eco-control

The results in Table 13 reveal that the extent to which firms pursue a more proactive environmental strategy is strongly related to the emphasis placed on a beliefs system (p<0.001), as well as the emphasis on both the diagnostic (p<0.001) and interactive use (p<0.001) of eco-controls. Accordingly, the results provide strong support for Hypotheses H1a, H1c and H1d, respectively. Further, a positive and significant path is observed between the diagnostic use and interactive use of eco-controls (p<0.001).

This finding, although not addressed in the hypotheses development for the current study, is consistent with the findings of Widener (2007) and Henri (2006) and suggests that the interactive and diagnostic use of eco-controls are complementary and inter-dependent.

The bivariate correlations presented in Table 14 show a positive relation between environmental strategy and emphasis placed on a boundary system, with a coefficient of 0.711 (p<0.01). However, as depicted in Figure 8, environmental strategy is not significantly related to emphasis on a boundary system when modelled together with the other levers, and the path was removed during the model trimming process. Accordingly, H1b is not supported. Consistent with Widener (2007), a positive, significant path is observed between the beliefs and boundary systems (p<0.001).

Thus, while no direct relation is observed between strategic factors and emphasis of a boundary system, the results suggest that environmental strategy influences the emphasis placed on a beliefs system, which, in turn, is significantly associated with the emphasis placed on a boundary system. This suggests that, when used together, firms communicate boundary systems ‘to remind employees of their responsibilities and to provide limits around beliefs systems that inspire them to innovate and seek opportunities’ (Arjaliès & Mundy 2013, p. 297).
Finally, Hypothesis H2 investigates the relation between proactive environmental strategies and an enabling stance towards eco-control. As shown in Table 13, the path between the two variables is significant (p<0.001) and in the predicted direction, providing full support for H2. The findings thus support the argument that firms pursuing more proactive strategies prefer enabling eco-control structures, allowing them to simultaneously pursue both efficiency and flexibility. Further, the process of integrating environmental concerns into formal strategic planning and decision-making processes, in itself, may contribute to the development of an enabling form of control.

The Use of Eco-controls and Environmental Performance

Full support is provided for Hypothesis H3a, which predicted a positive relation between the emphasis on a beliefs system and firms’ environmental performance (p<0.01). The findings thus support the contention that emphasis on an environmental beliefs system contributes to improvements in employee morale, encourages innovation, and positively influences employees’ motivation to achieve the firm’s environmental goals.

Given the presence of countervailing arguments in theoretical and empirical literature, the hypothesised relations between emphasis on a boundary system and diagnostic use of eco-controls on environmental performance were presented in the null form. Accordingly, Hypotheses H3b and H3c do not outline an a priori expectation regarding the sign of the predicted relation. Pursuant to this, the analysis results indicate a negative relation between the emphasis placed on a boundary system and environmental performance, though only significant at the 0.10 level (p=0.056). Accordingly, marginal support is provided for Hypothesis H3b, and suggests that careful use of boundary controls may be required to avoid potential
negative effects on learning and knowledge-sharing surrounding environmental management activities.

Interestingly, in terms of correlations (Table 14), emphasis on a boundary system is positively and significantly correlated with environmental performance (coefficient 0.409, p<0.01). Although there is no reason why the sign of the path coefficient must be the same as the correlation between two variables (Bentler & Chou 1987), differing signs are usually taken as an indicator of a suppressor effect (Maassen & Bakker 2001; Tabachnick & Fidell 2007). This would mean that from a univariate perspective, the correlation coefficient between a boundary system and environmental performance is positive, but in a multivariate setting boundary systems act as negative suppressors for the other predictor variables. This is consistent with previous theoretical arguments suggesting that MCS, and the LOC in particular, are inter-dependent and complementary, and the effect of the four levers should be assessed jointly (Tuomela 2005; Widener 2007; Mundy 2010) as failure to do so may result in a mis-specification of the research model.

Similarly, no a priori expectation is hypothesised regarding the sign of the relation between the diagnostic use of eco-controls and firms’ environmental performance. Nevertheless, although the item-pair correlations in Table 14 reveal a positive and significant relation (coefficient 0.578, p<0.01), in a multivariate setting a positive but non-significant path is observed. Therefore, the path was removed during the model trimming process, indicating Hypothesis H3c is not supported. However, given the presence of a path between the diagnostic use and interactive use of eco-controls, the

36 Because SEM deals with partial correlations among variables, it is assumed that the reversed sign between the two variables was caused by the correlations between other variables, called a suppressor effect. This phenomenon may occur where the suppressor variable correlates with the dependent variable, but also shares with other independent variables much information that is independent to the dependent variable. In this situation, a path coefficient between the suppressor variable and the dependent variable generates a sign opposite to that which is expected (Maassen & Bakker 2001).
emphasis placed on diagnostic use also effects environmental performance indirectly through the interactive use of controls. Thus, in addition to any direct effects, indirect effects may also be observed whereby emphasis on the interactive use of eco-controls acts as a mediating variable in the relations between the diagnostic use of eco-controls and environmental performance. Here, the total effect may be regarded as the sum of all direct and indirect effects of one variable on another (Kline 2010). Based on this observation, the standardised total effect of the diagnostic use of eco-controls on environmental performance is 0.169, which is significant at 0.01 level (p=0.008).

Further, Table 13 provides full support for Hypothesis H3d, with a positive and significant relation (p<0.01) observed between the emphasis placed on the interactive use of eco-controls and environmental performance. Taken together, the findings are consistent with Tuomela (2005) who argues that the monitoring and data collection processes associated with the diagnostic use of MCS are used to inform the interactive use of MCS for strategic learning purposes, that is, by providing the basis for discussing goals and strategies, and for learning about common issues and strategic uncertainties.

The final hypothesis for link 2 investigates the performance outcomes of enabling control, by examining the relation between an enabling stance towards eco-control and environmental performance. The result in Table 13 confirms the expected

---

37 I.e., Total Effect = Direct Effect + Indirect Effect(s). Further, indirect effects are estimated statistically as the products of direct effects that comprise them (Kline 2010). Accordingly, the standardised indirect effect of diagnostic use on environmental performance through interactive use (0.526 x 0.320) may be added to the standardised coefficient of the direct effect (0.0) to arrive at the total effect (0.169).

38 The p-value associated with the standardised total (direct and indirect) effect is a bootstrap approximation obtained by constructing two-sided bias-corrected confidence intervals in AMOS.
positive relation, with the path between the two variables significant at the 0.05 level (p=0.019). Thus, Hypothesis H4 is also supported.

Environmental Performance and Economic Performance

Link 3 of the conceptual model comprises a single hypothesis, which concerns the relation between firm environmental performance and economic performance. As can be seen in Table 13, the path between the two variables is positive and significant (p=0.012), providing full support for Hypothesis H5.

A summary of the structural model results for the hypothesised relations is presented below in Table 15.
Table 15: Summary of hypothesis testing results

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Coef.</th>
<th>p</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Strategy and Eco-control</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1a: The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on a beliefs system of eco-controls.</td>
<td>0.92</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H1b: The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on a boundary system of eco-controls.</td>
<td>0.15</td>
<td>n.s.</td>
<td>No</td>
</tr>
<tr>
<td>H1c: The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on the diagnostic use of eco-controls.</td>
<td>0.78</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H1d: The extent to which firms follow a more proactive strategy is positively associated with the emphasis they place on the interactive use of eco-controls.</td>
<td>0.35</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H2: There is a positive association between proactive environmental strategy and the adoption of an enabling stance towards eco-control.</td>
<td>0.83</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>The Use of Eco-Controls and Environmental Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3a: The emphasis firms place on a beliefs system is positively associated with environmental performance.</td>
<td>0.41</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H3b: The emphasis firms place on a boundary system is significantly associated with environmental performance.</td>
<td>-0.22</td>
<td>*</td>
<td>Marginal Support</td>
</tr>
<tr>
<td>H3c: The emphasis firms place on the diagnostic use of eco-controls is significantly associated with environmental performance.</td>
<td>0.14</td>
<td>n.s.</td>
<td>No 39</td>
</tr>
<tr>
<td>H3d: The emphasis firms place on the interactive use of eco-controls is positively associated with environmental performance.</td>
<td>0.32</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H4: An enabling stance towards eco-control is positively associated with environmental performance.</td>
<td>0.23</td>
<td>**</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Environmental Performance and Economic Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5: Environmental performance is positively associated with economic performance.</td>
<td>0.19</td>
<td>***</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)

39 Although the direct link between the diagnostic use of eco-controls and environmental performance was not supported, a positive and significant (p<0.01) indirect link through the interactive use of eco-controls is observed.
5.5 Dimensionality of the Conceptual Model

The structural model presented in the previous section was specified according to the original conceptual framework outlined in Chapter 3, for the purposes of hypothesis testing. Based on prior literature, the conceptual model assumed all research constructs, excluding ENABLE, to be uni-dimensional in nature. However, as outlined in Section 5.4, the test of uni-dimensionality was rejected for two of the theoretical constructs, representing firms’ environmental strategy and environmental performance, respectively. In each instance, the theoretical constructs were re-specified based on theoretical and empirical considerations as two distinct underlying dimensions. Specifically, a firm’s environmental strategy was identified as comprising both its degree of environmental corporate strategy (ECS) and internal environmental orientation (IEO) (Banerjee 2002; Banerjee et al. 2003), and environmental performance was distinguished according to the eco-efficient environmental outcomes (ECO_EFF) and the development of unique organisational capabilities (CAPABILITY) resulting from a firm’s environmental management activities. Accordingly, the conceptual model was tested following a partial aggregation approach, with the separate dimensions of each multi-dimensional construct treated as indicators of a single latent variable (Bagozzi & Heatherton 1994).

However, as Little et al. (2002, p. 163) argue, ‘problems involving multi-dimensionality for SEM occur when fewer dimensions than exist in the data are specified (i.e., the model is mis-specified with too few constructs)’. Further, difficulty in interpretation arises when the sub-dimensions of a construct are not highly correlated with each other, resulting in a confounded latent construct. Any associations of such latent variables with others in a model would be susceptible to
alternative explanations (i.e., there is uncertainty as to which dimension or source of variance produced the structural effect) (Little et al. 2002).

Given the multi-trait matrix presented in Table 10 provides evidence on the discriminant validity of the underlying dimensions of environmental strategy (i.e., ECS and IEO) and environmental performance (i.e., ECO_EFF and CAPABILITY), respectively, there are both theoretical and empirical grounds for including each dimension as separate latent constructs in a revised structural model.

5.5.1 Analysis of the Expanded Structural Model

Figure 9 describes the expanded structural model diagram for exploring the dimensionality of the original conceptual model. Consistent with the original conceptual model, a four-stage model is depicted which predicts that the environmental corporate strategy (ECS) and internal environmental orientation (IEO) of a firm are associated with the emphasis placed on eco-control systems. The emphasis placed on eco-controls is, in turn, expected to influence the firm’s environmental performance outcomes, in terms of both its eco-efficient environmental outcomes (ECO_EFF) and the development of unique organisational capabilities (CAPABILITY). Finally, the eco-efficiency and organisational capability dimensions of environmental performance are each predicted to influence the firm’s economic performance. Further, consistent with the findings outlined in the previous section, positive relations are anticipated between several of the LOC dimensions. Specifically, the emphasis placed on an environmental beliefs system is expected to influence the emphasis on an environmental boundary system. Likewise, the diagnostic use of eco-controls is expected to have a positive association with the interactive use of eco-controls.
As shown in Table 16, the expanded structural model initially demonstrates mediocre overall fit. Both TLI and CFI exceed the acceptable 0.95 level, and RMSEA is also acceptable, being less than 0.08. However, the $\chi^2$ test of overall model fit is significant at the 0.05 level ($\chi^2=110.463$, $df=48$, $BSp=0.007$), and the normed-$\chi^2$ is greater than 2.0. Further examination of the results in Table 16 indicates several of the estimated paths have insignificant structural coefficients, which suggests that the model does not accurately represent the sample data and could, therefore, be further improved.

Prior to summarising the procedures adopted to improve the overall fit of the expanded model, an irregular path coefficient in the expanded base model needs to be acknowledged and discussed. The results in Table 16 outline estimates of the standardised regression weights of the relations between latent constructs represented
in the path model. Of interest is the path coefficient between a firm’s internal environmental orientation (IEO) and the emphasis placed on an enabling approach to eco-control (ENABLE). Specifically, the estimated path coefficient is outside the bounds of (-1,1), and suggests that when IEO goes up by 1 standard deviation, ENABLE goes up by 1.047 standard deviations.

While the occurrence of a standardised regression coefficient greater than 1 in a model raises questions concerning its legitimacy, in the current model a viable explanation may be offered. In instances where the dependent variable has a single predictor, or multiple predictors that are uncorrelated, regression coefficient values are confined to the bounds of (-1,1). However, if there are two or more correlated predictors (positively or negatively), as in the present case, the regression coefficients may exceed those bounds (Deegan 1978). As depicted in Figure 9 by the curved double-headed arrow between ECS and IEO, the strategic elements estimated in the model are correlated ($r = 0.837$). Further, both ECS and IEO are modelled as predictors of ENABLE in the expanded base model, thus fulfilling the conditions whereby an allowable standardised regression coefficient greater than 1 may occur.40

Table 16: Summary of expanded structural model building and trimming

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ECS</td>
<td>BELIEF</td>
<td>0.417 ***</td>
<td>0.422 ***</td>
<td>0.480 ***</td>
<td>0.479 ***</td>
<td>0.479 ***</td>
</tr>
<tr>
<td>ECS</td>
<td>BOUND</td>
<td>-0.424 ***</td>
<td>-0.436 ***</td>
<td>-0.431 ***</td>
<td>-0.431 ***</td>
<td>-0.431 ***</td>
</tr>
<tr>
<td>ECS</td>
<td>DIAG</td>
<td>0.153</td>
<td>0.153</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ECS</td>
<td>INTERACT</td>
<td>0.206 **</td>
<td>0.212 **</td>
<td>0.298 ***</td>
<td>0.297 ***</td>
<td>0.297 ***</td>
</tr>
<tr>
<td>ECS</td>
<td>ENABLE</td>
<td>-0.230 *</td>
<td>-0.227 *</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>IEO</td>
<td>BELIEF</td>
<td>0.521 ***</td>
<td>0.516 ***</td>
<td>0.460 ***</td>
<td>0.462 ***</td>
<td>0.462 ***</td>
</tr>
<tr>
<td>IEO</td>
<td>BOUND</td>
<td>0.392 ***</td>
<td>0.397 ***</td>
<td>0.367 ***</td>
<td>0.367 ***</td>
<td>0.367 ***</td>
</tr>
<tr>
<td>IEO</td>
<td>DIAG</td>
<td>0.643 ***</td>
<td>0.642 ***</td>
<td>0.778 ***</td>
<td>0.779 ***</td>
<td>0.779 ***</td>
</tr>
<tr>
<td>IEO</td>
<td>INTERACT</td>
<td>0.122</td>
<td>0.117</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>IEO</td>
<td>ENABLE</td>
<td>1.047 ***</td>
<td>1.044 ***</td>
<td>0.837 ***</td>
<td>0.838 ***</td>
<td>0.838 ***</td>
</tr>
<tr>
<td>BELIEF</td>
<td>BOUND</td>
<td>0.789 ***</td>
<td>0.795 ***</td>
<td>0.823 ***</td>
<td>0.822 ***</td>
<td>0.822 ***</td>
</tr>
<tr>
<td>DIAG</td>
<td>INTERACT</td>
<td>0.566 ***</td>
<td>0.565 ***</td>
<td>0.605 ***</td>
<td>0.606 ***</td>
<td>0.606 ***</td>
</tr>
<tr>
<td>BELIEF</td>
<td>ECO_EFF</td>
<td>0.178</td>
<td>0.087</td>
<td>0.085</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>BOUND</td>
<td>ECO_EFF</td>
<td>-0.327 ***</td>
<td>-0.260 **</td>
<td>-0.257 **</td>
<td>-0.213 **</td>
<td>-0.213 **</td>
</tr>
<tr>
<td>DIAG</td>
<td>ECO_EFF</td>
<td>0.042</td>
<td>0.060</td>
<td>0.062</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>INTERACT</td>
<td>ECO_EFF</td>
<td>0.473 ***</td>
<td>0.472 ***</td>
<td>0.467 ***</td>
<td>0.534 ***</td>
<td>0.534 ***</td>
</tr>
<tr>
<td>ENABLE</td>
<td>ECO_EFF</td>
<td>0.127</td>
<td>0.137</td>
<td>0.136</td>
<td>0.168 *</td>
<td>0.168 *</td>
</tr>
<tr>
<td>BELIEF</td>
<td>CAPABILITY</td>
<td>0.396 ***</td>
<td>0.307 ***</td>
<td>0.305 ***</td>
<td>0.311 ***</td>
<td>0.311 ***</td>
</tr>
<tr>
<td>BOUND</td>
<td>CAPABILITY</td>
<td>-0.215 *</td>
<td>-0.023</td>
<td>-0.023</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>DIAG</td>
<td>CAPABILITY</td>
<td>0.133</td>
<td>0.129</td>
<td>0.134</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
This table presents the results of *ex post* analysis of an expanded structural equation model. The expanded base model explores the dimensionality of the original conceptual model, as depicted in Figure 9. The first alternate model (Alt 1) includes an additional path from improved eco-efficiency to environmental organisational capabilities. The first trimmed model (Trimmed 1) removes insignificant paths from environmental strategic factors to eco-control systems, while Trimmed 2 trims insignificant paths from the eco-control systems to dimensions of environmental performance. The final model (Trimmed 3), trims insignificant paths from dimensions of environmental performance to economic performance. Model fit statistics and $\chi^2$ difference tests are presented to demonstrate the incremental improvements to overall model fit, as the result of each model re-specification.

<table>
<thead>
<tr>
<th>Path</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>$p$-value</th>
<th>Significant at <em>p</em>-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERACT $\rightarrow$ CAPABILITY</td>
<td>0.195</td>
<td>-0.088</td>
<td>0.090</td>
<td></td>
</tr>
<tr>
<td>ENABLE $\rightarrow$ CAPABILITY</td>
<td>0.259</td>
<td><strong>0.187</strong></td>
<td><strong>0.186</strong></td>
<td><strong>0.198</strong></td>
</tr>
<tr>
<td>ECO_EFF $\rightarrow$ CAPABILITY</td>
<td>---</td>
<td><strong>0.524</strong></td>
<td><strong>0.525</strong></td>
<td><strong>0.531</strong></td>
</tr>
<tr>
<td>ECO_EFF $\rightarrow$ ECON_PERF</td>
<td>0.064</td>
<td>0.043</td>
<td>0.043</td>
<td>0.035</td>
</tr>
<tr>
<td>CAPABILITY $\rightarrow$ ECON_PERF</td>
<td>0.145</td>
<td>0.154</td>
<td>0.153</td>
<td>0.162</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Fit</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p$-value</th>
<th>$\chi^2/df$</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
<th>$\chi^2$ difference ($df$)</th>
<th>$\chi^2$ difference ($df$)</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>110.46</td>
<td>48</td>
<td>&lt;0.001</td>
<td>2.301</td>
<td>0.077</td>
<td>0.959</td>
<td>0.975</td>
<td>55.335 (1)</td>
<td>55.335 (1)</td>
<td>&gt;0.001</td>
</tr>
<tr>
<td></td>
<td>55.125</td>
<td>47</td>
<td>0.194</td>
<td>1.173</td>
<td>0.028</td>
<td>0.995</td>
<td>0.997</td>
<td>8.067 (3)</td>
<td>8.067 (3)</td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td>63.192</td>
<td>50</td>
<td>0.100</td>
<td>1.264</td>
<td>0.035</td>
<td>0.992</td>
<td>0.995</td>
<td>2.876 (5)</td>
<td>2.876 (5)</td>
<td>0.719</td>
</tr>
<tr>
<td></td>
<td>66.068</td>
<td>55</td>
<td>0.146</td>
<td>1.201</td>
<td>0.030</td>
<td>0.994</td>
<td>0.996</td>
<td>0.091 (1)</td>
<td>0.091 (1)</td>
<td>0.763</td>
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<tr>
<td></td>
<td>66.159</td>
<td>56</td>
<td>0.166</td>
<td>1.181</td>
<td>0.029</td>
<td>0.994</td>
<td>0.996</td>
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</table>

(*, **, ***: Significant at *p*-value <0.01, 0.05, 0.10)
Table 17: Estimated correlations for expanded structural model

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
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<tr>
<td>ECS</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEO</td>
<td>0.829***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BELIEF</td>
<td>0.862***</td>
<td>0.859***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOUND</td>
<td>0.582***</td>
<td>0.716***</td>
<td>0.766***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIAG</td>
<td>0.645***</td>
<td>0.779***</td>
<td>0.669***</td>
<td>0.558***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTERACT</td>
<td>0.688***</td>
<td>0.718***</td>
<td>0.662***</td>
<td>0.511***</td>
<td>0.798***</td>
<td>1</td>
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<tr>
<td>ENABLE</td>
<td>0.694***</td>
<td>0.838***</td>
<td>0.720***</td>
<td>0.600***</td>
<td>0.652***</td>
<td>0.601***</td>
<td>1</td>
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<td></td>
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</tr>
<tr>
<td>ECO_EFF</td>
<td>0.361***</td>
<td>0.372***</td>
<td>0.312***</td>
<td>0.161**</td>
<td>0.417***</td>
<td>0.527***</td>
<td>0.362***</td>
<td>1</td>
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</tr>
<tr>
<td>CAPABILITY</td>
<td>0.597***</td>
<td>0.631***</td>
<td>0.619***</td>
<td>0.442***</td>
<td>0.559***</td>
<td>0.605***</td>
<td>0.614***</td>
<td>0.701***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ECON_PERF</td>
<td>0.113*</td>
<td>0.119*</td>
<td>0.117*</td>
<td>0.084</td>
<td>0.106</td>
<td>0.114*</td>
<td>0.116*</td>
<td>0.133**</td>
<td>0.189***</td>
<td>1</td>
</tr>
</tbody>
</table>

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)
Model Trimming and Building

Given the model generating stage is exploratory in nature, *ex post* analysis of the conceptual model involved re-specification by both adding (building) and removing (trimming) paths among constructs to improve model fit.

The first alternative model (Alt 1), specified in Table 16, draws on modification indices supplied in AMOS to build the model by adding a path from ECO_EFF to CAPABILITY. Contrary to model trimming, a significant $\chi^2$ difference test indicates that the alternative model is better-fitting than the base model (Kline 2010), and the re-specified model demonstrates substantially improved fit across all fit statistics.

Once opportunities for model building are exhausted, model trimming is undertaken to improve model parsimony. The first trimmed model (Trimmed 1), outlined in Table 16, trims insignificant paths (at the 0.05 level) between environmental strategic elements and the eco-control systems. Specifically, paths from ECS to DIAG and from IEO to INTERACT, respectively, are removed from the model. Trimming the two paths results in an insignificant $\chi^2$ difference test at the 0.05 level ($\chi^2$ difference $2.989$, $df=5$, $p=0.235$), suggesting the model has not been overly trimmed.

Further assessment of path estimates reveals an unexpected negative path coefficient between ECS and ENABLE (significant at the 0.10 level), compared with a positive value in the correlation matrix (see Table 17). Accordingly, ECS appears to act as a negative suppressant (Tabachnick & Fidell 2007) on the relation between IEO and ENABLE. 41 Maassen and Bakker (2001) suggest that researchers should not

---

41 By removing the path between ECS and ENABLE, the standardised path coefficient between IEO and ENABLE decreases to 0.84. Whereas, reinstating the path between ECS and ENABLE, yields a standardised coefficient of -0.23, and improves the prediction of IEO on ENABLE to 1.05. The statistical inferences of the relation between IEO and ENABLE remain qualitatively unchanged, with both scenarios significant at the 0.01 level.
necessarily conclude that the different-from-expected direct effect is actually operating, and that, if a suppressor variable and other independent variable are strongly related, then one or both of the paths can be dropped for reasons of model parsimony. Given the estimated correlation between $ECS$ and $IEO$ is 0.84, the path from $ECS$ to $ENABLE$ may be considered a spurious relationship, and is subsequently eliminated from the model.

The second trimmed model (Trimmed 2) presented in Table 16, removes insignificant paths between the eco-control systems to the dimensions of environmental performance. Thus, paths from $BELIEF$ and $DIAG$ to $ECO\_EFF$, respectively, as well as from $BOUND$, $DIAG$ and $INTERACT$ to $CAPABILITY$, are eliminated from the model. The final model (Trimmed 3) trims an insignificant path from $ECO\_EFF$ to $ECON\_PERF$. The $\chi^2$ difference test is insignificant for all trimmed models, which indicates that the models have not been overly trimmed (Kline 2010).

The final expanded structural model in Table 16 (i.e., Trimmed 3), demonstrates excellent overall model fit with an insignificant $\chi^2$ ($\chi^2=66.159$, $df=56$, $BSp=0.603$), a normed-$\chi^2=1.181$, a $CFI=0.996$, a $TLI=0.994$, and $RMSEA=0.029$ ($90\% CI 0.000-0.053$, $p$-value=0.920). A model diagram depicting significant paths is provided in Figure 10, with a summary of both standardised and un-standardised parameter estimates, along with SMC for endogenous variables provided in Table 18.

The SMC for endogenous variables in the expanded model (Table 18) are, in general, consistent with the original model specification, and compare favourably with similar studies (e.g., Widener 2007; Chapman & Kihn 2009; Henri & Journeault 2010; Pondeville et al. 2013).
Chapter 5: Survey Results and Analysis

Figure 10: Expanded structural model diagram depicting significant paths

Table 18: Parameter estimates for expanded structural model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Path Coef. (std.)</th>
<th>Var. Extracted (SMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECS</td>
<td>BELIEF</td>
<td>0.461</td>
<td>0.089</td>
<td>5.176</td>
<td>***</td>
<td>0.479</td>
<td>0.810</td>
</tr>
<tr>
<td>ECS</td>
<td>BOUND</td>
<td>-0.430</td>
<td>0.150</td>
<td>-2.860</td>
<td>0.004</td>
<td>-0.431</td>
<td>0.641</td>
</tr>
<tr>
<td>ECS</td>
<td>INTERACT</td>
<td>0.328</td>
<td>0.071</td>
<td>4.623</td>
<td>***</td>
<td>0.297</td>
<td>0.688</td>
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<tr>
<td>IEO</td>
<td>BELIEF</td>
<td>0.470</td>
<td>0.094</td>
<td>5.009</td>
<td>***</td>
<td>0.462</td>
<td></td>
</tr>
<tr>
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<tr>
<td>IEO</td>
<td>DIAG</td>
<td>0.985</td>
<td>0.064</td>
<td>15.274</td>
<td>***</td>
<td>0.779</td>
<td>0.606</td>
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<tr>
<td>IEO</td>
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<td>16.956</td>
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<td>0.838</td>
<td>0.701</td>
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<td>BELIEF</td>
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<td>0.178</td>
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<tr>
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<td>0.057</td>
<td>9.761</td>
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<td>0.606</td>
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</tr>
<tr>
<td>BOUND</td>
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<td>-0.213</td>
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<tr>
<td>INTERACT</td>
<td>ECO_EFF</td>
<td>0.483</td>
<td>0.079</td>
<td>6.116</td>
<td>***</td>
<td>0.534</td>
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</tr>
<tr>
<td>ENABLE</td>
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<td>0.083</td>
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</tr>
<tr>
<td>BELIEF</td>
<td>CAPABILITY</td>
<td>0.265</td>
<td>0.071</td>
<td>3.743</td>
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<td>0.311</td>
<td>0.687</td>
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<tr>
<td>ENABLE</td>
<td>CAPABILITY</td>
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<tr>
<td>ECO_EFF</td>
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<td>0.048</td>
<td>9.065</td>
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<td>0.532</td>
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<tr>
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<td>0.088</td>
<td>2.539</td>
<td>0.011</td>
<td>0.189</td>
<td>0.036</td>
</tr>
</tbody>
</table>

(***, **, *: Significant at p-value <0.01, 0.05, 0.10)
Discussion of Expanded Structural Model Findings

Although the trimmed conceptual model presented in Figure 8 and Table 13 is well-fitting, the multi-dimensional nature of the environmental strategy and environmental performance constructs suggest that their associations with other variables in the model may be susceptible to alternative explanations (Little et al. 2002). An expanded structural model is used to assess the validity of the structural relations presented during the hypothesis testing stage, and also to explore the finer relations existing between all of the dimensions identified in the sample data.

Environmental Strategy and Eco-control

For the purposes of hypothesis testing, environmental strategy was represented as a higher-order construct with two latent dimensions: environmental corporate strategy (ECS) and internal environmental orientation (IEO). Results of the hypothesis testing revealed that firms pursuing proactive environmental strategies place higher emphasis on each of the four levers of eco-control, excluding boundary systems, as well as adopting a more enabling stance towards eco-control. However, exploring the dimensionality of the environmental strategy construct has provided a deeper insight into underlying structural relations.

ECS and Eco-control

ECS concerns the extent which environmental strategy has been integrated into the strategic planning processes of senior management. As shown in Table 18, ECS has a significant positive association with the emphasis placed on a beliefs system and the interactive use of eco-controls (p<0.01). This finding is consistent with the importance of beliefs systems and the interactive use of eco-controls in particular, in
Chapter 5: Survey Results and Analysis

the pursuit of continuous improvement and strategic renewal, as well as higher levels of senior management involvement in environmental management activities.

Further, a significant negative association is observed between ECS and the emphasis placed on a boundary system (p<0.01). This suggests that an increase in senior management’s perception of environmental management as a strategic issue is associated with a decrease in the emphasis of a boundary system to describe environmental risks to be avoided and set limits around environmental plans and activities.

Finally, ECS is not associated with either the emphasis placed on the diagnostic use of eco-controls, or with an enabling bureaucratic stance towards the implementation of eco-controls.

*IEO and Eco-control*

IEO is characterised by the overall importance placed on preserving the natural environment and the use of formalised processes to diffuse such values company-wide. The extent to which firms exhibit higher IEO is strongly and positively associated with the emphasis placed on beliefs and boundary systems, the diagnostic use of eco-controls, and an enabling stance towards eco-control (p<0.01), but is not associated with the interactive use of eco-controls. This finding is consistent with prior environmental management field studies which have observed ‘incongruities’ between firms’ purported subscription to environmentally-responsible principles, and the operation (or existence) of internal environmental management systems throughout the organisation (e.g., Masanet-Llodra 2006; Durden 2008). Accordingly, it is not necessarily the process of environmental strategic planning alone which influences the use of eco-controls by employees for decision-making purposes.
Rather, the existence of supporting structures to operationalise and diffuse environmental strategy throughout the organisation contributes to the different configurations and uses of eco-controls by operational managers and employees more generally.

Further, consistent with the conceptual model, several of the levers of eco-control are inter-dependent and complementary. Although countervailing positive and negative associations are observed with the strategic elements, emphasis on the environmental boundary system is positively associated with the emphasis placed on a beliefs system (p<0.01). A positive and significant association (p<0.01) is also observed between the emphases placed on the diagnostic and interactive uses of eco-controls.

The Use of Eco-controls and Environmental Performance

The findings presented in Table 18 concerning the structural relations between aspects of the eco-control systems and performance outcomes are consistent with Henri and Journeault (2010), whereby a limited mediating effect of environmental performance on the link between eco-controls and economic performance is observed. Further, this study extends the conceptualisation of environmental performance adopted by Sharma and Vredenburg (1998), and later Henri and Journeault (2010), by distinguishing between a firm’s eco-efficient outcomes (Porter & Van der Linde 1995a), and the unique organisational capabilities and competitive benefits associated with the resource-based view of the firm (Barney 1991; Hart 1995).

Eco-control and Eco-efficient Outcomes

Improved eco-efficiency is primarily associated with the emphasis placed on the interactive use of eco-controls, with a significant direct effect observed (p<0.01). An
additional positive, indirect effect of the diagnostic use of eco-controls on eco-efficiency, through the interactive use of eco-controls, is also observed (p<0.01). These findings suggest that identification of opportunities for reducing costs, as well as improving efficiency and productivity, may occur where eco-controls are used to enable discussion in meetings between superiors, subordinates and peers. Further, the diagnostic use of controls, although not directly affecting overall resource productivity, may further facilitate such discussions when used to support the information management process of eco-control. Thus, the findings of this study are consistent with Henri (2006) and Widener (2007) in observing superior performance when eco-controls are used both diagnostically and interactively.

Conversely, the emphasis placed on an environmental boundary system has a negative relation with eco-efficiency (p<0.05). Thus, the emphasis of a boundary system to delineate minimum standards and set limits on the behaviour of organisational members may hinder performance by constraining employees’ autonomy and decision-making activities. This may be contrasted with the weak, positive association observed between improved eco-efficiency and a more enabling stance towards eco-control (p<0.10). Here, the findings suggest that empowering employees by providing them with the tools to better perform their task has a moderate, positive influence on overall resource productivity.

Eco-control and Organisational Capabilities

The development of unique organisational capabilities and competitive benefits are most notably influenced by the emphasis placed on an environmental beliefs system (p<0.01) and an enabling stance towards eco-control (p<0.05). Thus, the motivational and inspirational effects of beliefs systems, along with the empowerment of employees associated with an enabling stance towards eco-control,
appear conducive to the high levels of employee involvement required to develop capabilities for innovation and organisation-wide higher-order learning, as well as fostering employee morale and stakeholder relationships.

**Environmental and Economic Performance**

Finally, consistent with the original conceptual model, a positive link is also observed between environmental and economic performance. However, a direct relation is only observed between the organisational capabilities measure and economic performance ($p=0.011$). While no direct link is observed between eco-efficiency and economic performance, the results also suggest that focusing organisational attention towards improving eco-efficiency, in turn, contributes to the development of unique organisational capabilities ($p<0.01$) and, therefore, indirectly influences economic performance.

**Summary of Expanded Findings**

Relative to the main conceptual model, the expanded analysis provides a number of additional insights into the structural relations between the underlying dimensions of key theoretical constructs. First, differentiating between the integration of environmental concerns into strategic planning processes ($ECS$), and the diffusion of such concerns throughout the organisation ($IEO$) has implications for the emphasis placed on eco-control systems. For example, though each strategic dimension has a comparable, positive influence on the emphasis placed on an environmental beliefs system, counteracting positive and negative associations are observed between the emphasis on a boundary system, and $IEO$ and $ECS$, respectively. This contrasts with the findings from the conceptual model, where no significant relation was observed between the higher-order environmental strategy construct ($ENV\_STGY$) and the emphasis on an environmental boundary system.
Further, the expanded findings suggest that the interactive use of eco-controls is primarily influenced by the integration of environmental concerns into strategic planning processes, and thereby contributes to opportunity-seeking behaviour and strategic renewal. In comparison, the emphasis placed on the diagnostic use and enabling stance towards eco-controls is driven more by the diffusion of environmental values and existing strategic priorities throughout the organisation.

The expanded findings also suggest that the emphasis placed on the diagnostic and interactive uses of eco-controls primarily contributes to improvements in eco-efficiency, and that the emphasis on a boundary system may hinder eco-efficient performance outcomes. However, a firm’s ability to realise environmental performance benefits beyond eco-efficiency may rely more on how eco-control systems are used by operational managers and employees (as opposed to senior management) to support the firm’s environmental management activities. Specifically, the development of unique organisational capabilities and competitive benefits appears primarily associated with the emphasis placed on an environmental beliefs system and an enabling approach to eco-control.

Finally, the model-generating process provides deeper insight into the relationship between environmental and economic performance. While the significant positive relationship observed during formal testing of the conceptual model is maintained, a direct relation is only observed between the organisational capabilities’ measure and economic performance. Thus, consistent with the resource-based view of the firm (Wernerfelt 1984; Barney 1991; Grant 1991), the findings suggest that the ability to transform a short-run competitive advantage (such as a cost advantage derived from adopting eco-efficient practices) into a sustained competitive advantage, may depend
on the firm’s ability to consolidate collective environmental learning into unique organisational capabilities.

5.6 Chapter Summary

The results of the tests of eleven hypotheses using SEM have been reported in this chapter. To summarise these quantitative findings, eight hypotheses were supported, one was found to have marginal support, and two were rejected. All hypotheses relating to the positive effect of environmental strategy on elements of the eco-control system were supported, with the exception of the emphasis placed on an environmental boundary system.

The emphasis placed on an environmental beliefs system, the interactive use of eco-controls and an enabling stance on eco-control were found to significantly influence environmental performance. The diagnostic use of eco-controls does not directly influence environmental performance, but a positive and significant indirect effect through the interactive use of controls is observed. A further marginal, negative relation is found between the emphasis placed on an environmental boundary system and environmental performance. Finally, a positive link between environmental and economic performance is observed.

In addition to the hypothesis tests, the results of the SEM analysis indicated several inter-dependent and complementary relations between the LOC variables. Consistent in these findings were the significant and positive relations between the emphasis placed on environmental beliefs and boundary systems, and between the emphasis on the diagnostic and interactive use of eco-controls, respectively.
Further, a model-generating process was used to assess the validity of the structural relations presented during the hypothesis testing stage, and also to explore the finer relations existing between the underlying dimensions represented in the sample data. Specifically, the expanded structural model provides additional insights into the sub-dimensions of environmental strategy and environmental performance, respectively, in their functions as antecedents and outcomes of firms’ uses of eco-controls.

The following chapter seeks to complement the empirical results by providing a more holistic and richer contextual understanding of the quantitative study. This was achieved through undertaking semi-structured interviews with selected respondents in the Australian forestry industry. An analysis of the findings from the case studies, and their contribution to the survey study results, follow in Chapter 6.
Chapter 6: Case Studies

‘Companies and organisations are people, they’re made of people, and those people have significant influence on the culture of the company.’

(Softwood External Relations Manager)

6.1 Introduction

This chapter presents complementary evidence on the organisational dynamics relating to environmental strategy, managerial controls and related outcomes based on a case analysis of two firms in the Australian forestry industry. The study undertakes a qualitative, practice-based approach (Ahrens & Chapman 2006) and is guided by the institutional perspective propounded by Rose and Miller (1992) and Arena et al. (2010). Data collection involves in-depth interviews with a total of eleven (11) managers and environmental specialists from the two forestry firms, with the case evidence framed around three key dimensions: i) environmental strategic rationalities; ii) environmental experts and champions; and iii) eco-control technologies. The focal research objective of these case studies is to investigate how key organisational members come together to make sense of the strategic rationalities which justify environmental management activities, and how their perceptions and attitudes affect the selection and use of eco-controls for environmental performance management. In doing so, the study aims to provide further insights into the earlier survey-based study (as discussed in the preceding three chapters) which was designed to test the main conceptual model on the associations between proactive
Chapter 6: Case Studies

strategy and use of management controls, and their subsequent impact on environmental and economic performance.

The remainder of the chapter is structured as follows: In the next section (i.e., Section 6.2), the study’s research questions and justification for the adoption of a qualitative approach are provided. In Section 6.3, the study’s conceptual framework which is based on the institutional perspective is discussed. Section 6.4 outlines the case study research method adopted, including the research site selection criteria, data collection procedures and the sources of evidence. Section 6.5 provides background information on the two case firms, including a description of the forestry business environment and relevant forestry industry practices and norms. The final two sections contain comparative analysis of the factors influencing: i) the strategic rationalities; ii) environmental experts and champions; and iii) eco-control technologies between the two case firms and discussion of the results (Section 6.6), followed by the conclusions of the study (Section 6.7).

6.2 Research Questions and Justification for a Qualitative Study

Prior studies on environmental management have predominantly focused on the impact of factors external to the firm, such as regulatory forces, stakeholder pressures and general public concerns which may have an effect on organisational processes and outcomes (e.g., Banerjee et al. 2003; Buysse & Verbeke 2003; Pondeville et al. 2013; Rodrigue et al. 2013). For example, several studies have identified how regulatory requirements and voluntary standards, such as EMAS and ISO 14001, provide the technical knowledge and tools for organisations to undertake more formalised approaches to environmental control (Melnyk et al. 2003; Masanet-Llodra 2006; Perez et al. 2007; Esther 2011). Other studies have examined how
managerial perceptions and attitudes towards stakeholder demands and needs affect firms’ environmental strategies (Henriques & Sadorsky 1999; Buysse & Verbeke 2003; Sharma & Henriques 2005), including the way managers use internal environmental performance indicators (EPI) (Rodrigue et al. 2013). However, Boiral (2007) and Perez et al. (2007) argue that the establishment of formal structures alone may not necessarily be sufficient for embedding environmental concerns into organisational routines and for improving environmental performance. They contend that human or employee sense-making and buy-in are just as critical for such outcomes.

A review of the mainstream MCS literature likewise suggests that the preference and use of management controls involves a rather complex interaction of people, structure and processes (e.g., Dent 1991; Brown & Eisenhardt 1997; Chenhall & Langfield-Smith 1998). In a more recent study, Arena et al. (2010) proposed a three-component framework comprised of rationalities, experts, and technologies, which was adapted from the institutional perspective propounded by Rose and Miller (1992) and Lounsbury (2008) to explain differences in organisational practices. More specifically, Arena et al. (2010) argue that the heterogeneity of organisational activities across different firms is a function of the meanings associated with the activities and the strategic intent of the firm. These strategic rationalities are shaped by people who come to support and lead organisational activities, and the controls adopted to support such dynamics. The authors apply their three-component model within the context of enterprise risk management and provide evidence of the dynamics leading to different conceptions and practice of ERM using case-based evidence from three firms. Their findings indicate that uncertainties faced by a firm are rationalised as risks that can be controlled and managed through various
discursive and visual domains, leading to risk rationalities (i.e., the idealised schemata for the sense-making of risks). Further, such rationalities are also found to be shaped by a variety of organisational members (often experts and champions within the field) as well as technologies, namely, the many and complex set of practices and procedures involving risk management, leading to beliefs that risks are open to control and need to be urgently addressed. It is also contended that such a perspective provides a more holistic framework and richer insights into the dynamics among people, structure and processes.

Given the potential for an institutional perspective to provide a more comprehensive understanding of the factors affecting environmental strategic management, including the roles played by people (organisational members/experts) and structures and processes (including management or eco-controls), such an approach is seen as appropriate and relevant for addressing the research questions of this study. In fact, Arjaliès and Mundy (2013, p. 298) specifically call for more comprehensive and holistic approaches to studying the organisational dynamics that affect managers’ interpretations and conceptions of the different aspects of environmental strategy and their subsequent implications for the use of eco-controls.

Following this train of thought, the overarching research objective of the present study is to gain a comprehensive understanding of firm-level environmental management practices and outcomes by examining the dynamics involving environmental strategic imperatives and the role of key organisational members, while taking into consideration both the internal and external contingencies faced by the firm including the design of its eco-controls. More specifically, the three main research questions addressed in this study are as follows:
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i) How do relevant external factors (e.g., industry-related norms and regulatory imperatives) and internal variables (e.g., human and financial resources) of organisations influence the environmental strategic rationalities of firms?

ii) How do organisational members who take on the role of environmental experts and champions affect the strategic rationalities of environmental management and the choice of eco-controls?

iii) How do eco-control systems, including formal and informal governance mechanisms, either aid or hinder organisational members from achieving desirable environmental and economic performance?

In answering the above questions, this study adopts a qualitative approach based on a comparative case analysis. Such an approach has been advocated by researchers such as Gray (2002), Parker (2005), and Adams and Larringa-Gonzalez (2007). Parker (2005, p. 856), for instance, argues that ‘there would appear to be ample room for further applications of direct researcher engagement in the field, via qualitative research and inductive theorising’. In fact, Parker (2005) specifically identifies the ‘environmental management systems and management accounting interface’ and ‘environmental strategy and performance evaluation’ as two areas where further case-based assessment is needed for better understanding of the dynamics between strategy, processes and outcomes.

In the next section, the conceptual background of the institutional perspective, as adopted by prior researchers in studying strategic management accounting practices, is provided.
6.3 An Institutional Perspective

An institutional perspective proposes that many aspects of an organisation’s formal structure, policies and procedures serve to demonstrate conformity with institutionalised norms and rules, in order to maintain their legitimacy and ensure their continued support (Meyer & Rowan 1977; Covaleski & Dirsmith 1988). Such normative pressures, which may arise from external sources such as regulators or within the organisation itself, at times lead the organisation to be guided by legitimated responses (such as adopting standard operating procedures and professional certification) which often have the effect of directing attention away from underlying task performance (Zucker 1987). Within this perspective, management accounting practices may be viewed as ‘institutionalised routines which enable organisations to reproduce and legitimate behaviour, and to achieve organisational cohesion’ (Scapens 1994, p. 301).

Proponents of an institutional approach for studying strategic management accounting (e.g., Lounsbury 2008; Modell 2012) argue that, traditionally, a rather narrow conceptualisation of institutional isomorphism has been adopted to explain the development of accounting practices within organisations. In particular, it is contended that the main focus has been on external pressures (i.e., DiMaggio & Powell 1983; Abernethy & Chua 1996) with limited attention paid to human interfaces. For example, it is argued:

_A more complete approach to [explaining] practice that accounts for institutional processes requires attention to broader cultural frameworks that are created and changed by field-level actors, as well as the lower-level_
activities of organisations and other actors that articulate within those frameworks (Lounsbury 2008, p. 356).

From this perspective, qualitative inquiries which seek to locate strategic management techniques within their social and organisational context have significant potential to provide an account of ‘how such techniques are implicated in shaping management control practices and the very meaning of the notion of strategy’ (Modell 2012, p. 291). Furthermore, insights from this perspective are intended to complement the resource-based-view arguments presented in the preceding chapters. Thus, a shift towards a more micro-level perspective of environmental management practices seeks to highlight the socially-complex nature of environmental strategy implementation, by recognising that ‘managerial activity and those involved in the activity of organisations – whether managers or not – are essential to the actualisation of potential value’ (Johnson, Melin & Whittington 2003, p. 7).

Figure 11: The organisational dynamics of environmental management
This study draws on the institutional framework adapted by Arena et al. (2010) where the data analysis is framed around three elements in relation to environmental management: i) environmental strategic rationalities; ii) environmental experts or champions; and iii) eco-control technologies. As outlined in Figure 11, the three dimensions are theorised to ‘evolve continuously through circular interactions’ (Arena et al. 2010, p. 671), as key organisational members interpret and shape the institutionalised meanings of environmental management as an organisational activity, and, in turn, affect the type of management or eco-controls utilised and the strategic rationality for such practices.

Rationalities, in general, refer to the ‘domain for the formulation and justification of idealised schemata for representing reality, analysing it and rectifying it’ (Rose & Miller 1992, p. 178). For the purposes of this study, environmental strategic rationalities denote the basis of why a particular environmental strategy is chosen, or has evolved, within a particular organisation and within a given period of time. Identification of environmental experts and champions follows the actors (Latour 1987) and organisational roles involved (to different extents) in conceptualising and controlling environmental management activities (Arena 2010). Environmental experts are the internal and external sense-makers (Basu & Palazzo 2008) who seek to understand environmental risks and opportunities which stem from operational activities. Champions act as key enablers of environmental projects, through their use of influence behaviour (such as inspirational appeals, consultation and rational persuasion) to gain intra-organisational commitment (Gattiker & Carter 2010).

Finally, adapted from Arena et al. (2010, p. 663), the definition of eco-control technologies for this study refers to ‘the complex set of practices, procedures and instruments put in place by organisations to carry out environmental strategies and
plans’. The analysis will also focus on the institutionalised beliefs (i.e., the values, ideas, laws, rules and regulations) promulgated by the formal, rationalised eco-control systems (Abernethy & Chua 1996). In this respect, this study assesses the role of eco-controls as embedding mechanisms (Perez et al. 2007), and the extent to which eco-controls are used ‘to distribute shared meanings or mediate between diverse interests and interpretations’ of environmental management practices (Cuganesan, Dunford & Palmer 2012, p. 246).

The following section describes the research method including case selection, data collection and analysis procedures.

6.4 Research Setting and Design

6.4.1 Case Analysis Design

The case study method is considered the preferred strategy when a ‘how’ or ‘why’ question is posed, with the researcher having little control over events, and when the focus is on a contemporary phenomenon in a real-life context (Yin 2003). Thus, case studies offer the possibility of a richer understanding of environmental management in practice based on their contextual setting - both in terms of the formal techniques, procedures and systems in place, and the way in which they are used by managers (Ryan, Scapens & Theobald 2002). Guided by recent case research in the area (Masanet-Llodra 2006; Boiral 2007; Perez et al. 2007; Rodrigue et al. 2013), a comparative case approach is undertaken for this study with data collected from two organisations operating in the Australian forestry industry. According to Yin (2003, p. 61), comparative case studies are preferred over a single case study as it provides more compelling evidence, and the ‘analytic conclusions independently arising from
two cases, as with two experiments, will be more powerful than those coming from a single case (or single experiment) alone’.

6.4.2 Case Selection

In this study, two companies in the Australian forestry industry were chosen for the comparative case analysis based on the following criteria and rationale. First, the case firms needed to be in an environmentally-sensitive industry. This was seen to be critical as the environmental activities and outcomes of such firms are likely to have significant implications for both the environment as well as the performance of the firm itself. In particular, such industries tend to face higher environmental regulation by government, as well as the likelihood of significant scrutiny and pressure from external stakeholders to review and adopt effective environmental practices (Sharma & Vredenburg 1998; Rodrigue et al. 2013). Therefore, choosing case firms in such industries is likely to entail a richer variety of formalised environmental management strategies and practices.

Second, firms needed to be in the Australian forestry industry because, among environmentally-sensitive industries, the forestry industry is argued to have a crucial role in global sustainable development (Li & Toppinen 2011). Further, the forest industry is seen to have a unique renewable resource base that potentially allows individual firms to develop and adopt more advanced environmental management practices (Sharma & Henriques 2005). Additionally, in selecting the Australian forestry industry, the study responds to calls for further research into ‘environmental accountability in industry sectors beyond mining, chemicals and manufacturing (and including small and medium-sized enterprise)’ (Parker 2005, p. 857).
Third, the decision to choose two companies from the same industry was grounded on the notion that comparative case studies of organisations in the same industrial context facilitate comparison through replication of results, either literally (when similar responses emerge) or theoretically (when contrary results emerge for predictable reasons) (Eisenhardt 1989; Sharma & Vredenburg 1998; Yin 2003). In other words, by examining two firms in the same industry (i.e., forestry, in this study) a better design is available for comparing the impact of industry pressures and changes on internal management practices.

In terms of the sampling approach, a judgemental as opposed to random sampling method is adopted in order to focus the analysis on theoretically useful cases (Eisenhardt 1989), where the presence of more developed environmental management systems was seen as a key selection criterion. More specifically, a case firm needed to meet the minimum criterion of having a formalised environmental management system, in contrast to being just a ‘good intentions’ forestry firm with no formalised environmental plans and procedures (cf. Masanet-Llodra 2006; Durden 2008; Rodrigue et al. 2013).

In judging and selecting appropriate case firms (i.e., those that are likely to have a formalised approach towards managing environmental strategy), the existence of Australian forestry management certification was seen as critical.42 This is similar to the approach undertaken by prior studies where case selection was based on voluntary environmental management system standards such as EMAS and ISO 14001 (with expectations for variances to still exist in the more specific

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42 Forest management certification is a market-based, voluntary forest management tool designed to recognise and promote environmentally-responsible forestry and the sustainable management of forest resources. The use of forest management certification seeks to assure consumers that the certified timber products they purchase have been produced in a socially, ecologically and economically sustainable manner. Both native forests and plantations can typically be certified, subject to restrictions required by the relevant standard.
environmental management practices across the sample firms) (Masanet-Llodra 2006; Boiral 2007; Perez et al. 2007). In Australia, forest certification is assessed against the relevant standard by an independent party or auditor. Further, forest managers and owners can seek certification under either the Australian Forest Certification Scheme (AFS), which is governed by the Programme for the Endorsement of Forest Certification (PEFC), or the Forest Stewardship Council (FSC). Both are internationally recognised, not-for-profit forest certification bodies, which provide recognition for regional and national standards and the labelling of forest products as sustainably managed.

Based on the above criteria, two distinct firms were chosen for this study. For reasons of confidentiality, pseudonyms are used (Hardwood and Softwood) in place of the companies’ real names. In the next section, an overview of the background to each firm is provided.

6.4.3 Background Information of Case Study Organisations

Hardwood is a wholly-owned subsidiary of an Australian publicly-listed company, which provides plantation establishment and management services on behalf of both private and retail investors. Hardwood employs more than 150 employees in its central and regional offices, and manages over 170,000 hectares of pulp-grade hardwood and high-value timber plantations in several Australian states. At the time of enquiry, Hardwood held over $650 million in assets, which, beyond its primary

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43 The AFS uses the Australian Forestry Standard [AS 4708] as the relevant standard for certifying forest management. The FSC currently uses interim, regionally-adapted forest management standards in Australia, and has committed to the development of a national FSC standard for Australia.
44 www.forestrystandard.org.au
45 www.pefc.org
46 www.fsc.org
plantation assets, also extended to a stake in several port infrastructure joint ventures and a significant shareholding in another listed forestry company.

*Softwood* is a Victorian-based, private timber plantation company, with over $800 million in assets and 240,000 hectares of land under management, including 50,000 hectares of native vegetation for conservation. *Softwood* supplies logs for sawn timber, paper manufacturing, panel board and treated round-wood producers in Australia and overseas. The company is governed by an international forestry consortium, and is jointly owned by Australian and US superannuation and infrastructure investment funds. The company consists of a central headquarters based in the state capital, with operational management divided among three geographical regions. *Softwood* employs around 135 full-time staff in its central and regional offices, with the company’s harvesting, haulage and silvicultural contractors indirectly employing a further 450 people.

At the time of investigation in mid-2011, *Hardwood* and *Softwood* each held approximately a 5% market share (Allday 2011) and actively promoted their environmental management credentials through certification to both the FSC and AFS forest management standards. In addition to maintaining their dual forest management certifications, both companies refer to the ISO 14001 framework in their formal documents. *Hardwood* also maintains certification against the ISO 14001 standard, while *Softwood* has elected not to do so. However, senior management at *Softwood* still regard having formalised ISO-type systems, which propose a ‘Plan-Do-Check-Review’ approach to environmental management practices, as being highly beneficial for improving environmental performance outcomes.
6.4.4 Data Collection and Sources of Evidence

Multiple sources of evidence were collected from each case organisation (Yin 2003). The main source of data for the study involves in-depth interviews with managers and environmental specialists from the two forestry firms. Corporate websites and several company documents from the two case organisations were also examined to corroborate evidence obtained during the interviews, including environmental policy documents, operational procedure manuals and brochures relating to stewardship projects. Further, externally-generated documentation, such as environmental certification audit reports and newspaper articles, were also gathered to provide evidence of each firm’s historical environmental activities and performance.

<table>
<thead>
<tr>
<th>Person Interviewed</th>
<th>Years in Current Position (Company)</th>
<th>Interview Duration (min)</th>
<th>Follow-up Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardwood</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Manager</td>
<td>3 (7)</td>
<td>50 min</td>
<td>X</td>
</tr>
<tr>
<td>Health, Safety &amp; Environment (HSE) Co-ordinator</td>
<td>5 (7)</td>
<td>45 min</td>
<td>X</td>
</tr>
<tr>
<td>Harvest Planning Manager</td>
<td>2.5 (5.5)</td>
<td>65 min</td>
<td></td>
</tr>
<tr>
<td>Environmental Officer (District Forester A)</td>
<td>2 (6)</td>
<td>30 min</td>
<td></td>
</tr>
<tr>
<td>District Forester B</td>
<td>0.5 (3)</td>
<td>30 min</td>
<td></td>
</tr>
<tr>
<td><strong>Softwood</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Manager, Stewardship and Risk</td>
<td>10 (18)</td>
<td>65 min</td>
<td>X</td>
</tr>
<tr>
<td>Manager, Environmental Management Systems</td>
<td>13 (13)</td>
<td>40 min</td>
<td>X</td>
</tr>
<tr>
<td>External Relations Manager</td>
<td>1.5 (10)</td>
<td>45 min</td>
<td></td>
</tr>
<tr>
<td>Management Accountant - Manager</td>
<td>5 (10)</td>
<td>30 min</td>
<td></td>
</tr>
<tr>
<td>Plantations Operations Manager</td>
<td>2 (20)</td>
<td>40 min</td>
<td></td>
</tr>
<tr>
<td>Stewardship Forester</td>
<td>7 (37)</td>
<td>40 min</td>
<td>X</td>
</tr>
</tbody>
</table>

Letters outlining the purpose of the study and requesting participation were initially sent to environmental managers, and a snowball sampling technique (Atkinson & Flint 2004) was thereon used to take advantage of an identified respondent’s networks to identify other suitable candidates within the organisation. Where
possible, the selected interviewees included the environmental manager (or equivalent) and management accountants, with the aim of identifying possible connections and interactions between the accounting and environmental management functions (cf. Perez et al. 2007). Beyond this, the interviews sought insights from individuals across different levels of the organisation hierarchy. Hence, interviews were conducted with senior executives who reported directly to the CEO, regional managers in charge of district offices, operational managers and ‘front-line’ forestry personnel. A summary of the interview participants is provided in Table 19.

The interviews were conducted over multiple site visits during a six-month period between April and September 2011. An interview guide was adopted to ensure consistency of coverage across interview participants. However, the interviews were conducted with a conversational and flexible approach, allowing for the exploration of new themes and opinions as they arose. All interviews were between 30 and 65 minutes in duration, and interviewees were assured of confidentiality prior to commencing so they might more readily discuss sensitive issues such as environmental matters. Each interview was digitally recorded and transcribed, and the transcripts forwarded to the respective interview participants to check for accuracy and completeness. During this process a number of follow-up conversations occurred (primarily via email) between the research and interview participants, which clarified incomplete or ambiguous responses identified during the transcription process. These communications were subsequently recorded and incorporated into the analysis. Furthermore, notes were taken by the interviewer during and immediately following each interview, to capture any immediate reactions including non-verbal cues and the identification or persistence of themes within the data.
The interview guide was initially used to conduct the analysis, by categorising, grouping and comparing information based on concepts and themes that emerged from the interpretation of the transcribed interviews. The process of coding and categorising data was conducted with the aid of the qualitative data analysis software package, NVivo 9.0. This enabled the rapid retrieval of specific quotes based on various search criteria. These themes, or categories, were then re-grouped or modified to highlight the concepts pertaining to the conceptual framework (strategic rationalities, environmental experts and champions, and eco-control technologies). Relations between the conceptual elements were analysed and, in conjunction with the supplementary information, initial findings were outlined.

In the following section, a brief discussion is provided on the business environment and operational norms that are inherent in the Australian forestry industry. This provides the foundation for analysing variations in the strategic orientation of the two case firms and the way in which eco-controls may be used differently in each firm.

6.5 Forestry Industry: Business Environment and Operational Norms

6.5.1 Business Environment

The forestry industry in Australia derives most of its revenue from managing native forests, plantations and timber tracts. The demand for forestry is derived from the demand for logs, which is directly linked to the demand for downstream products such as sawn timber, pulp and paper, and woodchips. The industry is governed by numerous regulations, the majority of which relate to the access to, and sustainable management of, Australia’s forests. For example, each State/Territory government (in conjunction with the Commonwealth Government) outlines a ‘Code of Practice’
that applies to commercial timber production in both public and private forests and plantations. As such, the Code provides a set of guidelines and minimum operating standards for planning, establishing and maintaining forests, and harvesting timber, as well as the conservation of natural and cultural values associated with forests.

Despite the growing demand for forest products in Australia and overseas, the future of the Australian forestry industry remains uncertain. Increasing restrictions on access to native forests (brought about by changes in access rights and conservation policies, largely in response to pressures from environmental lobby groups) has seen a growing focus on forest plantations as an alternative source of timber supplies. However, the collapse of several forestry managed investment schemes (MIS) in recent years has created further instability, with the exit of several firms from the industry placing negative pressure on the market value of forestry landholdings. Further, while forests are seen as offering a partial solution to problems such as greenhouse gases, erosion and soil salinity, increasing scrutiny of the impact of logging activities on habitats for native species and the high water usage of plantations in low rainfall areas may also have a negative effect on the industry in the future (Allday 2011). Thus, forestry firms’ ability to engage with stakeholders and demonstrate a responsible and accountable approach to managing their environmental impact remain critical factors for their continued success.

6.5.2 Operational Norms of Practice

In general, the environmental management systems of firms in the Australian forestry industry deal with several operational norms of practice. In particular, the following three areas are often prominent in the planning, implementation, control and general management of forestry activities:
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i) *Environmental impact monitoring*, which concerns the management of the short-term, direct environmental impacts of commercial operations (i.e., planting and harvesting). This includes managing soil disturbance and erosion, wilding and noxious weed control, the use of agricultural chemicals and fertilisers, as well as preserving native vegetation and wildlife habitat;

ii) *Biodiversity monitoring*, which relates to the indirect and long-term impacts of operations on local ecosystems – and includes flora and fauna surveys, as well as waterways and catchment monitoring; and,

iii) *Stewardship projects*, which are voluntary initiatives such as rainforest and wetland rehabilitation projects and native species conservation programs, which extend beyond the direct and indirect environmental impact of commercial forestry operations. These often involve collaborating with stakeholders such as neighbours, local communities and NGOs, as well as both state and federal government bodies, to preserve and maintain the environmental aspects of forestry landholdings.

Firms within the industry may differ in the way they approach each of these areas in terms of operational policy and performance standard-setting, as well as monitoring processes. Such differences, in turn, will reflect the strategic orientation towards environmental management. More specifically, the way firms portray their corporate vision on environmental protection, set environmental performance standards, engage with stakeholders and undertake resource allocation will signify their strategic orientation, for example, whether they are inclined to be more proactive or reactive.
In the next section, case findings for each firm are provided with the discussion undertaken in four distinct parts. The first part describes the influence of key internal and external factors that play an important role in shaping the norms of practice in the firms, such as forestry certification, regulatory change, and leadership. The second, third and fourth parts, each describe the norms of practice in relation to the three operational areas as delineated above, that is, environmental impact monitoring, biodiversity monitoring and stewardship project management.

**Hardwood**

*Internal and External Contingencies*

*Hardwood* positions itself as ‘Australia’s leader in certified hardwood forestry plantations’, as reported in some of the documents prepared for external stakeholders and the corporate website. However, there is limited evidence to suggest that a sincere effort has been made to embed environmental concerns in their organisational identity. Notably, the company is neither explicit nor clear on its desirable values, purpose and direction, which is critical for developing environmental shared vision throughout the organisation (Campbell & Yeung 1991; Arjaliès & Mundy 2013; Rodrigue et al. 2013). Further, whilst a single-page ‘Sustainable Forest Management’ policy is available on both their corporate website and internal employee intranet, the document appears perfunctory in nature and primarily devised to satisfy their external certification standards. As noted by its operational staff, the rationale for environmental management activities at *Hardwood* is not clearly defined or communicated:

*There is a policy there, I’m sure. I wouldn’t be too familiar with its content. There’s been very little filtered down ... (Hardwood Environmental Officer).*
Nothing really comes down from upstairs about that sort of stuff ... it’s all very much operational (Hardwood Harvest Planning Manager).

Hardwood also appears to pride itself on its certification against external management standards. However, upon further inquiry, this appears to be largely motivated by the need for external legitimacy, rather than the desire to improve or achieve good environmental performance outcomes. The company first adopted the ISO 14001 environmental management system standard in 2000. As noted by its Health, Safety and Environment (HSE) co-ordinator:

The guy that owned the company back then, I think was the main driver - wanted to be seen as an environmentally-conscious company ... I think it was more about image (Hardwood HSE Co-ordinator).

Similarly, the decision to obtain FSC certification in 2004 is seen as being ‘customer driven’, where such symbols are deemed necessary to retain market share in the face of increasing competition from both domestic and international market players:

FSC is seen as very important by our customers, or at least they tell us it is. They don’t necessarily pay us anything more for certified wood. So, as a company, there’s a strong, I guess, goal to maintain our FSC certification (Hardwood Harvest Planning Manager).

Another similar comment indicates that the heavy emphasis placed by Hardwood on meeting certification standards, along with the highly legislated nature of the industry, are seen as sufficient to institute proper practices to be followed:

It’s drilled into us how important our FSC accreditation is and how important ISO 14001 accreditation is. I guess the reason why it is not pushed [more]
from up top is that we are so highly regulated already, we are so highly audited (Hardwood Regional Manager).

Consistent with what appears to be a more reactive approach to environmental strategy, environmental management activities at Hardwood receive minimal involvement or support from senior management (Banerjee et al. 2003; Wisner et al. 2006). Environmental experts are primarily identified at the regional level, with no single dedicated position assigned at the senior executive level to oversee environmental management activities. Key environmental staff report to regional managers who, in turn, report to the General Manager for Forestry - whose responsibilities encompass all aspects of forestry operations. Further, individuals assigned with environmental management responsibilities, typically, occupy part-time positions (i.e., HSE Co-ordinator) or ‘officer’ roles in addition to their primary duties. The appointment of environmental officers, in particular, appears figurative, with at least one individual not fully informed of the nature or extent of their responsibilities:

I don’t know if I’ve ever actually seen a brief for what the environmental officer actually does ... The environmental officer [title] is something that I’ve sort of inherited since taking up this role. And yeah, something I do as an aside, very much an aside to my principal role (Hardwood Environmental Officer).

Besides the organisational roles of individuals, Hardwood has established a committee to manage the ‘day-to-day running’ of the company’s environmental management system. The committee consists of a representative from each region,
along with the HSE and biodiversity co-ordinators, and is responsible for the
development and amendment of environmental policies and operational procedures.

**Environmental Impact Monitoring**

The direct environmental impact of *Hardwood’s* forestry operations is overseen by
four regional managers, covering forestry landholdings in 13 districts in five
Australian states. In order to manage the environmental aspects of its operations,
*Hardwood* maintains an on-line environmental management system (EMS), made
accessible to staff via a company intranet. This central database is used to
communicate organisation-wide environmental management policies, facilitate data
management and record keeping, as well as to outline operational procedures and
standards. However, many elements of *Hardwood’s* formal EMS appear primarily
driven by the need to meet the ISO 14001 standard, such as their document control
and records management procedures.

*Hardwood’s* management of the direct environmental impact of their commercial
operations is largely achieved in terms of its operational controls. Specifically,
formalised forest management plans are developed at the individual property level
and are used to map out detailed environmental traits of each estate in order to
identify: non-commercial land including remnant vegetation, areas of rare flora and
fauna, and exclusion zones such as wetlands and waterways. The management plans
are intended to provide precise, customised descriptions of the operating conditions
for each plantation estate, including the identification of new and existing
environmental risks to be avoided. Some of the main environmental risks faced by
*Hardwood* include potential damage to native vegetation and wildlife habitat, silt
run-off, and chemical usage around waterways.
As noted by a *Hardwood* Regional Manager, the efficacy of this approach relies heavily on the commitment of operational staff:

*They are supposed to be an organic document. They are not supposed to be a management plan that is done and then just dropped in a folder. They are supposed to be reviewed annually, and if things need to be changed or new information comes to hand ... So it’s probably up to the forester to really be diligent in making sure he picks up all of the environmental aspects of a property* (*Hardwood Regional Manager*).

Within the scope of the forest management plans, standardised operating procedures are conveyed to contractors during induction training and prior to the commencement of a new work request. The operating procedure manuals provide detailed specifications for the task required, and also specify ‘minimum environmental standards’ which must be maintained. Interestingly, regulatory guidelines (i.e., the forestry Code of Practice) seem to strongly determine what staff at *Hardwood* need and should do:

*Basically, the level that we’re expected to do our work in an environmental sense is legislated – which is exactly the way you would expect it to be ... In terms of what we are trying to achieve on the ground, our environmental on ground stuff is basically dictated by legislation - which is fine* (*Hardwood Environmental Officer*).

This view was reinforced by the HSE Co-ordinator, who indicated that beyond ensuring compliance with legislative requirements (*Buysse & Verbeke 2003*), limited importance is placed on improving environmental performance standards:
We don’t tend to be too ambitious. Some things you can’t achieve. It really comes down to: what can we achieve within the required time frames, what resources are needed, and how much is it going to cost? (Hardwood HSE Coordinator).

Similarly, there appears limited formal evaluation of Hardwood’s environmental performance beyond reporting environmental incidents and periodic auditing by both regulatory and certification bodies. The following comments are typical responses to the question, ‘How is environmental performance evaluated?’:

*I don’t actually know. You know, there are no real benchmarks that I’m aware of. No measurement of our environmental performance (Hardwood Harvest Planning Manager).*

*Evaluated? Yeah, it’s done by the auditors, basically. It’s not a big push from up top unless things are going the wrong way (Hardwood Regional Manager).*

As a result, changes to environmental policies and operational procedures are typically implemented on a needs basis, with intervention generally in response to environmental incidents, or corrective actions identified during operational and certification audits. Further, while operational staff are provided opportunities to discuss new procedures during regional meetings, these discussions tend towards a ‘tick and flick’ approach rather than any meaningful debate (Hardwood Harvest Planning Manager).

**Biodiversity monitoring**

In terms of its long-term and indirect impact operations, Hardwood identified water quality deterioration in wetlands and catchment areas, resulting from silt and
chemical run-off from operational sites, as a significant environmental impact that the organisation may cause to local ecosystems. Interestingly though, there appears to be a general level of uncertainty regarding longer term plans on how to monitor and manage the biodiversity impacts, and who is responsible for initiating and monitoring such programs (including what the data produced during this process is actually used for):

_I suppose it’s more the environmental officer [who] deals with a lot of that stuff ... I believe (Hardwood District Forester B)._  

_I’ve had really brief chats with [the biodiversity officer] about that ... it has been down on my list of priorities in terms of what I’ve been doing (Hardwood Environmental Officer)._  

_I think you are asking ‘do you present your results in an open forum?’ We don’t do that. Maybe we should [laughs] ... I’m just trying to think how we use that information ... (Hardwood Regional Manager)._  

This uncertainty is not limited to the use of specific environmental monitoring data, but rather is a pervasive theme identified throughout the interviews. Though interview participants are often able to identify environmental initiatives within the organisation, their knowledge of the underlying rationale for such activities (Adler & Borys 1996; Wouters & Wilderom 2008) is typically limited. In general, the need to comply with certification and other industry regulation is brought up as the rationale for managing the environment and being accountable for the firm’s impact.

Thus, the example of biodiversity monitoring programs further suggests that many environmental management activities at _Hardwood_ are largely symbolic in nature,
primarily undertaken to satisfy the requirements of an external standard (cf. Boiral 2007). This is most evident in their failure to produce either internal or external reporting of the monitoring outcomes, or connect data collection processes with formalised performance management techniques. As noted by a regional manager, assessment of the indirect and long-term impact of forestry operations at Hardwood is largely to satisfy a specific certification criterion:

_We measure it for the certification, to show that we are doing things to keep our accreditation (Hardwood Regional Manager)._

**Stewardship Projects**

Ongoing stewardship projects at Hardwood include programs to eradicate noxious weeds, and fencing off remnant vegetation of high value to exclude livestock grazing. At the time of interview, Hardwood was not involved in any significant rehabilitation or conservation projects, but in the past had undertaken larger wetland revegetation and bird monitoring joint-programs with various state government departments. While these projects were perceived as successful and as contributing to their certification against the FSC standard, there is a notable lack of ongoing support or resources for new projects provided by Hardwood’s senior management. In most cases, stewardship projects are restricted to non-commercial land and rely heavily on collaborating with external environmental groups, ‘depending on who’s got funding’ (Hardwood Regional Manager).

The identification of new projects tends to be driven by motivated individuals at the regional level. For example, the experiences of ‘Jack’, a former employee who championed this area, are frequently drawn on by interviewees:
One former employee did some great environmental works in the region, and he just did that off his own back really. He wasn’t told to do it, and he went and secured all the funding. You know, he did it because he had a passion for doing it, not because there was any incentive or because he would get a bonus (Hardwood HSE Co-ordinator).

This lack of recognition and financial support from senior management has had considerable implications for employee morale, meaning otherwise committed employees are less likely to search for and champion new opportunities and many potential improvements go unrealised:

I think they are probably pretty annoyed. There’s probably a lot of things they’ve wanted to do over the years, and not had the money to do it. I know ‘Jack’ came up against that. You know, he’s identified these great projects that would have really good environmental benefits, and they’ve said ‘yeah, well go find the money for it’ – and so he did. So, that’s sort of ... frustrating (Hardwood HSE Co-ordinator).

It is thus not surprising that, at Hardwood, the identification of stewardship projects is sporadic.

Softwood

Internal and External Contingencies

Softwood was the first forestry company in Australia to receive FSC certification in 2004, and later became the first company to achieve dual certification with the introduction of the AFS standard in 2007. Further, there is also a lot of pride and visibility given to forest stewardship, as reflected in their formal statement of
desirable values, purpose and direction, outlined in the company’s mission statement:47

Mission:

‘To deliver optimal value to our investors in a way that embraces and demonstrates Forest Stewardship by continuous development of skills and practices so that we are widely respected as responsible business and environmental managers.’

Definition:

‘Forest Stewardship is establishing, harvesting and protecting our clients’ forest investments while maintaining or enhancing the environmental and community values associated with the land.’

The mission statement, which appears in several internal communication outlets, including information distributed to staff through the company intranet and training programs, is further reinforced through the use of a visual analogy depicting the three foundations of organisational performance:

Stewardship is where, if you like, you’ve got three legs on the stool – one of them is commercial, one of them is environmental, one of them is community relations or the social aspects. And you need to pay attention to those three areas in an equal way so that those three legs are equal, and that stool is therefore stable (Softwood EMS Manager).

Thus, it would appear that unlike *Hardwood*, where gaining and maintaining certification status was critical, *Softwood’s* corporate mission and philosophy appear to take a more balanced and rigorous approach to environmental management where profit, planet and people were all seen as equally critical. This corporate philosophy can be attributed to the organisational culture promoted by the company’s current owners when the plantations were privatised in 1998:

*This was really part of the company’s original charter, to be a responsible environmental manager* (*Softwood Stewardship Forester*).

*They [the owners of Softwood] have a very strong ethic around stewardship and good forest management. All of their lands around the world are all certified. They had stewardship programs going long before we were FSC certified. When they walked in the door, they said, ‘This is how we’re going to run this’. ‘Good stewardship is good business’ is their sort of motto* (*Softwood GM, Stewardship & Risk*).

Further, forest management certification is principally viewed as incidental to the achievement of environmental performance objectives, rather than as a driving factor:

*I don’t like to think of us managing our forest so that we can have AFS or FSC certification. The way I see it is that we manage our forest well, and we bring these people in to have a look at it and say ‘yeah, that’s well enough to meet our standard, so we’ll give you a tick for that’* (*Softwood GM, Stewardship & Risk*).
Consistent with a more proactive strategic approach, senior management at *Softwood* place significant importance on and are directly involved in the firm’s environmental preservation activities (Banerjee et al. 2003; Wisner et al. 2006). Specifically, *Softwood* has appointed a General Manager (GM) for Stewardship and Risk to oversee all aspects of the company’s environmental management activities, and the GM is directly supported by the EMS Manager to facilitate the communication and implementation of consistent policies and procedures across each of the regions. At the operational level, Stewardship Foresters are engaged in each region and responsible for environmental monitoring activities, operational auditing, and overseeing the company’s various stewardship projects.

Further, beyond managing the environmental impacts of commercial operations, *Softwood* also appointed a dedicated External Relations Manager to oversee some of the more social impacts of operations, such as community and stakeholder relations. Reporting directly to the CEO, the position is ‘flexible’ in nature and entails involvement in:

... *any aspect that has the potential to impact, both positively or negatively, on how we’re perceived in society. So on our reputation, on our image ... [And] a significant aspect of our reputation revolves around our environmental performance* (*Softwood External Relations Manager*).

The distribution of specialist staff across multiple levels of the organisational hierarchy at *Softwood* gives substantial weight to the internal legitimacy of environmental management activities. Importantly, however, the identification of environmental expertise within the company extends beyond specialist staff...
positions, with the cumulative knowledge and expertise of the broader workforce also recognised, as noted by a Regional Planning Manager:

This organisation is pretty good in that we don’t have a strong hierarchical situation. You know, if our base level contractor came up with a smart thing [to improve environmental performance], that would filter all the way up the organisation and be taken on board (Softwood Regional Planning Manager).

Environmental Impact Monitoring

The management of Softwood’s operational activities is divided into three distinct geographic regions of south-eastern Australia, with staff operating from six district offices. Similar to Hardwood, an on-line EMS is also available at Softwood via a company intranet to support environmental management activities. The central database is systematically structured around Softwood’s overall Forest Stewardship Policy, which embodies ten principles for managing the environmental aspects under the company’s control. The EMS is integrated into Softwood’s overall business management system, and incorporates ‘organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, reviewing and maintaining the stewardship objectives as laid down in the company Forest Stewardship Policy’ (Softwood Internal Corporate Document).

Similar to Hardwood, Softwood also relies on operational controls, in the form of site-specific management plans, to manage the environmental aspects of operational activities. Following a site-specific environmental risk assessment, company-wide operating procedures, termed ‘best management practices’ (BMPs), are used to communicate desired performance standards to contractors, as well providing detailed specifications for how a given task should be performed. These performance
standards form the basis for evaluating Softwood’s performance against the
organisation’s commercial, environmental and community relations goals, which are
established for each operational activity.

The process of environmental performance benchmarking at Softwood includes the
identification of short- and long-term objectives which typically exceed regulatory
requirements (Hunt & Auster 1990; Roome 1992; Buysse & Verbeke 2003):

We operate within a comprehensive legal framework for management of
environmental aspects of our forest management activities, and we go beyond
the legal benchmark to maintain our reputation as good corporate citizens and
to maintain our social licence to operate. This approach is supported at the top
level of management, including the board of directors, through enunciation of
the Forest Stewardship Policy and Principles (Softwood EMS Manager).

Further BMPs are viewed as ‘dynamic documents’, with staff continuously revising
them as part of a formalised ‘core continuous improvement process’ (Softwood
Stewardship Forester). This process involves responding to incidents as well as the
anticipation and scoping of potential issues and impacts (Aragón-Correa & Sharma
2003), both at a regional level as well as company-wide, via formalised knowledge-
sharing mechanisms and group meetings. Further, though this continuous
improvement process is largely internally driven, Softwood also engages in regular
dialogue with a number of external stakeholders:

We do get a lot of influence from community organisations in our area - from
councils, from NGOs, et cetera - and we try to work with those people. Many,
sort of, consultation arrangements have arisen over the years in the way we
conduct our business. So I guess a lot of the ideas, whether they be new
initiatives or new agreements, come from our external stakeholders as well.

(Softwood Stewardship Forester)

Biodiversity monitoring

At Softwood, the purpose of environmental management activities related to biodiversity monitoring appeared well-defined. A key assumption is that Softwood needs to manage the ‘biodiversity values’ associated with the forests as ‘custodians’, on behalf of both their investors and the broader community. The firm also sees its biodiversity programme as safeguarding the ‘cultural heritage’ and indigenous significance associated with the land. As noted by a Softwood Stewardship Forester:

The company manages over 50,000 hectares of native forest for conservation purposes - so the biodiversity within that native forests estate is quite large. It’s an extremely important asset, both for the company and for the community, so we feel that monitoring that is quite important ... to determine how those biodiversity values are performing over time and what management we might need to do to maintain them (Softwood Stewardship Forester).

Biodiversity programmes at Softwood span three regional areas, and aim to maintain the biodiversity value associated with their forestry landholdings. Specifically, Softwood has conducted a series of fauna surveys within its forests, undertaken a significant vegetation mapping project to identify the dominant species and age structure across its entire estate, and monitors both baseline water quality and macro-invertebrate populations in waterways within their properties. The programmes are largely designed and overseen by stewardship foresters in each region, who are also responsible for the collation and analysis of data from the monitoring activities:
I crunch the numbers and get the stats out, produce graphs and reports and present those to people. If there is an issue, we arrange a site meeting with the contractor involved and the staff involved. We discuss the issues or the difficulties they may have had, and we put procedures in place to stop that sort of thing from happening again (Softwood Stewardship Forester).

Interestingly, it is also asserted that the predominant use of paper-based recording and the time needed to update the on-line EMS database may have limited broader analysis and company-wide sharing of information, as noted by Softwood’s EMS manager:

*One of the challenging things is to be able to collate that data into a database and to be able to report on that at various levels in the company. And I guess we’re at various stages of collecting the data electronically and assimilating it company-wide to be then analysed. But ultimately, what our system wants us to do – or is designed to do – is to then report on trends, and where they are serious to undertake a root cause analysis and then vary practices (Softwood EMS Manager).*

**Stewardship projects**

As previously discussed, stewardship programs are voluntary initiatives and often co-funded through collaborations with external environmental groups. At Hardwood such projects were rare and tended to emerge sporadically, given that many project champions did not have sufficient funds to finance them from their own budgets. However, the approach to managing stewardship projects was more strategic in nature at Softwood. At Softwood, partnering with local community groups and government bodies is seen as both increasing the range of opportunities for
environmental preservation activities, and also providing opportunities to improve project outcomes due to the perceived benefits and relationships that working with these bodies entail.

Softwood’s past and present involvement in numerous stewardship projects was highlighted during the interviews. Examples of these projects included participating in research and conservation programs for threatened native species, such as Koalas, the rehabilitation of a tract of cool-temperate rainforest, and the establishment of native wildlife corridors on company land. The identification of stewardship programs at Softwood is typically driven by project champions originating from middle management and operational staff. Senior management at Softwood were also more willing to commit funding and resources for such projects, in particular, where mutual benefits for both the company and the wider community can be identified:

_We’re not a philanthropic organisation. We’re not a bottomless pit. But we are conscious of the fact that we manage a lot of waterways and other features that are of value to the community (Softwood GM, Stewardship & Risk)._ 

The performance and impact-conscious culture of Softwood appears to be strongly reflected in the stewardship programmes. There is also equal awareness of the costs associated with such projects, and, in fact, new stewardship projects are generally assessed using cost-benefit type analysis methods, prior to being undertaken. Nevertheless, Softwood appears to be quite pragmatic in viewing what are ‘costs’. As noted by Softwood’s EMS Manager, the costs of restoration projects, for instance, are largely non-financial, and can be limited to the sacrifice of small, unprofitable areas of forestry holdings, as well as providing the knowledge, skills and management expertise of its forestry employees. At the same time, the perceived benefits of
Softwood’s involvement in such projects include the potential for enhancing its reputation in the local community, enabling ‘ease of operation’ with community support, less resistance to their business operations, as well as general improvements in employee morale and satisfaction. As noted by one senior manager:

*Those sorts of projects do provide you with a bit of additional social licence to do business, because you’ve actually got neighbours and so on who are looking at you and thinking you are, in fact, a genuine steward of the land, and that you take your responsibility seriously. So we do it for those reasons. We do it for the reason [that] our staff like to do them ... I guess it’s a nice addition for our staff to know that these things are going on in their business. It gives them some pride in their business (Softwood GM, Stewardship & Risk).*

In summary, the planning, implementation, control and general management of forestry activities at Softwood are consistent with a more proactive stance towards environmental management. Furthermore, this approach appears motivated by the institutionalised belief that improving environmental performance, along with social performance aspects including the fostering of good relationships with both internal and external stakeholders, are in essence value-creating activities. These observations demonstrate that firms operating in highly regulated industries do initiate proactive environmental strategies (cf. Sharma & Vredenburg 1998), which, in turn, influences how the costs and benefits of environmental management are conceptualised and assessed by key organisational decision-makers.

### 6.6 Discussion of Findings

In this section, further retrospection and comparative analysis of the case evidence is undertaken based on the conceptual framework adapted from Arena et al. (2010), to
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identify and explain the organisational dynamics that lead to variances in the practice of environmental management, including the use of eco-controls. The discussion begins by considering the strategic rationalities espoused in both firms, and how such conceptions are interpreted and given meaning by environmental experts and champions within the organisation. This is followed by a review of the use of formalised eco-controls in relation to these strategic rationalities, and whether there are recursive associations among the three dimensions: strategic rationalities, experts/champions and eco-controls. The key findings are presented in Table 20.

Table 20: Summary of key findings from the case studies

<table>
<thead>
<tr>
<th>Strategic Rationalities</th>
<th>Hardwood</th>
<th>Softwood</th>
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<tbody>
<tr>
<td>‘Compliance’</td>
<td>Environmental risk management to ensure conformance with regulatory requirements and maintain ‘market-driven’ forest management certification</td>
<td>‘Pervasive Performance’</td>
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<tr>
<th>Environmental Experts and Champions</th>
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<tbody>
<tr>
<td>Experts primarily identified at the operational level</td>
<td>Experts identified at the senior executive and operational level</td>
<td>Environmental champions supported by facilitating structures and resource allocation</td>
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<tr>
<td>Limited acknowledgement or support for environmental champions beyond regional level</td>
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<tr>
<th>Eco-control Technologies</th>
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<tbody>
<tr>
<td>No formal or informal systems to motivate employees or promote shared responsibility for environmental objectives</td>
<td>Strong emphasis on environmental ‘stewardship’ beliefs systems</td>
<td></td>
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<tr>
<td>Focus on boundary systems and diagnostic control to manage risks and maintain minimum standards of performance</td>
<td>Emphasis on boundary systems and diagnostic control complemented by enabling stance towards control focused on transparency and localised flexibility</td>
<td></td>
</tr>
<tr>
<td>Lack of transparency constrains efforts of committed employees to translate environmental plans and procedures into practice</td>
<td>Increased interactive use of eco-controls to foster debate and discussion surrounding emerging threats and opportunities</td>
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<tr>
<th>Performance Outcomes</th>
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<tr>
<td>Limited conceptualisation of environmental performance beyond compliance objectives</td>
<td>Increased knowledge about effective ways of managing operations</td>
<td></td>
</tr>
<tr>
<td>Improvements largely administrative in nature, which aid demonstration of compliance in future audits</td>
<td>Improved employee morale</td>
<td></td>
</tr>
<tr>
<td>Enhanced relations with internal and external stakeholder groups</td>
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</table>
6.6.1 Strategic Rationalities

In general, there is strong regulatory and professional scrutiny (e.g., the forestry Code of Practice) over the forestry industry. Further, various certification schemes have come into being as symbols of quality and responsible environmental management. The importance of being compliant with certification policies and rules was clearly evident in the interviews of both firms, where a core recurring theme was the importance placed on the highly-regulated nature of the industry and the critical need for formal risk management. However, there were also distinct differences in the way such rules and standards of practice are viewed and responded to in each company.

At Hardwood, the focus is largely on meeting minimum requirements to ensure continued certification and regulatory compliance, with limited attention paid to how such regulatory and voluntary guidelines may potentially improve environmental outcomes for the firm. It was further evident that many environmental management activities and processes are largely administrative in nature, and implemented to ensure the company’s continued certification to the FSC and AFS forest management standards, as well as the ISO 14001 environmental management standard. While this rationale may not have been clearly communicated to operational managers and front-line workers, there is a pervasive belief that the certifications are ‘customer-driven’ and, therefore, necessary to retain market share in the face of increasing competition. Thus, it would appear that environmental management practices at Hardwood are predominantly framed by a ‘compliance’ rationality, with voluntary environmental and forest management standards adopted to give the company a more legitimate appearance. In this regard, beyond demonstrating conformity to the
relevant standards, environmental management practices do not elicit any type of urgency towards achieving real improvements in environmental performance.

By contrast, *Softwood* has developed more systematic approaches towards the management of both the direct and indirect impacts of their operations, driven by a holistic appreciation of the environmental and social ‘values’ attributable to their forestry landholdings. The approach to environmental management at *Softwood* appears to be driven by an awareness of both the positive and negative environmental aspects of their commercial operations, and the benefits associated with a more proactive approach. As noted by the *Softwood* EMS Manager:

> We’re a forestry organisation so our activities interact with the environment in quite a considerable way … There’s a lot of positive environmental interactions, but there are some negative aspects [and] risks to some of those environmental attributes which we need to manage. So, while we’re conducting a commercial business, we’re very mindful of the environmental aspects of our forest operations and we’re also very mindful about the way that we interact with the local community (Softwood EMS Manager).

The following comment from the External Relations Manager also highlights the complexity of environmental strategic planning at *Softwood*:

> It’s a complex process, because its influence is at lots of different levels in the organisation. At the individual level, it’s all about being a good company to work for and a good corporate citizen. There’s the regulator level, the legal reasons. There’s the community level, from a social licence point of view. There’s direction from our Board and our investors who want to invest in an environmentally-responsible organisation – their own reputations are at stake.
as well. So those factors [all] influence the strategic direction (Softwood External Relations Manager).

This ‘pervasive performance’ rationale appears engrained in Softwood’s internal corporate identity (Sharma 2000), and can be attributed to the organisational culture promoted by the company’s current owners who instilled the institutionalised belief that proactively managing the firm’s environmental and social performance aspects are value-creating activities.

6.6.2 Environmental Experts and Champions

According to Arena et al. (2010), rationalities, experts and technologies all evolve continuously through circular interactions. However, their empirical evidence also suggests that the heterogeneity in ERM practices is strongly marked by the risk rationality invoked on ERM inception. Likewise, in this study, the findings suggest that the environmental strategic rationalities may imbue greater importance to the views of certain experts and champions. In the case of Hardwood, where maintaining certification and compliance are important factors, the roles and voices of experts such as auditors are critical. However, while the company has ‘learnt from experience’ through the auditing process, knowledge development appears primarily administrative in nature. This signals the effect a strategic rationality based on conformance may have on system management, where managers are keener to showcase their conformity with the relevant standards during subsequent audits than to seek more comprehensive solutions (Boiral 2007):

So the audit will identify some areas of concern or some non-conformances that are discussed with the auditor and the manager. We develop a set of actions that they need to implement to address the issues, and then that’s all
logged on to their actions register and tracked through that process (Hardwood HSE Co-ordinator).

Or, described more succinctly:

You know, we’d get a corrective action in an audit and (then) change that bit of the system (Hardwood Harvest Planning Manager).

Thus, auditing processes at Hardwood appear unlikely to result in any real improvements in environmental performance, with several interviewees suggesting that the impetus for such improvements needs to be led by those in the higher echelons:

I think we should be able to improve compliance with the system. But whether it will improve standards? ... I think in terms of our environmental performance standards, they are something that really need to come down from the top and the system isn’t going to change that (Hardwood Harvest Planning Manager).

By contrast, the role of senior management in signalling the importance of environmental management activities is exemplified in the case of Softwood, where environmental experts are identified not only at the senior executive level, but throughout the organisational hierarchy (Hunt & Auster 1990). Softwood’s General Manager for Stewardship and Risk works closely with the EMS Manager, a team of Stewardship foresters, the External Relations Manager and the regional area managers. The identification of environmental expertise across multiple levels of the organisational hierarchy emphasises the internal legitimacy of environmental management at Softwood, and reflects the strategic rationalities which mainly revolve
around achieving balance between the commercial, environmental and social performance aspects of their operations.

The comprehensive and socially-complex nature of a more proactive approach to environmental management at Softwood, necessitating significant employee involvement and cross-disciplinary co-ordination (Russo & Fouts 1997), is further reflected in the recognition and value placed on the environmental expertise of the broader workforce. This stance is best illustrated by Softwood’s senior environmental managers when describing the participative processes (Adler & Borys 1996; Wouters & Wilderom 2008) involved in developing new environmental policies and procedures:

We would put the document together, but we would do it with the assistance of all of our people in the field. Because, firstly, they’re the experts, and secondly there’s no point in us coming up with what we think is best practice if all those guys are saying ‘well that sounds fine in the office, but when I get out in the field it’s not practical’. So we use their advice to put the [procedure] together (Softwood GM, Stewardship & Risk).

They’re all professional people, foresters, who bring that, I guess the scientific discipline to bear on what those objectives and targets are and indeed how we’re going to manage it. And so, that’s where the people who are actually doing the job have a role in the development (EMS Manager).

The formal audit processes, too, are given broader meaning at Softwood, with both internal and external auditors engaged to ensure compliance with regulatory and certification standards, as well as an additional layer of auditing aimed at identifying potential opportunities for further improvements in operations and performance:
Independent auditors come on-site and assess how we’re complying with not just the Code of Practice, but our own internal standards. So those auditors have copies of the company’s internal management practices. And these audits are also done jointly with local regulators as well, so it’s quite a transparent process (Softwood Stewardship Forester).

We do third-party external audits of our operations. And so those auditors would give us advice, firstly, on whether they think we are meeting the Code, or secondly meeting our own internal standards, or in fact whether we could improve the standard (Softwood GM for Stewardship and Risk).

Further, audit outcomes are viewed as opportunities to improve environmental management practices, rather than merely taking corrective action to ‘fix’ the system:

*Often those audit reports will pick up something where they can see there is a discrepancy in the way different people are applying a policy, or something like that. And that would result in us taking corrective action to get everyone on board (Softwood Regional Planning Manager).*

In this respect, auditing processes at *Softwood* are viewed as ‘good discipline to make sure your systems are working’ (Softwood Regional Planning Manager), and moreover contribute to the continuous improvement of performance standards.

Thus, in both *Hardwood* and *Softwood*, the rationalities or meanings attached to environmental management practices have been substantially influenced by the type of experts and organisational members who take the lead in defining the boundaries and diagnostic (i.e., performance) metrics, how such metrics are used (i.e., the
dialogue surrounding environmental performance goals) and the level at which performance standards are set.

6.6.3 Eco-control Technologies

The compliance rationale which provides the foundations for environmental management activities at *Hardwood* is further exemplified by the lack of resource commitment and budgeting for environmental management activities. Thus, beyond the direct costs of maintaining certification, such as auditing costs, licensing fees and memberships, the allocation of funding for environmental expenditure is typically limited:

*Unfortunately, and I’ll be frank, we don’t have a budget. It’s crazy, there is no official environmental budget. It’s quite ridiculous. So I’ve got to manage environmental programs out of my operational budget* (Hardwood Regional Manager).

*That’s actually a non-conformance we’ve got from one of our certifications, that we don’t have an environmental budget. It sort of falls under other property management costs, I think is the code that they use ... Even the monitoring programs are starting to fall off the radar because there is no money to do it* (Hardwood HSE Co-ordinator).

As noted by the HSE Co-ordinator at *Hardwood*, the success of environmental management initiatives has, accordingly, hinged on regional managers’ ability to leverage them into the operational staff’s existing workloads:

*It’s trying to sort of absorb it in indirect costs rather than direct costs. In people’s time ... It’s just been absorbed into everyday running costs. It’s not*
factored as a separate item, except for my direct certification costs (Hardwood HSE Co-ordinator).

In recent years, the resource constraints at Hardwood have also affected employee benefits and morale. Thus, although Hardwood has integrated environmental performance measures into their staff incentive systems, an inability to pay performance bonuses has negatively influenced the continued motivation of its employees:

*The company is doing it tough, so you get a ‘thankyou’ letter and that’s it. Everyone’s pretty cynical about it because of that. And, you know, it’s from an entire performance management perspective, not just environmental. And everyone is pretty cynical about it, so yeah, no real incentives for staff* (Hardwood Harvest Planning Manager).

Another source of frustration is the inconsistencies between environmental standards, and constant amendments to Hardwood’s EMS following on from compliance audits. As noted by the Hardwood HSE Co-ordinator:

*The problem with the system is that it was just a simple environmental management system. Then we get a forest management certification, and we’ve got to change all this – OK. Then we get another one. You know, it keeps evolving, and it becomes ad hoc and it has lost its systematic process* (Hardwood HSE Co-ordinator).

Thus, the design limitations of Hardwood’s EMS and, in particular, the lack of clarity surrounding the operational staff’s environmental management
responsibilities, has created a working environment characterised by confusion and uncertainty:

_I’ve struggled with the [system] a little bit. But I’ve learnt that it’s just been built on, and built on, and built on, and people have moved on. It does tend to get confusing the more I am getting into it, the processes of it and who sort of runs what (Hardwood District Forester B)._

_I find the current system a little bit piecemeal, and trying to get a strategic picture out of it is very hard, because it is all over the shop, in my mind anyway (Hardwood Environmental Officer)._  

_At the moment, in some areas of the system there’s very poor compliance – basically because people don’t know what they need to do (Hardwood HSE Co-ordinator)._  

The uncertainty and lack of clarity surrounding environmental management activities may, in part, be attributed to the failure of senior management to communicate the purpose and rationale of such activities:

_At an organisation-wide level there are no goals, no mission statement that relates to it, or anything like that (Hardwood Harvest Planning Forester)._  

This lack of ‘push’ from senior management, coupled with the constraining nature of boundary and diagnostic process, have impeded organisational commitment towards environmental management activities. As a result, the practice of environmental management at Hardwood is largely superficial in nature, with limited progress made towards embedding environmental concerns into commercial activities.
By contrast, organisational commitment towards environmental management practices at Softwood is seen through a more balanced system of formalised structures and informal communications, including the shared values and beliefs of employees (Falkenberg & Herremans 1995; Norris & O'Dwyer 2004), as noted by a Regional Planning Manager:

_I think there’s a pretty strong driver within the organisation, the people are in it to do the right thing and have a good approach to environmental issues and environmental management (Softwood Regional Planning Manager)._  

Employees’ social identification with the company’s environmentally-responsive goals (Adler & Chen 2011) is strongly supported by organic communication processes, characterised by free flows of information across the company (Chenhall & Morris 1995), to take advantage of environmental opportunities or react to threats as they emerge:

_I can go to the General Manager, and I often do, to have a one-on-one discussion with him about something I think might be important. And, in fact, he frequently comes and asks me how things are going in certain areas. So we have a fairly free dialogue, and that’s a healthy way of getting things done and fixed (Softwood Stewardship Forester)._  

_The company’s very open. You know, we’re not a closed company. Very much an open company and everyone is involved in the processes. So it’s a very good company to work for from that point of view (Softwood Management Accountant – Manager)._
Significantly, informal and social control processes are complemented by a formalised beliefs system, promoting an environmental shared vision throughout the organisation (Arjaliès & Mundy 2013; Rodrigue et al. 2013). Prior research by Norris and O’Dwyer (2004) likewise indicates the importance of achieving congruence between formal and informal control systems, and the dominant influence of shared values and beliefs in directing socially-responsible decision-making.

Whilst *Softwood* also emphasises boundary and diagnostic systems to control the environmental impact of their operations, they are complemented with an enabling approach to control which provides operational staff with the underlying logic behind environmental management activities. In this respect, transparency is largely achieved by ensuring that operational staff are involved in the development of new policies and procedures (Adler 1999; Wouters & Wilderom 2008):

> Most things are done by consensus and by involving enough people to ensure that all views are taken on board (Softwood Regional Planning Manager).

> The strength of it is that they are developed with the staff, so the staff are quite familiar with what’s happening when they’re being developed (Softwood GM, Stewardship & Risk).

Further, by facilitating knowledge integration at the operational level (Ditillo 2004), an enabling approach to the development of formalised eco-controls contributes to organisational learning about effective ways of managing operations. This benefit was highlighted in the following comment:
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One of the reasons for having an EMS is to trap company knowledge, IP, experience, so that as staff change over knowledge is not lost, and risks are reduced due to having a system which enables knowledge to be passed on to new staff (Softwood GM, Stewardship & Risk).

Finally, consistent with the higher levels of senior management attention concerning the environmental management activities at Softwood, an increased emphasis on the interactive use of eco-controls by senior management is observed (Simons 1995). Whilst these processes are not extensive in terms of the broader control package, eco-control information produced from auditing and biodiversity monitoring activities is used to stimulate debate and discussion during periodic meetings involving specialist environmental staff and senior management.

Furthermore, eco-controls are used in a manner consistent with a more interactive style of use throughout the organisational hierarchy, rather than being limited to senior management’s attention. The transparent nature of operational controls provides users with both a localised perspective of environmental management practices, as well as an understanding of how their local tasks fit into the organisation as a whole (Adler & Borys 1996). As noted by the Softwood GM for Stewardship and Risk:

It’s important that the people on the ground who actually have an impact on our environmental values are aware of the requirements (Softwood GM, Stewardship & Risk).

This transparency allows for the discussion and debate of management plans at the front-line, operational level between forestry staff and contractors. Here, operational
plans and procedures are discussed prior to and during operational activities, in order to identify emerging environmental threats:

_Sometimes you’ll have a situation where the management plan says ‘you must treat this area [with herbicide]’, and when our district forester goes out and speaks to the contractor, the contractor says ‘look if you want me to treat that area, I’m going to cause some damage to that native vegetation down there that’s not within the area.’ So then they agree, ‘OK we’re not going to do that’ and they record that in the site diary so there is a written record to say, ‘look, environmentally, we’ve decided to do this, not that’._

Thus, the flexibility of operational procedures allows front-line users to identify and prevent environmental incidents before they occur, and provides them with the ability to repair operational controls onsite – thus avoiding unnecessary work stoppages and the delay of commercial activities (Adler & Borys 1996).

In summary, the preceding sections presented the cases of two companies from the Australian forestry industry that have adopted formalised environmental management systems, and actively promote their environmental management credentials through certification to internationally-recognised forest management standards. Further, the interdependencies and organisational dynamics of environmental management at _Hardwood_ and _Softwood_, along with the aforementioned three core dimensions, are illustrated below in Figure 12 and Figure 13, respectively.
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Figure 12: Interdependencies between the organisational dynamics of environmental management at *Hardwood*

Solid lines represent the presence of an interaction between aspects of the framework, whereas dotted lines indicate the suppression or absence of anticipated interactions.

Figure 13: Interdependencies between the organisational dynamics of environmental management at *Softwood*
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6.7 Conclusion

These case studies aim to provide a rich description of the organisational dynamics related to why and how firms differ in their approaches to environmental management and the use of management or eco-controls. An adapted version of the Arena et al. (2010) model comprising rationalities, experts and technologies was utilised to analyse evidence based on two Australian forestry firms to better understand the various factors that link people, processes and outcomes. Overall, the findings indicate different rationalities trigger different responses from experts/champions in the way eco-controls are viewed and utilised. Thus, while Hardwood and Softwood may have established some common and comparable formalised structures (e.g., online database systems to manage the environmental impacts of their operations), the differing meanings attached to environmental management practices have had a substantial influence on both the dialogue and practices surrounding environmental performance goals and environmental stewardship initiatives. In other words, the meanings attributed to the practice of environmental management, borne through the interplay of experts’ and champions’ interpretation of strategic rationalities, are further reflected in the design and use of eco-control technologies. In particular, eco-controls are seen to play a pivotal role in the development of shared meanings and the embedding of environmental concerns into the organisational agenda.

Hardwood’s staff appear to primarily rationalise environmental management planning and operations as responses to external pressures, and a need to be compliant with certification and regulatory guidelines. As a result, most improvements were primarily technical and administrative in nature (Boiral 2007), with limited importance placed on improving actual environmental performance.
standards. Conversely, at *Softwood* there seems a pervasive and genuine interest in effecting real improvements in performance outcomes. Consistent with the findings of Perez et al. (2007), the higher commitment of senior managers and a more sophisticated use of eco-controls contribute to embedding environmental issues and values into the organisation. Further, a more enabling stance towards control is seen to facilitate the socially-complex nature of a more proactive approach to environmental management.

Although the commitment of senior management to environmental issues is widely held as a precursor to firms adopting proactive environmental strategies (e.g., Hunt & Auster 1990; Roome 1992; Banerjee et al. 2003; Wisner et al. 2006), the implementation of such strategies requires an organisation-wide commitment to environmental values. Here, senior management’s commitment to, and direct involvement in, environmental initiatives can be seen to signal the importance placed on environmental management as an organisational activity. In this respect, the legitimacy of environmental management activities as an integral part of the organisation’s corporate identity is perhaps most effectively communicated through the emphasis on an environmental beliefs system.

Furthermore, the apparent benefits of the emphasis on an environmental beliefs system is two-fold: First, the emphasis placed on a beliefs system may help firms achieve congruence between formal and informal control systems (Norris & O'Dwyer 2004). More specifically, formalised statements of desirable values, purpose and direction may be used to reinforce more informal control methods, such as social controls, by fostering shared values and beliefs and the alignment of personal and organisational environmental objectives, that is, by supporting both intrinsic and identified forms of motivation (Adler & Chen 2011).
In addition, the emphasis placed on an environmental beliefs system may contribute to an enabling approach to eco-control by fostering global transparency. In this respect, beliefs systems can be used to communicate how a firm’s environmental goals and objectives contribute to broader organisational objectives. For example, the environmental mission statement and the 3-legged stool analogy at Softwood contributed to the firm-wide understanding of how environmental and social objectives contributed to the value-creating commercial activities.

The identification of environmental expertise across multiple levels of the organisational hierarchy further appears to have implications for the role of eco-control technologies. Participative formulation processes, which draw on the professionalism and existing knowledge of operational employees (Adler 1999; Wouters & Wilderom 2008), support the internal transparency of eco-control policies and procedures, as well as organisational commitment towards their implementation (Groen, Wouters & Wilderom 2012). Such development processes further contribute to the role of eco-controls as knowledge-integration mechanisms (Ditillo 2004), by capturing the collective learning of organisational members throughout the organisational hierarchy.

The findings also provide additional support for the growing evidence suggesting that the contribution of boundary systems and the diagnostic use of MCS to organisational performance are enhanced when complemented by an enabling stance towards control (e.g., Chenhall et al. 2010; Mundy 2010; Adler & Chen 2011; Tessier & Otley 2012). In this respect, the transparency of controls, in particular, appears to have significant implications for the effectiveness of both boundary and diagnostic processes (cf. Wouters & Wilderom 2008).
Finally, an enabling stance towards control also appears to have implications for the interactive use of eco-control technologies. Here, the transparency surrounding environmental management activities enables organisational members across all levels of the organisational hierarchy to participate in informed discussion and debate of environmental management practices, in order to identify emerging environmental opportunities and threats.

The next chapter concludes this thesis by summarising the key findings and contributions of this study, summarising the research design limitations that may affect the validity or ability to generalise the results, and proposing directions that may be considered in future environmental strategy and eco-control research.
7.1 Introduction

The purpose of this final chapter is to present the key research findings and provide concluding remarks about the study. Section 7.2 outlines the approach used to address the research questions identified in Chapter 1, and attempts to answer them by drawing on the results of the questionnaire-survey and insights from the case studies to summarise the overall findings and major contributions of this study. In Section 7.3 a summary of the limitations of the study and suggested directions for future research are provided. Section 7.4 offers some final remarks, and concludes the thesis.

7.2 Summary and Discussion of Findings

A review of the literature in Chapter 2 indicated that prior studies have paid little attention to eco-controls as a mediating variable, where the impact of environmental strategy on firm performance may be affected by the nature and use of eco-controls. This study thus provides evidence on the role of eco-controls, in terms of both the style of use (Simons 1995) and bureaucratic stance (Adler & Borys 1996) towards eco-controls, as a critical mediating variable between an organisation’s level of proactive environmental strategy and its environmental and economic performance outcomes. In doing so, the present study adds a further dimension to the recent empirical studies of eco-control by Henri and Journeault (2010), Perego and Hartmann (2009), and Poneville et al. (2013), by systematically examining not just the impact environmental strategy has on the importance of eco-controls, but the
manner in which such eco-controls are used, and the implications of such use of eco-controls for environmental and economic outcomes.

The study adopts a mixed-mode research design, which involves the collection of both quantitative and qualitative data, in order to place a balanced emphasis on both theory testing and development in this research area (Modell 2005, 2009). Empirical data for the quantitative study were obtained from a cross-sectional questionnaire-survey administered to 1,120 medium- to large-sized firms operating in Australia. A final sample size of 221 (20.7%) usable cases was obtained, which compares satisfactorily with similar recent MCS and eco-control studies (e.g., Henri 2006; Widener 2007; Henri & Journeault 2010; Pondeville et al. 2013). The survey data were analysed using structural equation modelling (SEM) to test a number of hypotheses developed from the conceptual model outlined in Chapter 3. In addition, a model-generating process (Jöreskog 1993) was used to assess the validity of the formal hypothesis testing results, and also to explore the finer relations existing between the focal constructs.

Further, additional insight into the relations between environmental strategy and eco-controls is derived from a comparative case analysis of two firms operating in the Australian forestry industry. In particular, evidence on the organisational dynamics related to why and how firms differ in their approaches to environmental management and their use of management or eco-controls is provided. Data sources include company documents, corporate websites and in-depth interviews of a total of eleven (11) managers and environmental specialists from the two forestry firms (pseudo-named Hardwood and Softwood, to protect confidentiality). Guided by the institutional perspective propounded by Rose and Miller (1992) and Arena et al. (2010), the case evidence was framed around three key dimensions: i) environmental
strategic rationalities; ii) environmental experts; and iii) eco-control technologies. Further, in this study, the framework is extended by introducing *environmental champions* in recognition that environmental initiatives may be originated by actors at all levels of the organisational hierarchy. This, accordingly, includes individuals at mid- and lower-levels, who lack the positional power to mandate others’ compliance and, therefore, may rely on less formal mechanisms to influence others (Gattiker & Carter 2010). As such, the case studies aim to complement the findings from the survey and allows for a more in-depth analysis of the internal mechanisms that drive the environmental management activities. In combination, the findings from the survey and case analysis provide comprehensive evidence on the determinants, consequences and processual aspects of the uses of eco-controls for environmental performance management.

In the following sub-sections, findings from the formal hypothesis testing are considered. This is followed by a discussion of some of the more exploratory findings of the study, resulting from the model-generating process and case study observations, respectively.

**Main Model**

The findings of this study are, in general, consistent with prior empirical studies of eco-controls, such as Perego and Hartmann (2009) and Pondeville et al. (2013), which have identified an alignment between corporate environmental strategies and a firm’s MCS. The results of the hypothesis testing suggest that the managers of organisations pursuing a more proactive environmental strategy (as opposed to a more reactive environmental strategy) are likely to place greater emphasis on the style of use of eco-controls relating to beliefs systems and both the interactive and
diagnostic use of eco-controls. Thus, the findings of this study provide empirical support for Rodrigue et al. (2013), who use case-based evidence from a single firm pursuing a more proactive environmental strategy to describe how eco-controls may be used in both diagnostic and interactive ways. Similar to this study, Rodrigue et al. (2013) further observe that the diagnostic and interactive uses of eco-controls were supported by the emphasis on a beliefs system, to communicate the firm’s core environmental values and inspire organisational members to achieve the firm’s environmental goals and objectives.

Within the context of this study, the emphasis placed on a beliefs system and the interactive use of eco-controls have positive and direct effects on environmental performance. This finding is consistent with Ramus and Steger (2000, p. 622), who observe that ‘employees who perceive strong signals of organisational and supervisory encouragement are more likely to develop and implement creative ideas that positively affect the natural environment.’ Further, the diagnostic use of eco-controls has an additional indirect effect on performance through interactive use. Thus, the findings of this study are consistent with Henri (2006) and Widener (2007) in observing superior performance when eco-controls are used both diagnostically and interactively.

While some findings of this study support those of Widener (2007), others do not. For instance, the results of this study parallel Widener’s (2007) observations where a firm’s strategic elements are positively associated with the emphasis on a beliefs system, which, in turn, is seen to positively influence performance outcomes. Likewise, the emphasis placed on boundary systems is not directly related to the strategic factors the firm faces, but rather, is positively associated with the emphasis placed on a beliefs system. On the other hand, Widener (2007) also observes positive
associations between the emphasis placed on beliefs systems and the interactive and
diagnostic use of controls, as well as between interactive use and boundary systems. 
These findings are not supported by the present study. Given the context of
Widener’s study focused on the business-level strategic risk and uncertainty faced by
firms, and that this study is concerned with firms’ environmental strategies, it is
likely that the inter-relations between the four LOC (or lack thereof) are affected by
the information demands of the specific strategic elements they support.

Interestingly, a moderate negative relation is observed between the emphasis of an
environmental boundary system and firms’ environmental performance. Although
Simons (1995) argues that each of the four LOC positively contribute to firms’
performance outcomes, empirical research in this area is less clear. For example,
Widener (2007) does not observe a significant relation between the emphasis on a
boundary system and organisational learning. Prior MCS studies have further
suggested that the use of boundary systems to create operational constraints may be
perceived as unnecessary or imply that employees cannot be trusted (Chenhall et al.
2010), and could have the unintended consequence of supressing debate and
discouraging employee-driven innovation (Ramus & Steger 2000; Mundy 2010). For
example, Mundy (2010, p. 508) identifies how tight financial controls create
operational boundaries which discourage managers from engaging in excessive
search behaviour, and argues that ‘boundary control levers focused on the attainment
of [pre-determined] goals provides a strong restraining influence on the strategic
aims of innovation and creativity espoused through the beliefs system’. Likewise, the
findings of this study suggest that firms pursuing a more proactive environmental
strategy may require the careful use of boundary controls to avoid potential negative
Chapter 7: Conclusions and Directions for Further Research

effects on learning and knowledge-sharing surrounding environmental management activities.

The empirical assessment of the bureaucratic stance towards eco-control, as a mediator between a firm’s environmental strategy and performance outcomes, responds to calls from the literature for further study of how MCS are used at lower hierarchical levels of the organisation (Langfield-Smith 1997; Ferreira & Otley 2009). Further, while prior studies have examined the four underlying design traits of an enabling approach to control (e.g., Chapman & Kihn 2009), this study explicitly analyses the overall concept of enabling bureaucracy. Consistent with expectations, findings from the hypothesis testing suggest that firms pursuing more proactive strategies are likely to adopt enabling eco-control structures which allow them to simultaneously pursue the joint objectives of flexibility and efficiency. Further, consistent with prior studies which have conceptualised how an enabling approach to control may contribute to firm performance (e.g., Ahrens & Chapman 2004; Davila et al. 2009; Adler & Chen 2011), this study observes a positive relation between the emphasis placed on an enabling stance towards eco-control and environmental performance.

The second link of the conceptual model contributes to the literature by providing additional insight into how firms’ use of eco-controls affect their performance in terms of environmental and economic outcomes. The findings of this study are consistent with Henri and Journeault (2010) and Wisner et al. (2006), who observe that the link between eco-controls and economic performance is not necessarily direct. In particular, it provides an added dimension to Henri and Journeault (2010) by demonstrating that both the style of use of eco-controls and their bureaucratic stance have an impact on firms’ environmental performance outcomes. As discussed
above, the emphasis on a beliefs system, the interactive use, and an enabling bureaucratic stance towards eco-controls have a direct and positive effect on environmental performance. Further, an alternate model testing the direct relation between the use of eco-controls and firms’ economic performance revealed that neither the style of use nor the bureaucratic stance towards eco-controls has a significant direct effect on economic performance.

Finally, the findings for this study contribute to the ‘business case’ for environmental management, by providing empirical evidence of an overall positive association between environmental and economic performance. This finding may be contrast with Henri and Journeault (2010), however, who only observe a positive relation in a limited context. This suggests that it is not the mere adoption of eco-controls, but rather the manner in which they are used, which may enable firms to realise economic benefits from improved environmental performance.

**Expanded Model**

Further to the confirmatory analysis of the conceptual model outlined above, a model-generating strategy within SEM (Jöreskog 1993) was used to undertake a more exploratory analysis of the strategy-structure-performance link in an environmental management context. Specifically, factor analysis of the environmental strategy construct adapted from Peregó and Hartmann (2009) indicated that the strategic approach to environmental management could be differentiated in terms of firms’ integration of environmental concerns into strategic planning processes (ECS), and the diffusion of such concerns throughout the organisation (IEO) (Banerjee 2002; Banerjee et al. 2003). In addition, factor analysis of the environmental strategy construct developed by Sharma and Vredenburg
(1998), and later adopted by Henri and Journeault (2010), suggested that firms’ environmental performance outcomes could be differentiated in terms of benefits attributable to improved eco-efficiency (Porter & Van der Linde 1995a; King & Lenox 2002; Burnett & Hansen 2008) and the development of unique firm capabilities and organisational benefits, as predicted by the resource-based view of the firm (Barney 1991; Hart 1995; Russo & Fouts 1997; Aragón-Correa & Sharma 2003).

The expanded findings suggest that the integration of environmental concerns into strategic planning processes is associated with an increasing emphasis on an environmental beliefs system and the interactive use of eco-controls. These results are consistent with Simons’ (1995) conceptual arguments that the two sub-systems create positive and inspirational forces which contribute to opportunity-seeking behaviour and strategic renewal. Further, the inclusion of environmental concerns in strategic planning processes is associated with a decrease in the emphasis of a boundary system. This suggests that senior management’s perceptions of environmental concerns as a strategic issue are likely to lead to a reduced reliance on formal systems to describe environmental risks to be avoided and set limits around environmental plans and activities.

Conversely, the extent to which firms promote an internal environmental orientation is positively associated with the emphasis placed on environmental beliefs and boundary systems, the diagnostic use of eco-controls, as well as an enabling stance towards eco-control. These findings suggest that the overall importance placed on preserving the environment, including efforts to diffuse environmental values and existing strategic priorities throughout the organisation, has far broader implications for the use of eco-controls in the decision-making activities of organisational
members (cf. Perez et al. 2007). Emphasis on the diagnostic use and an enabling stance towards eco-control implementation, in particular, point to the importance of more processual and operational-level use of eco-controls, including the involvement of subordinate managers and front-line employees in implementing environmental initiatives (Adler & Borys 1996; Ahrens & Chapman 2004).

The expanded findings also indicate that the emphasis placed on the diagnostic and interactive use of eco-controls to focus organisational attention on environmental strategic imperatives is primarily associated with improvements in eco-efficiency, and that the emphasis on a boundary system may hinder eco-efficient performance outcomes. However, the motivational and inspirational effects of a beliefs system, along with the empowerment of employees associated with an enabling stance towards eco-control, appear crucial in supporting the development of capabilities for innovation and organisation-wide higher-order learning, as well as fostering employee morale and stakeholder relationships.

Further, the findings from the model-generating process provide deeper understanding of the link between environmental and economic performance. Specifically, it was proposed that, consistent with Henri (2006) and Grafton et al. (2010), insights from the resource-based view of the firm may help to resolve some of the ambiguous findings from the literature that attempt to relate MCS use and organisational outcomes, in terms of both environmental and economic performance. The results of this study suggest that focusing organisational attention towards improving eco-efficiency is not directly related to improved economic performance, but rather contributes to the development of unique organisational capabilities (and, therefore, indirectly influences economic performance). Thus, consistent with the resource-based view of the firm, the findings suggest that the ability to transform a
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short-run competitive advantage (such as a cost advantage derived from adopting eco-efficient practices) into a sustained competitive advantage may depend on the firm’s ability to consolidate collective environmental learning into unique organisational capabilities.

Case Studies

Finally, the focal research objective of the case studies presented in Chapter 6 was to investigate how key organisational members come together to make sense of the strategic rationalities which justify environmental management activities, and how their perceptions and attitudes affect the selection and use of eco-controls for environmental performance management. The findings suggest that the rationalities imbued in the strategic vision and management of the environment in each firm differed substantially, although both firms were in a highly-regulated, environmentally-sensitive industry. Further, various actors (i.e., key organisational members) assumed critical roles in making sense of their environmental strategy and the meanings attributed to their practice of environmental management, which, in turn, was further reflected in the design and use of eco-control technologies.

In Hardwood, the absence of a ‘push’ or the direct involvement of senior management in environmental management activities resulted in environmental concerns being conceptualised as an operational, as opposed to strategic, issue. Forestry and environmental management system certifications became symbols for undertaking environmental practices, primarily leading to ceremonial behaviour intended to demonstrate conformance with certification standards (cf. Boiral 2007). The ensuing compliance mentality, in turn, resulted in the reliance on internal and
external auditing processes for environmental performance evaluation and knowledge development.

The identification of environmental experts at the operational level, as well as the importance placed on the auditing process to maintain compliance, further resulted in ad hoc development processes, with changes to environmental standards and procedures largely undertaken in response to environmental incidents and non-conformance in audit findings. This contributed to a working environment characterised by confusion and uncertainty, with the lack of clarity surrounding environmental management responsibilities impeding otherwise committed staff from performing their duties. Furthermore, the lack of resource commitment and budgeting for environmental management activities created boundaries which constrained the identification of new environmental initiatives, and required ongoing management practices to be ‘absorbed’ into existing operational budgets and workloads. This, in turn, negatively influenced employee morale, and inhibited opportunity-seeking behaviour by environmental champions.

By contrast, the case of Softwood demonstrated how a more performance-focused strategy, championed by senior management and diffused throughout the organisation, entailed a more sophisticated use of formal and informal eco-controls to embed environmental values into the organisation’s corporate identity (Perez et al. 2007). At Softwood, an awareness of both the positive and negative aspects of the company’s interaction with the natural environment, and its larger social responsibility both as a steward of the environment as well as a good corporate citizen, were critical factors shaping a more proactive stance towards environmental management. The importance placed on environmental concerns at Softwood is further signalled by the appointment of specialist environmental staff throughout the
organisational hierarchy, including the direct and frequent involvement of senior management in environmental management activities.

Consistent with the findings of the survey study, the eminence of an environmental beliefs system and an enabling approach to control were observed to be critical in promoting shared values and vision, supporting task and role clarity, and promoting shared responsibility for Softwood’s commercial, environmental and social objectives. Further, the identification of environmental expertise in the broader workforce contribute to participative formulation processes, which draw on the professionalism and existing knowledge of operational employees for developing new policies and procedures (Adler 1999; Wouters & Wilderom 2008). Such processes were seen to facilitate the role of eco-controls as knowledge-integration mechanisms (Ditillo 2004), as well as fostering organisational commitment towards their implementation (Groen et al. 2012).

In addition to contributing to theoretical knowledge, the results presented in this study allow for possible recommendations for management practices. The empirical findings indicate the central role of senior management in signalling the importance of environmental management as an organisational activity. The results thus suggest that the emphasis on an environmental beliefs system, including the recognition of environmental concerns in corporate mission statements, provides a meaningful avenue for promoting the internal legitimacy of environmental goals and objectives (cf. Rodrigue et al. 2013). In addition, the role of eco-controls in supporting the decision-making activities of subordinate managers and employees generally, appears critical for converting short-term eco-efficiencies into a sustained competitive advantage. Thus, consideration of the design elements contributing to an enabling formalisation is important when developing eco-control performance
management systems (Adler 1999). In this respect, observations from the case studies highlighted how participative development processes served to facilitate the role of eco-controls as knowledge-integration mechanisms, by capturing the collective learning of organisational members, as well as supporting organisational commitment towards their implementation. Finally, findings from the survey and case studies, respectively, suggest that careful use of boundary controls may be required to avoid potential negative effects on environmental performance outcomes.

7.3 Limitations and Directions for Further Research

This study is subject to a number of limitations, and thus the findings need to be interpreted with caution. The first five limitations pertain to the questionnaire-survey, while the last three limitations pertain to the case studies.

First, the data for this study are based on single-respondent, cross-sectional surveys which do not permit definitive claims of cause and effect relationships between the variables. Further, the conceptual model presumes some degree of time lag between the variables, ‘Environmental Strategy affecting the use of MCS’; ‘Use of MCS affecting Environmental Performance’; and, ‘Environmental Performance affecting Economic Performance’. However, all variables were measured at a single point in time. For the present study, efforts to overcome these limitations included i) developing a compelling theoretical causal model based on relevant prior literature, ii) maintaining that one variable (the cause) logically precedes the other (the effect), then iii) finding a (predicted) association between the focal variables, i) establishing a compelling theoretical causal model; and ii) finding a (predicted) association between the focal variables (Van der Stede 2013), such that inferences of causality, though not proven, are strengthened.
The second limitation of the current study relates to model specification. Though compelling arguments for the conceptual model were advanced in Chapter 3, the possibility of two-way relations between key variables in the model must be acknowledged. For example, a feedback relationship may exist between the style of use of eco-controls and the orientation of environmental strategy (cf. Kober, Ng & Paul 2007). In other words, the use of eco-controls is also likely to shape environmental strategy, where certain characteristics of the eco-controls (e.g., a more enabling bureaucratic stance) would encourage and promote more independent thinking and employee-driven incremental innovation, leading to a more proactive environmental strategic stance. Future studies may benefit from the use of longitudinal data, or data gathered from multiple sources or multiple respondents, to further strengthen both the causal inferences and assessment of the directionality of relations between the studied variables.

The third limitation concerns the measurement and operationalisation of several key variables. The latent variable ENABLE was measured using scales developed by the author based on a review of the literature, rather than being adopted from an established instrument. Further, the conceptualisation of ENABLE as a second-order construct, reflected against the underlying dimensions of repair, internal transparency, global transparency, and flexibility, whilst consistent with the theoretical arguments of Adler and Borys (1996), is unique to the literature. As discussed in Section 5.4.1, though flexibility (FLEX) was significantly correlated with the three other design traits, discriminant validity was also established. This may indicate a more complex relationship exists between the four elements of enabling control (cf. Chapman & Kihn 2009; Jørgensen & Messner 2009). Thus, given the importance of this construct, additional research is required to further
develop this instrument and extend present understanding of the role of flexibility in an enabling approach to control.

In addition, the survey used for this study elicits only the views of senior management and their intentions when implementing eco-controls, and is therefore unable to capture the perceptions of subordinate managers or employees (Tessier & Otley 2012). Future studies may benefit from examining employees perspectives of the enabling versus constraining stance placed on control systems, to further elucidate their relation with organisational performance outcomes.

Further, the diagnostic and interactive use of control measurement scales employed in the current study represent only one of a variety of scales developed in the literature (e.g., Abernethy & Brownell 1999; Bisbe & Otley 2004; Henri 2006; Widener 2007). There is also ongoing debate concerning the adequacy of existing measurement scales and modelling techniques, and the extent to which they reflect their intended theoretical constructs (e.g., Bisbe et al. 2007; Tessier & Otley 2012; Grabner & Moers 2013). While this study aims to contribute to the continuing discussion, it also takes the somewhat pragmatic stance of adopting previously validated approaches in order to enhance the comparability of findings with those from prior studies.

A fourth limitation in this research relates to potential respondent or social desirability bias, and is applicable to the use of questionnaires as well as interviews as the means by which data were collected. Any study which seeks to examine environmental issues in organisations faces the risk of self-selection bias: people who are interested in environmental issues and place a higher value on environmental responsibility tend to be more inclined to respond (Pondeville et al. 2013). In
addition, the use of Likert type scales in the survey instrument entails that respondents may interpret the scale differently from one another, and individual responses may differ according to the participants opinions towards the subject. Thus, for the purpose of this study, it is assumed that the spaces between response choices are equidistant, and that the responses themselves measure the true attributes of the organisations surveyed.

Further, using a survey method to collect data creates a potential for bias due to common response. However, descriptive statistics for the empirical study reveal that every environmental strategic orientation (i.e., from reactive to proactive), as well as industries which are generally regarded as having higher environmental impact, are well-represented in the sample. The case analysis also provides further evidence of both proactive and reactive strategic responses to environmental issues.

A fifth limitation concerns the use of SEM. As discussed in Chapter 4, SEM determines the extent to which a particular hypothesised model conforms to a particular data set. The concept of equivalent models recognises that, for any set of theoretical latent constructs, multiple structural models may exist which yield equivalent levels of fit for the given data sample (MacCallum et al. 1993). Thus, it is acknowledged that equivalent models may exist which offer substantively meaningful alternative explanations of the relations present in the sample data. Future studies can develop alternate valid models informed by different theories to identify relations among the variables, environmental strategy, eco-controls and organisational outcomes. Further, while a usable sample size of 221 (with statistical power greater than 0.80) is regarded as adequate for stable SEM analysis, a greater number of responses would have provided more confidence in the findings. Nevertheless, the study’s sample reflects participants from a wide range of industries,
firm size and strategic orientation, and all models meet the fit criteria required to provide meaningful results.

Finally, the case analysis presented in Chapter 6 is also subject to several limitations. First, while every attempt was made to gain information from a wide selection of individuals in the two case organisations, and to corroborate interview data with internal corporate documents, the everyday operations of the two firms were not observed in an intensive manner. Consequently, much of the data is based on a rather limited number of in-depth interviews. Second, the study was conducted in a single, environmentally-sensitive industry, subject to a unique set of regulatory and stakeholder pressures. Additional research could replicate and extend the study findings into other industries, whose environmental concerns may differ. Finally, the process of qualitative data analysis involves a set of choices made by the researcher, and therefore the findings are subject to possible analytical and interpretive bias based on the researcher’s own values and perceptions.

Notwithstanding these limitations, the findings of the current study suggest that exploring the ways in which MCS and strategy interact in an environmental management context should be considered a significant area for management accounting and strategic management research. Thus, beyond addressing the limitations to this research outlined above, several opportunities for future research can be identified.

First, empirical analysis of the primary conceptual framework for this study sought to identify potential complementary and substitution effects among the style of use of formal MCS as well as the bureaucratic stance towards control. However, the case findings provide additional support for the body of literature, suggesting that an
interaction type relationship may also exist (e.g., Chenhall et al. 2010; Mundy 2010; Adler & Chen 2011; Tessier & Otley 2012). Specifically, it would appear that a potential moderating relationship may exist, whereby an enabling approach to control influences the link between the emphasis placed on boundary and diagnostic controls, and a firm’s performance outcomes. However, current contributions to this argument are largely theoretical or descriptive in nature. Thus, further empirical research is required to determine the specific nature of the relations between the two frameworks, and their implications for firm performance outcomes.

Second, little attention has been paid to broader controls, such as informal and social controls, in an environmental management context. For instance, social controls such as shared values, beliefs and traditions which guide the behaviour of employees are contended to be critical for enhancing goal congruence and motivating socially-responsive decision-making (Falkenberg & Herremans 1995; Norris & O'Dwyer 2004). However, there is little evidence on how such controls may be affected by a firm’s environmental strategic orientation (cf. Pondeville et al. 2013) or contribute to a firm’s environmental and economic performance outcomes.

A third logical extension of the current study would be a further examination of eco-control-strategy relationships from a resource-based view of the firm. Specifically, an understanding of which organisational capabilities are most influential in enhancing specific aspects of performance (e.g., Henri 2006), and how these capabilities interact in an environmental management context, are insufficient at this stage to enable a definitive conclusion to be drawn from the findings of the current study.
Finally, further study of the various dimensions of environmental performance on firms’ economic performance is warranted, including the assessment of a broad range of control variables, in order to assess the robustness of the relations observed in this study.

7.4 Final Concluding Remarks

In an increasingly environment-aware business world, the use of appropriate management controls to guide the attainment of environmental strategic objectives is critical. This study has provided insights into the linkages among firms’ proactive environmental strategy, use of eco-controls and their environmental and economic performance. However, unresolved questions remain, and new opportunities and directions for further research in this complex, yet critical area still exist. As noted by Hopwood (2009, p. 439):

*The research traditions now established in the area of the organizational and social analysis of accounting provide a good basis for looking beyond abstract schemes for change and improvement to explore the actuality of their functioning and operations, and to use this knowledge for the more realistic design of approaches to changing the significance which environmental and sustainability considerations play in the corporate sphere.*

Thus, while this thesis contributes to knowledge development surrounding the role of eco-controls in corporate environmental management, it is similarly hoped that the findings of this study will form the catalyst for further research in the area of environmental performance management.
Appendix A: Survey Questionnaire

Dear Sir / Madam,

I write to request your participation in a study which aims to improve our understanding of environmental management by Australian organisations. It is anticipated that the study results will assist in identifying how businesses may create value through integrating environmental concerns into decision making and management processes.

The expertise and insights of a senior manager in charge of environmental management activities would be most useful for this survey. As such, I would greatly appreciate your participation. The survey will take approximately 15 minutes to complete. Participants will also be given the opportunity to receive a copy of the study findings.

If you complete and return the survey, a tree will be donated to Landcare Australia on your behalf.

This project is part of my doctoral studies, and is supervised by Professor Nava Subramaniam and Associate Professor VG Sridharan at Deakin University. Your participation is completely voluntary, and the return of the completed questionnaire will be taken as agreement for the information you provide to be used in this project. A self addressed envelope has been included for return of the completed survey.

Ethics Approval
Approval to undertake this research project has been given by the Human Research Ethics committee of Deakin University. If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a participant, please contact:

The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood VIC 3125. Tel: 03 9251 7129, Email: research-ethics@deakin.edu.au. Please quote project number BL-EC 6-12.

I thank you for your time and look forward to your kind assistance.

If you require further information please contact:

Campbell Heggan
Doctoral Candidate, Deakin University
School of Accounting, Economics and Finance
Telephone: (03) 9251 2727
campbell.heckgan@deakin.edu.au

Please Note: The research findings will be published in academic journals and the doctoral thesis of the principal researcher. All information collected will be stored securely for a minimum of five (5) years after final publication. All information will be treated confidential until the project is complete, and the data may be destroyed. No corporate institution or individual will be able to be identified in any publication.
### Appendix A: Survey Questionnaire

**Environmental Management Survey**

**About Your Environmental Management Activities**

*Note: All questions in this survey relate only to your firm’s operations in Australia.*

1. The following statements relate to the integration of environmental concerns into your organisation’s decision making processes. Please indicate the extent to which you agree or disagree with the following:

   *(Please indicate your response with a tick ✓ for all items)*

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Our organisation has a clear policy statement urging environmental awareness in every area</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>ii.</td>
<td>Our organisation has integrated environmental issues in the formal strategic planning process</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>iii.</td>
<td>The top-management of our organisation always gives environmental issues a high priority</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>iv.</td>
<td>In our organisation, ‘quality’ includes reducing our environmental impact</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>v.</td>
<td>In our organisation, environmental goals are linked with other corporate goals</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>vi.</td>
<td>Environmental issues, policies and procedures are included in formal training programs for our organisation’s employees</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>vii.</td>
<td>There is a formal reporting position between those responsible for environmental affairs within our organisation and our organisation’s senior executives</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>viii.</td>
<td>My organisation engages in a continuous dialogue with local communities and environmental organisations with regards to the environmental aspects of processes and products</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>ix.</td>
<td>Our organisation is engaged in developing products and processes that minimize environmental impact</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>x.</td>
<td>Our organisation has a formalised continuous improvement program for environmental policies and procedures</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>xi.</td>
<td>Our organisation is engaged in exploring markets for environmental products and services</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>xii.</td>
<td>In our organisation, we often assess what has worked for our competitors before moving into new markets for environmental goods and services</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>xiii.</td>
<td>Our organisation’s environmental efforts mainly revolve around compliance with current environmental regulation</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

2. These statements relate to environmental issues and beliefs in your organisation. Please indicate the extent to which you agree or disagree with the following:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Our environmental mission statement clearly communicates the organisation’s core environmental values to our workforce</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>ii.</td>
<td>Top managers communicate core environmental values to our workforce</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>iii.</td>
<td>Our workforce is aware of the organisation’s core environmental values</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>iv.</td>
<td>Our environmental mission statement influences our workforce</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>v.</td>
<td>Our organisation has a system that communicates to our workforce environmental risks that should be avoided</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>vi.</td>
<td>Our organisation relies on an environmental code of conduct/practice to define appropriate behaviour for our workforce</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>vii.</td>
<td>Our environmental code of conduct/practice informs our workforce about behaviours that are off-limits</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>viii.</td>
<td>Our workforce is aware of the organisation’s environmental code of conduct/practice</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Appendix A: Survey Questionnaire

3. Provided below is a list of potential uses of environmental controls and Environmental Management Systems (EMS). Please indicate the extent to which your senior management team relies on environmental controls or EMS to:

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>A Great Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Track progress towards goals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ii.</td>
<td>Monitor results</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>iii.</td>
<td>Compare outcomes to expectations</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>iv.</td>
<td>Review key performance measures</td>
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<td></td>
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</tr>
<tr>
<td>v.</td>
<td>Enable the organisation to focus on critical success factors</td>
<td></td>
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<tr>
<td>vi.</td>
<td>Enable discussion in meetings of superiors, subordinates and peers</td>
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<tr>
<td>vii.</td>
<td>Enable continual challenge and debate of underlying data, assumptions and action plans</td>
<td></td>
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<tr>
<td>viii.</td>
<td>Provide a common view of the organisation</td>
<td></td>
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</tr>
<tr>
<td>ix.</td>
<td>Tie the organisation together</td>
<td></td>
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</tr>
<tr>
<td>x.</td>
<td>Develop a common vocabulary in the organisation</td>
<td></td>
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</tr>
<tr>
<td>xi.</td>
<td>Enable the organisation to focus on common issues and strategic uncertainties</td>
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</tr>
</tbody>
</table>

4. The following relate to the extent which your senior management are personally involved with environmental controls or EMS. Please indicate the extent to which you agree or disagree with the following:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Senior management are directly involved in interpreting information from the EMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ii.</td>
<td>Operating managers are frequently involved in facilitating the EMS</td>
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<tr>
<td>iii.</td>
<td>Senior management pays little day-to-day attention to the EMS</td>
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</tbody>
</table>

**Employee Involvement**

1. Provided below are some ways how employees within your organisation may interact with the organisation's environmental controls and EMS. Please indicate the extent to which you agree or disagree with the following:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>In our organisation, environmental controls and EMS:</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>i.</td>
<td>Are designed to help employees adapt guidelines to real work processes</td>
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<tr>
<td>ii.</td>
<td>Allow all employees to identify problems and suggest improvement opportunities</td>
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<tr>
<td>iii.</td>
<td>Increase employees knowledge of environmental management activities in their area</td>
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<td>iv.</td>
<td>Outline key components of environmental management activities and provide best-practice routines</td>
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<td>v.</td>
<td>Help clarify the rationale behind environmental management activities</td>
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<tr>
<td>vi.</td>
<td>Provide employees feedback on their actual performance against historical standards</td>
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<tr>
<td>vii.</td>
<td>Allow changes to be made/suggested only by senior management</td>
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<tr>
<td>viii.</td>
<td>Are designed to highlight to managers whether employees actions are in compliance</td>
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</tr>
</tbody>
</table>
Appendix A: Survey Questionnaire

2. The following items relate to how environmental controls and EMS assist employees within your organisation. Please indicate the extent to which you agree or disagree with the following:

<table>
<thead>
<tr>
<th>In our organisation:</th>
<th>Strongly Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. EMS help employees to understand the overall context within which they are working</td>
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<tr>
<td>ii. EMS help to communicate the firm’s environmental goals and objectives</td>
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<tr>
<td>iii. Operational managers use information generated by EMS to come up with ideas to improve operations under their control</td>
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<tr>
<td>iv. Employees often think of new ways of doing things when adopting EMS processes</td>
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<tr>
<td>v. Employees are able to modify environmental procedures and controls when they are considered inappropriate for the real work scenario</td>
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<tr>
<td>vi. Employees are able to implement environmental management processes beyond those specified in the EMS</td>
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<tr>
<td>vii. Employees have information only on the specific environmental management activities they are responsible for</td>
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<tr>
<td>viii. Discussion of environmental management activities focuses on ensuring strict adherence to original procedures and action plans</td>
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</tbody>
</table>

Environmental Outcomes

1. Provided below is a list of potential outcomes of your organisation’s environmental management activities. Please indicate the extent to which the organisation’s environmental practices have led to:

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>A Great Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Reduction in costs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Input costs</td>
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<tr>
<td>- Process/production costs</td>
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<td></td>
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<tr>
<td>- Costs of regulatory compliance</td>
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<td></td>
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<tr>
<td>ii. Improved operations:</td>
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<td></td>
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<tr>
<td>- Increased efficiency</td>
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<tr>
<td>- Increased productivity</td>
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<td></td>
</tr>
<tr>
<td>- Increased knowledge about effective ways of managing operations</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>- Process innovations</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii. Improved product/service quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv. Product/Service innovations</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v. Organisation-wide learning among employees</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi. Improved employee morale</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>vii. Improved overall business reputation or goodwill</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>viii. Enhanced relationships with stakeholders such as local communities, regulators, and environmental groups</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix A: Survey Questionnaire

About Your Organisation

1. Name of your Organisation (optional): .................................................................

2. Number of FTE employees: □ < 100 □ 101 - 500 □ 501 - 2,000 □ 2,001 - 10,000 □ > 10,000

3. Business ownership structure (please tick ‘✓’ all that apply):
   □ ASX Public Listed □ Proprietary Company □ Government Enterprise
   □ Australian Owned □ Foreign Owned
   □ Other (please indicate) ..........................................................................................

4. Primary industry sector ............................................................................................

5. Please indicate your organisation’s performance compared to the goals set for each of the indicators below for the past 12 months:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Very Poor Performance</th>
<th>Average Performance</th>
<th>Excellent Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Sales volume</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
</tr>
<tr>
<td>ii. Cost control</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
</tr>
<tr>
<td>iii. Cash flow from operations</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
</tr>
<tr>
<td>iv. Operating profit</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
</tr>
<tr>
<td>v. Return on investment</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
</tr>
<tr>
<td>vi. Market share</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
<td>□ □ □ □ □ □ □ □ □</td>
</tr>
</tbody>
</table>

About You

1. Current position: ..................................................................................................

2. Years worked in current position: ............... years. 3. Years worked in the organisation: ............... years.

4. Your highest qualification: ..................................................................................

5. Your age group: □ 25 - 34 □ 35 - 44 □ 45 - 54 □ 55+ years

6. Your gender: □ Male □ Female

7. What proportion of your work time is spent dealing with environmental management activities:
   □ None □ 1 - 19% □ 20 - 39% □ 40 - 59% □ 60 - 79% □ 80 - 100%

8. I feel that my current level of involvement in environmental management is:
   [Please answer both sections (a) AND (b)]
   (a) □ Rare □ Insufficient □ About right □ Demanding □ Overwhelming □ No view
   (b) □ Increasing a lot □ Increasing a little □ Not changing □ Decreasing a little □ Decreasing a lot □ No view

Contact Details

Thank you for your time. I highly appreciate your participation in this study. If you would like to receive a copy of the survey results, please provide your email address:

Email (optional): ............................................................................................................
Appendix B: Model Fit Indices Summary

The following goodness-of-fit criteria, and their corresponding levels of acceptable fit, were adopted for model evaluation in the present study:

**Chi-squared Statistic**

The conventional overall test of fit in SEM analysis is the $\chi^2$ statistic, which is reported with its associated degrees of freedom ($df$) and $p$-value. A non-significant $p$-value (i.e., $> 0.05$) indicates that the theoretical specified model fits the sample data (Schumacker & Lomax 2004). The $\chi^2$ statistic is considered most reliable for sample sizes between 100-200, and has a tendency to indicate a significant probability level as sample size increases (Schumacker & Lomax 2004).

Further, the $\chi^2$ statistic is sensitive not only to sample size but also multivariate non-normality (Hu & Bentler 1999; Kline 2010). When the assumption of multivariate normality is known to be violated, the Satorra-Bentler scaled $\chi^2$ may be used as an alternative to the $\chi^2$ statistic (Satorra & Bentler 1994). However, for this study, use of the Satorra-Bentler scaled $\chi^2$ was considered unnecessary given that Bollen-Stine bootstrapping (Bollen & Stine 1992) was employed. Accordingly, the Bollen-Stine corrected $p$-value ($BSp$) is reported where multivariate non-normality is observed, and assessed against the usual cut-off of 0.05.

As $\chi^2$ increases comparative to model complexity, increasing the likelihood that the specified model will be rejected, a ‘normed $\chi^2$’ ($\chi^2/df$) may be used (Holmes-Smith 2012). The use of $\chi^2/df$ is not unanimously supported (Kline 2010), but nonetheless may be used to evaluate model parsimony (Schumacker & Lomax 2004; Holmes-
Appendix B: Model Fit Indices Summary

Smith 2012). Normed $\chi^2$ should be greater than 1.0 and ideally smaller than 2.0, although values of less than 3.0 may be acceptable.

**Root Mean-Square Error of Approximation**

The RMSEA is a parsimony adjusted ‘badness-of-fit’ index, where a value of zero indicates best fit. In computer output, RMSEA is presented with the associated upper and lower bounds of the 90% confidence interval, and a p-value for the test of the close-fit hypothesis (Kline 2010). RMSEA value should be less than 0.05 and a $PCLOSE$ greater than 0.05 to accept the test of close fit (Browne & Cudeck 1993). A RMSEA value between 0.05 and 0.08 indicates the model has a reasonable fit, and between 0.08 and 0.1 a mediocre fit (Browne & Cudeck 1993; MacCallum et al. 1996). When evaluating the 90% confidence intervals, the lower bound ideally equals zero, and the upper bound should also fall within the acceptable range (i.e., less than 0.1).

**Comparative Fit Index and Tucker-Lewis Index**

The CFI and TLI are incremental (or comparative) fit indices which measure the relative fit of the researcher’s model over a baseline model. Incremental fit indices typically range between 0 and 1, where 1 indicates the best fit. The TLI (also called the non-normed fit index [NNFI]) can fall below 0 or above 1, but values greater than 1.0 may indicate a lack of parsimony (Holmes-Smith 2012).

For both CFI and TLI, values greater than 0.95 are generally regarded as indicating acceptable fit (Hu & Bentler 1999), but this may be adjusted to take into consideration the effect of sample size and model complexity. A more stringent cut-off of 0.97, for example, has been suggested for studies with 12 or fewer observed variables and a sample size less than 250 (Hu & Bentler 1999; Hair et al. 2010).
Standardised Root Mean-Square Residual

The SRMR is a measure of the mean absolute correlation residual, the overall difference between the observed correlations and those predicted by the model. A cut-off value close to 0.08 indicates a relatively good fit (Hu & Bentler 1999), and large values may indicate outliers in the raw data (Holmes-Smith 2012).

Kline (2010) suggests Hu & Bentler’s (1999) threshold of \( \text{SRMR} \leq 0.08 \) is not a very demanding standard, as an average residual of 0.08 would suggest many individual cases would exceed this value. Inspecting the correlation residuals pattern matrix is accordingly recommended as part of a diagnostic assessment of fit, which will enable the researcher to identify potential problems with a measurement model.
Appendix C: Descriptive Statistics for Questionnaire Items

C.1 Questions/Items and Variable Codes (Codebook)

Section 1: Environmental Management Activities

1 The following statements relate to the integration of environmental concerns into your organisation’s decision-making processes. Please indicate the extent to which you agree or disagree with the following:

i. Our organisation has a clear policy statement urging environmental awareness in every area
   STGY_1

ii. Our organisation has integrated environmental issues in the formal strategic planning process
    STGY_2

iii. The top-management of our organisation always gives environmental issues a high priority
     STGY_3

iv. In our organisation, ‘quality’ includes reducing our environmental impact
    STGY_4

v. In our organisation, environmental goals are linked with other corporate goals
   STGY_5

vi. Environmental issues, policies and procedures are included in formal training programs for our organisation’s employees
    STGY_6

vii. There is a formal reporting position between those responsible for environmental affairs within our organisation and our organisation’s senior executives
     STGY_7

viii. My organisation engages in a continuous dialogue with local communities and environmental organisations with regards to the environmental aspects of processes and products
    STGY_8

ix. Our organisation is engaged in developing products and processes that minimize environmental impact
    STGY_9

x. Our organisation has a formalised continuous improvement program for environmental policies and procedures
   STGY_10

xi. Our organisation is engaged in exploring markets for environmental products and services
    STGY_11

xii. In our organisation, we often assess what has worked for our competitors before moving into new markets for environmental goods and services
   STGY_12R

xiii. Our organisation’s environmental efforts mainly revolve around compliance with current environmental regulation
    STGY_13R
Appendix C: Descriptive Statistics for Questionnaire Items

**Question 2**

These statements relate to environmental issues and beliefs in your organisation. Please indicate the extent to which you agree or disagree with the following:

i. Our environmental mission statement clearly communicates the organisation’s core environmental values to our workforce  
   **BELIEF_1**

ii. Top managers communicate core environmental values to our workforce  
   **BELIEF_2**

iii. Our workforce is aware of the organisation’s core environmental values  
   **BELIEF_3**

iv. Our environmental mission statement inspires our workforce  
   **BELIEF_4**

v. Our organisation has a system that communicates to our workforce environmental risks that should be avoided  
   **BOUND_1**

vi. Our organisation relies on an environmental code of conduct/practice to define appropriate behaviour for our workforce  
   **BOUND_2**

vii. Our environmental code of conduct/practice informs our workforce about behaviours that are off limits  
   **BOUND_3**

viii. Our workforce is aware of the organisation’s environmental code of conduct/practice  
   **BOUND_4**

**Question 3**

Provided below is a list of potential uses of environmental controls and Environmental Management Systems (EMS). Please indicate the extent to which your senior management team relies on environmental controls or EMS to:

i. Track progress towards goals  
   **DIAG_1**

ii. Monitor results  
   **DIAG_2**

iii. Compare outcomes to expectations  
   **DIAG_3**

iv. Review key performance measures  
   **DIAG_4**

v. Enable the organisation to focus on critical success factors  
   **DIAG_5**

vi. Enable discussion in meetings of superiors, subordinates and peers  
   **INTERACT_1**

vii. Enable continual challenge and debate of underlying data, assumptions and action plans  
   **INTERACT_2**

viii. Provide a common view of the organisation  
   **INTERACT_3**

ix. Tie the organisation together  
   **INTERACT_4**

x. Develop a common vocabulary in the organisation  
   **INTERACT_5**

xi. Enable the organisation to focus on common issues and strategic uncertainties  
   **INTERACT_6**
Appendix C: Descriptive Statistics for Questionnaire Items

Section 2: Employee Involvement

**Question**

1 Provided below are some ways how employees within your organisation may interact with the organisation’s environmental controls and EMS. Please indicate the extent to which you agree or disagree with the following:

In our organisation, environmental controls and EMS:

i. Are designed to help employees adapt guidelines to real work processes

ii. Allow all employees to identify problems and suggest improvement opportunities

iii. Increase employees’ knowledge of environmental management activities in their area

iv. Outline key components of environmental management activities and provide best-practice routines

v. Help clarify the rationale behind environmental management activities

vi. Provide employees feedback on their actual performance against historical standards

vii. Allow changes to be made/suggested only by senior management

viii. Are designed to highlight to managers whether employees’ actions are in compliance

**Variable Code**

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<td>Help clarify the rationale behind environmental management activities</td>
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<td>Provide employees feedback on their actual performance against historical</td>
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2 The following items relate to how environmental controls and EMS assist employees within your organisation. Please indicate the extent to which you agree or disagree with the following:

In our organisation:

i. EMS help employees to understand the overall context within which they are working

ii. EMS help to communicate the firm’s environmental goals and objectives

iii. Operational managers use information generated by EMS to come up with ideas to improve operations under their control

iv. Employees often think of new ways of doing things when adopting EMS processes

v. Employees are able to modify environmental procedures and controls when they are considered inappropriate for the real work scenario

vi. Employees are able to implement environmental management processes beyond those specified in the EMS

vii. Employees have information only on the specific environmental management activities they are responsible for

viii. Discussion of environmental management activities focuses on ensuring strict adherence to original procedures and action plans

**Variable Code**

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<td>strict adherence to original procedures and action plans</td>
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Appendix C: Descriptive Statistics for Questionnaire Items

Section 3: Environmental Outcomes

**Question**

1. Provided below is a list of potential outcomes of your organisation’s environmental management activities. Please indicate the *extent to which the organisation’s environmental practices have led* to:

   i. Reduction in costs:
      - Input costs
      - Process/production costs
      - Costs of regulatory compliance

   ii. Improved operations:
      - Increased efficiency
      - Increased productivity
      - Increased knowledge about effective ways of managing operations
      - Process innovations

   iii. Improved product/service quality

   iv. Product/Service innovations

   v. Organisation-wide learning among employees

   vi. Improved employee morale

   vii. Improved overall business reputation or goodwill

   viii. Enhanced relationships with stakeholders such as local communities, regulators, and environmental groups

**Variable Code**

- OUTCOME_1
- OUTCOME_2
- OUTCOME_3
- OUTCOME_4
- OUTCOME_5
- OUTCOME_6
- OUTCOME_7
- OUTCOME_8
- OUTCOME_9
- OUTCOME_10
- OUTCOME_11
- OUTCOME_12
- OUTCOME_13

Section 4: Organisation Details

**Question**

1. **Name of your Organisation** (optional):

2. Number of FTE employees:
   - c < 100
   - c 101 - 500
   - c 501 – 2,000
   - c 2,001 – 10,000
   - c > 10,000

3. Business *ownership structure* (please tick ‘ü’ all that apply):
   - c ASX Publicly Listed
   - c Proprietary Company
   - c Government Enterprise
   - c Australian-Owned
   - c Foreign-Owned
   - c Other (please indicate)

4. **Primary industry** sector

**Variable Code**

- ORG_NAME
- NUM_EMPLOY
- OWN_PUBLIC
- OWN_PROP
- OWN_GOVT
- OWN_AUST
- OWN_FOREIGN
- OWN_OTHER
- INDUSTRY
Appendix C: Descriptive Statistics for Questionnaire Items

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<td>5  Please indicate your organisation’s <strong>performance compared to the goals</strong> set for each of the indicators below <strong>for the past 12 months</strong>:</td>
<td></td>
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<td>i. Sales volume</td>
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<td>ii. Cost control</td>
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</tr>
<tr>
<td>iii. Cash flow from operations</td>
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<td>iv. Operating profit</td>
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<td>v. Return on investment</td>
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<td>vi. Market share</td>
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Section 5: Demographic Details

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<td>3  <strong>Years</strong> worked in <strong>the organisation:</strong></td>
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<td>4  Your highest <strong>qualification:</strong></td>
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<td>c 25 - 34</td>
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<td>c 35 - 44</td>
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<td>c 45 - 54</td>
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<td>c 55+ years</td>
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<td>6  Your <strong>gender:</strong></td>
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<tr>
<td>c Female</td>
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<td>7  What proportion of your <strong>work time</strong> is spent dealing with environmental management activities:</td>
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<td>c 20 - 39%</td>
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<td>c 80 - 100%</td>
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</table>
Appendix C: Descriptive Statistics for Questionnaire Items

8 I feel that my current level of involvement in environmental management is:

(a) c Rare
c Insufficient
c About right
c Demanding
c Overwhelming
c No view

8 I feel that my current level of involvement in environmental management is:

(b) c Increasing a lot
c Increasing a little
c Not changing
c Decreasing a little
c Decreasing a lot
c No view

Question

Variable Code

WORK_VIEW

WORK_CHANGE
## C.2 Descriptive Statistics for Measured Items

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## Appendix C: Descriptive Statistics for Questionnaire Items

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Appendix D: One-factor Congeneric Models

D.1 One-factor Congeneric Model for ECS

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Scale reliability

- Cronbach’s Alpha: 0.889
- Ave Variance Extracted: 0.672
- Composite Reliability: 0.890

Goodness-of-fit measures

- Chi-square ($\chi^2$), degrees of freedom ($df$), probability level ($p$)
  $$\chi^2 = 5.881 \quad df = 2 \quad p = 0.053$$
- Normed-Chi-square ($\chi^2/df$), Bollen-Stine probability level (BSp)
  $$\frac{\chi^2}{df} = 2.941 \quad BSp = 0.107$$
- Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)
  $$GFI = 0.987 \quad AGFI = 0.934 \quad SRMR = 0.019$$
- Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value
  $$RMSEA = 0.094 \quad 90\% CI 0.000 - 0.186 \quad p = 0.147$$
- Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)
  $$TLI = 0.977 \quad CFI = 0.992$$
### D.2 One-factor Congeneric Model for IEO

#### Parameter estimates

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(* * *: Significant at p-value < 0.01)

#### Goodness-of-fit measures

- Chi-square ($\chi^2$), degrees of freedom ($df$), probability level ($p$)
  \[ \chi^2 = 4.410 \quad df = 2 \quad p = 0.110 \]
- Normed-Chi-square ($\chi^2/df$), Bollen-Stine probability level (BSp)
  \[ (\chi^2/df) = 2.205 \quad BSp = 0.212 \]
- Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)
  \[ GFI = 0.990 \quad AGFI = 0.950 \quad SRMR = 0.017 \]
- Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value
  \[ RMSEA = 0.074 \quad 90\% CI 0.000 - 0.170 \quad p = 0.245 \]
- Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)
  \[ TLI = 0.982 \quad CFI = 0.994 \]
Appendix D: One-factor Congeneric Models

D.3 One-factor Congeneric Model for *BELIEF*

### Parameter estimates

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<td>0.380</td>
<td>0.208</td>
</tr>
</tbody>
</table>

### Scale reliability

- Cronbach's Alpha: 0.887
- Ave Variance Extracted: 0.666
- Composite Reliability: 0.888

(***: Significant at p-value <0.01)

---

**Goodness-of-fit measures**

- Chi-square ($\chi^2$), degrees of freedom ($df$), probability level ($p$)
  \[ \chi^2 = 0.008 \quad df = 2 \quad p = 0.996 \]
- Normed-Chi-square ($\chi^2/df$), Bollen-Stine probability level (BSp)
  \[ (\chi^2/df) = 0.004 \quad BSp = 0.999 \]
- Goodness of fit index ($GFI$), Adjusted GFI ($AGFI$) & Standardised Root Mean-squared Residual ($SRMR$)
  \[ GFI = 1.000 \quad AGFI = 1.000 \quad SRMR = 0.007 \]
- Root Mean Square Error of Approximation ($RMSEA$), 90% confidence level & p-value
  \[ RMSEA = 0.000 \quad 90\% CI 0.000 - 0.000 \quad p = 0.998 \]
- Tucker-Lewis Index ($TLI$), & Comparative Fit Index ($CFI$)
  \[ TLI = 1.012 \quad CFI = 1.000 \]
Appendix D: One-factor Congeneric Models

D.4 One-factor Congeneric Model for *BOUND*

Parameter estimates

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOUND_1</td>
<td>0.907</td>
<td>0.084</td>
<td>10.788</td>
<td>&lt;0.01</td>
<td>0.668</td>
<td>0.446</td>
<td>0.554</td>
<td>0.104</td>
</tr>
<tr>
<td>BOUND_2</td>
<td>1.186</td>
<td>0.085</td>
<td>13.923</td>
<td>&lt;0.01</td>
<td>0.801</td>
<td>0.641</td>
<td>0.359</td>
<td>0.177</td>
</tr>
<tr>
<td>BOUND_3</td>
<td>1.288</td>
<td>0.077</td>
<td>16.728</td>
<td>&lt;0.01</td>
<td>0.907</td>
<td>0.823</td>
<td>0.177</td>
<td>0.423</td>
</tr>
<tr>
<td>BOUND_4</td>
<td>1.253</td>
<td>0.080</td>
<td>15.687</td>
<td>&lt;0.01</td>
<td>0.871</td>
<td>0.759</td>
<td>0.241</td>
<td>0.296</td>
</tr>
</tbody>
</table>

Scale reliability

* Cronbach’s Alpha 0.884
* Ave Variance Extracted 0.667
* Composite Reliability 0.888

(* * *: Significant at p-value < 0.01)

Goodness-of-fit measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square (χ²), degrees of freedom (df), probability level (p)</td>
<td>χ² = 5.393, df = 2, p = 0.067</td>
</tr>
<tr>
<td>Normed-Chi-square (χ²/df), Bollen-Stine probability level (BSp)</td>
<td>(χ²/df) = 2.697, BSp = 0.082</td>
</tr>
<tr>
<td>Goodness of fit index (GFI), Adjusted GFI (AGFI) &amp; Standardised Root Mean-squared Residual (SRMR)</td>
<td>GFI = 0.998, AGFI = 0.939, SRMR = 0.019</td>
</tr>
<tr>
<td>Root Mean Square Error of Approximation (RMSEA), 90% confidence level &amp; p-value</td>
<td>RMSEA = 0.088, 90% CI 0.000 - 0.181, p = 0.175</td>
</tr>
<tr>
<td>Tucker-Lewis Index (TLI), &amp; Comparative Fit Index (CFI)</td>
<td>TLI = 0.980, CFI = 0.993</td>
</tr>
</tbody>
</table>
Appendix D: One-factor Congeneric Models

D.5 One-factor Congeneric Model for DIAG

Parameter estimates

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIAG_1</td>
<td>1.373</td>
<td>0.077</td>
<td>17.824</td>
<td>&lt;0.01</td>
<td>0.919</td>
<td>0.884</td>
<td>0.116</td>
<td>0.159</td>
</tr>
<tr>
<td>DIAG_2</td>
<td>1.406</td>
<td>0.076</td>
<td>18.478</td>
<td>&lt;0.01</td>
<td>0.937</td>
<td>0.878</td>
<td>0.122</td>
<td>0.208</td>
</tr>
<tr>
<td>DIAG_3</td>
<td>1.484</td>
<td>0.079</td>
<td>18.758</td>
<td>&lt;0.01</td>
<td>0.945</td>
<td>0.893</td>
<td>0.107</td>
<td>0.228</td>
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<tr>
<td>DIAG_4</td>
<td>1.518</td>
<td>0.079</td>
<td>19.251</td>
<td>&lt;0.01</td>
<td>0.958</td>
<td>0.919</td>
<td>0.081</td>
<td>0.300</td>
</tr>
<tr>
<td>DIAG_5</td>
<td>1.337</td>
<td>0.081</td>
<td>16.604</td>
<td>&lt;0.01</td>
<td>0.881</td>
<td>0.776</td>
<td>0.224</td>
<td>0.105</td>
</tr>
</tbody>
</table>

Scale reliability

| Cronbach’s Alpha | 0.969 |
| Ave Variance Extracted | 0.870 |
| Composite Reliability | 0.971 |

(* * *: Significant at p-value <0.01)

Goodness-of-fit measures

| Chi-square ($\chi^2$), degrees of freedom (df), probability level (p) | $\chi^2 = 13.896$ | df = 5 | p = 0.016 |
| Normed-Chi-square ($\chi^2$/df), Bollen-Stine probability level (BSp) | ($\chi^2$/df) = 2.779 | BSp = 0.110 |
| Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR) | GFI = 0.976 | AGFI = 0.927 | SRMR = 0.009 |
| Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value | RMSEA = 0.090 | 90% CI 0.035 - 0.148 | p = 0.101 |
| Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI) | TLI = 0.988 | CFI = 0.994 |

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D.6 One-factor Congeneric Model for *INTERACT*

### Parameter estimates

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERACT_1</td>
<td>1.174</td>
<td>0.090</td>
<td>13.013</td>
<td>&lt;0.01</td>
<td>0.761</td>
<td>0.579</td>
<td>0.421</td>
<td>0.056</td>
</tr>
<tr>
<td>INTERACT_3</td>
<td>1.341</td>
<td>0.078</td>
<td>17.224</td>
<td>&lt;0.01</td>
<td>0.907</td>
<td>0.822</td>
<td>0.178</td>
<td>0.253</td>
</tr>
<tr>
<td>INTERACT_4</td>
<td>1.400</td>
<td>0.079</td>
<td>17.750</td>
<td>&lt;0.01</td>
<td>0.922</td>
<td>0.851</td>
<td>0.149</td>
<td>0.322</td>
</tr>
<tr>
<td>INTERACT_5</td>
<td>1.409</td>
<td>0.085</td>
<td>16.499</td>
<td>&lt;0.01</td>
<td>0.907</td>
<td>0.780</td>
<td>0.220</td>
<td>0.200</td>
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<tr>
<td>INTERACT_6</td>
<td>1.242</td>
<td>0.080</td>
<td>15.527</td>
<td>&lt;0.01</td>
<td>0.922</td>
<td>0.725</td>
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<tr>
<td>covar(e12, e13)</td>
<td>0.147</td>
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<td>2.551</td>
<td>0.011</td>
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### Scale reliability

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Ave Variance Extracted</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.939</td>
<td>0.751</td>
<td>0.938</td>
</tr>
</tbody>
</table>

(***: Significant at p-value <0.01)

### Goodness-of-fit measures

- Chi-square ($\chi^2$), degrees of freedom ($df$), probability level ($p$)
  
  \[
  \chi^2 = 11.356 \quad df = 4 \quad p = 0.023
  \]

- Normed-Chi-square ($\chi^2/df$), Bollen-Stine probability level (BSp)
  
  \[
  (\chi^2/df) = 2.839 \quad BS_p = 0.270
  \]

- Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)
  
  \[
  GFI = 0.980 \quad AGFI = 0.924 \quad SRMR = 0.016
  \]

- Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value
  
  \[
  RMSEA = 0.091 \quad 90\% CI = 0.031 - 0.156 \quad p = 0.111
  \]

- Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)
  
  \[
  TLI = 0.981 \quad CFI = 0.993
  \]
### Appendix D: One-factor Congeneric Models

#### D.7 First-order Simultaneous CFA Model for ENABLE

<table>
<thead>
<tr>
<th>Parameter estimates</th>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REPAIR</strong></td>
<td>REPAIR_1</td>
<td>1.016</td>
<td>0.075</td>
<td>13.522</td>
<td>&lt;0.01</td>
<td>0.806</td>
<td>0.650</td>
<td>0.350</td>
<td>0.269</td>
</tr>
<tr>
<td></td>
<td>REPAIR_2</td>
<td>1.011</td>
<td>0.076</td>
<td>13.299</td>
<td>&lt;0.01</td>
<td>0.796</td>
<td>0.633</td>
<td>0.367</td>
<td>0.252</td>
</tr>
<tr>
<td><strong>Scale reliability</strong></td>
<td>Cronbach's Alpha</td>
<td>0.781</td>
<td>Ave Variance Extracted</td>
<td>0.642</td>
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</tr>
<tr>
<td></td>
<td>Composite Reliability</td>
<td>0.782</td>
<td>Ave Variance Extracted</td>
<td>0.642</td>
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</tr>
<tr>
<td><strong>INTERNAL</strong></td>
<td>INTERNAL_1</td>
<td>1.111</td>
<td>0.077</td>
<td>14.489</td>
<td>&lt;0.01</td>
<td>0.817</td>
<td>0.668</td>
<td>0.332</td>
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<tr>
<td></td>
<td>INTERNAL_2</td>
<td>1.269</td>
<td>0.069</td>
<td>18.495</td>
<td>&lt;0.01</td>
<td>0.949</td>
<td>0.900</td>
<td>0.100</td>
<td>0.504</td>
</tr>
<tr>
<td></td>
<td>INTERNAL_3</td>
<td>1.158</td>
<td>0.073</td>
<td>15.769</td>
<td>&lt;0.01</td>
<td>0.86</td>
<td>0.739</td>
<td>0.261</td>
<td>0.174</td>
</tr>
<tr>
<td><strong>Scale reliability</strong></td>
<td>Cronbach's Alpha</td>
<td>0.907</td>
<td>Ave Variance Extracted</td>
<td>0.769</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Composite Reliability</td>
<td>0.909</td>
<td>Ave Variance Extracted</td>
<td>0.769</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GLOBAL</strong></td>
<td>GLOBAL_1</td>
<td>1.056</td>
<td>0.077</td>
<td>13.693</td>
<td>&lt;0.01</td>
<td>0.804</td>
<td>0.646</td>
<td>0.354</td>
<td>0.222</td>
</tr>
<tr>
<td></td>
<td>GLOBAL_2</td>
<td>1.088</td>
<td>0.076</td>
<td>14.269</td>
<td>&lt;0.01</td>
<td>0.826</td>
<td>0.683</td>
<td>0.317</td>
<td>0.253</td>
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<tr>
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<td>GLOBAL_3</td>
<td>0.988</td>
<td>0.090</td>
<td>11.004</td>
<td>&lt;0.01</td>
<td>0.686</td>
<td>0.470</td>
<td>0.530</td>
<td>0.116</td>
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<tr>
<td><strong>Scale reliability</strong></td>
<td>Cronbach's Alpha</td>
<td>0.814</td>
<td>Ave Variance Extracted</td>
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</tr>
<tr>
<td></td>
<td>Composite Reliability</td>
<td>0.817</td>
<td>Ave Variance Extracted</td>
<td>0.600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FLEX</strong></td>
<td>FLEX_1</td>
<td>0.877</td>
<td>0.103</td>
<td>8.504</td>
<td>&lt;0.01</td>
<td>0.644</td>
<td>0.415</td>
<td>0.585</td>
<td>0.215</td>
</tr>
<tr>
<td></td>
<td>FLEX_2</td>
<td>1.131</td>
<td>0.109</td>
<td>10.413</td>
<td>&lt;0.01</td>
<td>0.847</td>
<td>0.717</td>
<td>0.283</td>
<td>0.595</td>
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<tr>
<td><strong>Scale reliability</strong></td>
<td>Cronbach's Alpha</td>
<td>0.706</td>
<td>Ave Variance Extracted</td>
<td>0.566</td>
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</tr>
<tr>
<td></td>
<td>Composite Reliability</td>
<td>0.719</td>
<td>Ave Variance Extracted</td>
<td>0.566</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(***: Significant at p-value <0.01)**
Appendix D: One-factor Congeneric Models

Goodness-of-fit measures

- Chi-square ($\chi^2$), degrees of freedom $(df)$, probability level $(p)$
  \[ \chi^2 = 82.215 \quad df = 29 \quad p = 0.000 \]
- Normed-Chi-square ($\chi^2/df$), Bollen-Stine probability level (BSp)
  \[ \chi^2/df = 2.835 \quad BSp = 0.071 \]
- Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)
  \[ GFI = 0.926 \quad AGFI = 0.860 \quad SRMR = 0.037 \]
- Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value
  \[ RMSEA = 0.091 \quad 90\% CI 0.069 - 0.115 \quad p = 0.002 \]
- Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)
  \[ TLI = 0.939 \quad CFI = 0.960 \]
Appendix D: One-factor Congeneric Models

D.8 One-factor Congeneric Model for *ECO_EFF*

### Parameter estimates

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECO_EFF</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUTCOME_1</td>
<td>0.942</td>
<td>0.101</td>
<td>9.287</td>
<td>&lt;0.01</td>
<td>0.592</td>
<td>0.350</td>
<td>0.650</td>
<td>0.031</td>
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<tr>
<td>OUTCOME_2</td>
<td>1.088</td>
<td>0.094</td>
<td>11.572</td>
<td>&lt;0.01</td>
<td>0.704</td>
<td>0.495</td>
<td>0.505</td>
<td>0.078</td>
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<tr>
<td>OUTCOME_4</td>
<td>1.304</td>
<td>0.074</td>
<td>17.557</td>
<td>&lt;0.01</td>
<td>0.929</td>
<td>0.862</td>
<td>0.138</td>
<td>0.496</td>
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<tr>
<td>OUTCOME_5</td>
<td>1.271</td>
<td>0.079</td>
<td>16.031</td>
<td>&lt;0.01</td>
<td>0.876</td>
<td>0.767</td>
<td>0.233</td>
<td>0.269</td>
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<td>OUTCOME_7</td>
<td>1.037</td>
<td>0.082</td>
<td>12.610</td>
<td>&lt;0.01</td>
<td>0.747</td>
<td>0.557</td>
<td>0.443</td>
<td>0.126</td>
</tr>
<tr>
<td>covar(e1, e2)</td>
<td>0.597</td>
<td>0.114</td>
<td>5.246</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Scale reliability

- **Cronbach’s Alpha**: 0.888
- **Ave Variance Extracted**: 0.606
- **Composite Reliability**: 0.883

(***: Significant at p-value <0.01)

### Goodness-of-fit measures

- Chi-square ($\chi^2$), degrees of freedom ($df$), probability level ($p$)
  \[ \chi^2 = 11.714 \quad df = 4 \quad p = 0.020 \]

- Normed-Chi-square (\(\chi^2/df\)), Bollen-Stine probability level (BSp)
  \[ (\chi^2/df) = 2.929 \quad BSp = 0.159 \]

- Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)
  \[ GFI = 0.980 \quad AGFI = 0.924 \quad SRMR = 0.027 \]

- Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value
  \[ RMSEA = 0.094 \quad 90\% CI 0.034 - 0.158 \quad p = 0.100 \]

- Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)
  \[ TLI = 0.971 \quad CFI = 0.988 \]
Appendix D: One-factor Congeneric Models

D.9 One-factor Congeneric Model for CAPABILITY

Parameter estimates

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPABILITY</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>OUTCOME_9</td>
<td>0.887</td>
<td>0.098</td>
<td>9.077</td>
<td>&lt;0.01</td>
<td>0.599</td>
<td>0.358</td>
<td>0.642</td>
<td>0.111</td>
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<tr>
<td>OUTCOME_10</td>
<td>1.030</td>
<td>0.082</td>
<td>12.537</td>
<td>&lt;0.01</td>
<td>0.770</td>
<td>0.593</td>
<td>0.407</td>
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<td>OUTCOME_11</td>
<td>1.081</td>
<td>0.079</td>
<td>13.716</td>
<td>&lt;0.01</td>
<td>0.824</td>
<td>0.680</td>
<td>0.320</td>
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<td>OUTCOME_12</td>
<td>0.951</td>
<td>0.076</td>
<td>12.439</td>
<td>&lt;0.01</td>
<td>0.767</td>
<td>0.589</td>
<td>0.411</td>
<td>0.234</td>
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<tr>
<td>OUTCOME_13</td>
<td>0.833</td>
<td>0.092</td>
<td>9.072</td>
<td>&lt;0.01</td>
<td>0.609</td>
<td>0.371</td>
<td>0.629</td>
<td>0.061</td>
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<tr>
<td>covar(e12, e13)</td>
<td>0.319</td>
<td>0.082</td>
<td>3.891</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scale reliability

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Ave Variance Extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.848</td>
<td>0.518</td>
</tr>
</tbody>
</table>

Composite Reliability 0.841

(***: Significant at p-value <0.01)

Goodness-of-fit measures

Chi-square ($\chi^2$), degrees of freedom (df), probability level ($p$)

\[ \chi^2 = 2.702 \quad df = 4 \quad p = 0.609 \]

Normed-Chi-square ($\chi^2$/df), Bollen-Stine probability level (BSp)

\[ (\chi^2/df) = 0.675 \quad BSp = 0.741 \]

Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)

\[ GFI = 0.995 \quad AGFI = 0.982 \quad SRMR = 0.012 \]

Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value

\[ RMSEA = 0.000 \quad 90\% CI = 0.000 - 0.085 \quad p = 0.802 \]

Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)

\[ TLI = 1.007 \quad CFI = 1.000 \]
D.10 One-factor Congeneric Model for \textit{ECON\_PERF}

### Parameter estimates

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Factor Loading (std.)</th>
<th>Item Reliability (SMC)</th>
<th>Error Variance</th>
<th>Factor Score Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{ECON_PERF}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{ECON_PERF_1}</td>
<td>0.994</td>
<td>0.080</td>
<td>12.484</td>
<td>&lt;0.01</td>
<td>0.739</td>
<td>0.546</td>
<td>0.454</td>
<td>0.106</td>
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<tr>
<td>\textit{ECON_PERF_2}</td>
<td>0.883</td>
<td>0.075</td>
<td>11.836</td>
<td>&lt;0.01</td>
<td>0.710</td>
<td>0.504</td>
<td>0.496</td>
<td>0.100</td>
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<td>\textit{ECON_PERF_4}</td>
<td>1.287</td>
<td>0.076</td>
<td>16.857</td>
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<td>0.902</td>
<td>0.814</td>
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<tr>
<td>\textit{ECON_PERF_5}</td>
<td>1.223</td>
<td>0.068</td>
<td>17.866</td>
<td>&lt;0.01</td>
<td>0.935</td>
<td>0.874</td>
<td>0.126</td>
<td>0.509</td>
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</tbody>
</table>

**Scale reliability**

- **Cronbach’s Alpha** 0.891
- **Ave Variance Extracted** 0.685
- **Composite Reliability** 0.895

(***: Significant at p-value <0.01)

#### Goodness-of-fit measures

- **Chi-square ($\chi^2$), degrees of freedom (df), probability level (p)**
  \[
  \chi^2 = 3.756 \quad df = 2 \quad p = 0.153
  \]
- **Normed-Chi-square ($\chi^2$/df), Bollen-Stine probability level (BSp)**
  \[
  (\chi^2$/df) = 1.878 \quad BSp = 0.287
  \]
- **Goodness of fit index (GFI), Adjusted GFI (AGFI) & Standardised Root Mean-squared Residual (SRMR)**
  \[
  GFI = 0.992 \quad AGFI = 0.958 \quad SRMR = 0.018
  \]
- **Root Mean Square Error of Approximation (RMSEA), 90% confidence level & p-value**
  \[
  RMSEA = 0.063 \quad 90\% CI \quad 0.000 - 0.161 \quad p = 0.306
  \]
- **Tucker-Lewis Index (TLI), & Comparative Fit Index (CFI)**
  \[
  TLI = 0.991 \quad CFI = 0.997
  \]

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Appendix E: Semi-Structured Interviews

E.1 Plain Language Statement and Consent Form

PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO:

Plain Language Statement

Date: [Blank]

Full Project Title: Using Eco-controls to Implement Environmental Strategy and Improve Firm Performance

Principal Researcher: Professor Nava Subramaniam

Student Researcher: Mr. Campbell Heggen

Associate Researcher(s): Associate Professor VG Sridharan

You are invited to take part in this research project. Participation in any research project is voluntary. If you do not wish to take part you are not obliged to. Deciding not to participate will not affect your relationship to the researchers or Deakin University. Once you have read this form, please sign the attached consent form. You may keep this copy of the Plain Language Statement.

The purpose of this research is to investigate whether and how organisations incorporate environmental management issues into internal management systems and procedures. The research findings will be published in academic journals and the doctoral thesis of the student researcher. No corporate institution or individual will be able to be identified in any publication. The possible benefits of the study include a clearer understanding of how the design and use of internal planning, monitoring and control systems foster improvement in firm environmental and economic performance.

With your consent, your participation in the project will involve an interview of approximately 45 minutes to 1 hour. We wish to voice record the interview. If you do not wish this to occur, we will take handwritten notes of the interview. You may of course decide to stop the interview at any point. You may also ask, up to the time of publication, that any information collected in your interview be destroyed and not used for the research. Your interview will cover a range of topics including:
Appendix E: Semi-Structured Interviews

– How long-term environmental goals and plans are developed and monitored within the organisation;
– The type and nature of environmental management practices adopted by the organisation;
– The use of environmental considerations within internal management reports and controls, and;
– Whether and how environmental management systems foster environmental and economic performance.

Data collected during the research project will only be used by the researchers for the purpose of the research project specified above, and any dissemination of the information will be provided in such a manner that participants cannot be identified. Accordingly, the attached consent form requests your specific consent to use the information you provide for this research project only.

All data collected from participants will be stored securely for a period of a minimum of six (6) years after final publication. The researchers will keep and continue to maintain the confidentiality of the data until the project is complete, and the data may be destroyed. Participants will be given the opportunity to review a copy of the transcript of their interview, to ensure accuracy and completeness of the information provided. Summary information on the results will be made available to all participating institutions where requested. However, data collected during individual interviews will remain confidential and will not be made available to other participants or any further members of the participating institution.

Approval to undertake this research project has been given by the Human Research Ethics committee of Deakin University. If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact: The Manager, Office of Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: +61 3 9251 7129, Facsimile: +61 3 9244 6581; research-ethics@deakin.edu.au

Please quote project number BL-EC 13-11

If you require further information or if you have any problems concerning this project, you can contact either of the principal researchers. The researchers responsible for this project are:

Mr. Campbell Heggen
Deakin University
School of Accounting, Economics & Finance
70 Elgar Road
Burwood, VIC 3125
Ph: 044 885 2727
@: campbell.heggen@deakin.edu.au

Professor Nava Subramaniam
Deakin University
School of Accounting, Economics & Finance
70 Elgar Road
Burwood, VIC 3125
Ph: +61 3 9251 7288
@: nava.subramaniam@deakin.edu.au
Appendix E: Semi-Structured Interviews

PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO:

Consent Form

Date:  

Full Project Title:  Using Eco-controls to Implement Environmental Strategy and Improve Firm Performance

Reference Number:  BL-EC 13-11

I have read and I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement and Consent Form to keep.

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Name of person giving consent (printed)  ………………………… …………………………….....................

Signature  ………………………………………………………........... Date  …………………………

Please mail or email (scanned) this form to:

Campbell Heggen  
Deakin University  
School of Accounting, Economics and Finance  
70 Elgar Road  
Burwood, VIC  3125  
Email:  campbell.heggen@deakin.edu.au
Appendix E: Semi-Structured Interviews

PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO:

Revocation of Consent Form

Date: _ _ - _ _ - 2011
Full Project Title: Using Eco-controls to Implement Environmental Strategy and Improve Firm Performance
Reference Number: BL-EC 13-11

I hereby wish to WITHDRAW my consent to participate in the above research project and understand that such withdrawal WILL NOT jeopardise my relationship with Deakin University or the researchers.

Name of person giving consent (printed) .................................................................

Signature ................................................................. Date .................................

Please mail or email (scanned) this form to:

Campbell Heggen
Deakin University
School of Accounting, Economics and Finance
70 Elgar Road
Burwood, VIC 3125
Email: campbell.heggen@deakin.edu.au
Appendix E: Semi-Structured Interviews

E.2 Interview Participant Questionnaire

Interview participant questionnaire

(Interviewee to complete)

About You

Current Job title: ____________________________________________

Years worked in current role: ___________ years

Years worked in the organisation: ___________ years

Highest qualification: ____________________________________________

Age group:  
☐ 25 - 35  ☐ 35 - 44  ☐ 45 - 54  ☐ 55+ years

Gender:  
☐ Male  ☐ Female

What proportion of your work time is spent dealing with environmental management:

☐ None  ☐ 1 - 19%  ☐ 20 - 39%  ☐ 40 - 59%  ☐ 60 - 79%  ☐ 80 - 100%

Do you personally feel that your level of involvement in environmental management is:

[Please answer both sections (a) AND (b)]

(a)  ☐ Insufficient  ☐ About right  ☐ Too involved  ☐ No view

(b)  ☐ Increasing  ☐ Not changing  ☐ Decreasing  ☐ No view

About Your Organisation

Approximate total number of employees:

☐ 1 - 5  ☐ 6 - 25  ☐ 26 - 100  ☐ 101 - 250  ☐ more than 250
E.3 Sample Semi-structured Interview Guide

[Company Name]
Meeting with [Job Title]
[Interview Participant]
[Address]

Interview Scope:

This study is concerned with the strategic approaches adopted by firms in managing the impact of their operations and activities on the environment. This includes understanding the effective and efficient use of various resources such as water and energy; controlling emissions and wastes; and considerations for the overall natural environment.

Questions (Interviewee copy):

1. Briefly describe your role within the organisation.

2. Environmental goals of the organisation: what (goals) and why (motivations)?

3. How are (specific) environmental plans developed: who (people), what (roles) and why (roles)?

4. How are environmental plans implemented within the organisation: who (people), what (controls) and why (controls)?

5. How is environmental performance evaluated: who (people), what (measures), when (frequency)?

6. Is there anything else you wish to add?
Appendix E: Semi-Structured Interviews

[Company Name]
Meeting with [Job Title]
[Interview Participant]
[Address]

Questions (Interviewer copy):

1. Could you please begin by briefly describing your role with HVP?
   Prompt: your involvement in the firm's environmental management activities?

2. How would you describe the strategic approach adopted by HVP in managing the environmental impact of their operations? : what (goals) and why (motivations)?
   Prompt: internal / external factors which influence goals
   are they formally stated? where? who is aware of them?

3. How are (specific) environmental plans developed: who (people), what (roles) and why (roles)?
   Prompt: how and when are environmental issues identified?
   where do ideas come from? i.e., senior management or firm-wide
   are plans discussed, debated and challenged within the organisation?
   what are the key factors in determining whether a new policy or project will be adopted?
   how are performance levels / benchmarks set?

4. How are environmental plans implemented within the organisation: who (people), what (controls) and why (controls)?
   Prompt: how are plans conveyed to staff/contractors?
   what methods are used to align employee behaviour with environmental policies? i.e., training
   are there any employee incentives for environmental performance?

5. How is environmental performance evaluated: who (people), what (measures), when (frequency)?
   Prompt: what are the KPI's implemented in your area?
   how is performance information used?
   does current performance data influence future policy development?

6. Is there anything else you wish to add?


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