The Role of IS-enabled Capabilities in Corporate Sustainability: Evidence from China

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DECLARATION

I hereby declare that this thesis represents my own work which has been done after registration for the degree of PhD at Hong Kong Baptist University, and has not been previously included in a thesis, dissertation submitted to this or other institution for a degree, diploma or other qualification.

Signature: ___________________

Date: August 2011

ABSTRACT

As the natural environment deteriorates in recent years, many companies consider the practice of corporate sustainability as the best option of competitive strategies to help them not only to reduce global warming with complying local government regulations but also to achieve a competitive advantage for organizations. Information systems (IS), which integrates people, process and information technologies together, is said to serve as an enabler for organizational capabilities (we call it as IS-enabled capabilities) that has a direct impact on the practice of corporate sustainability. The aim of this thesis is to gain a better understanding of the role of IS-enabled capabilities in a company's corporate sustainability practice. In particular, this study considers corporate sustainability is represented by three dimensions; namely, social, economic, and environmental developments.

This study examines the above objective in three procedural steps. The first step is to examine the prerequisite requirement of our proposed model, which is to verify if IS-enabled capabilities have direct relationships to each of the three dimensions of corporate sustainability. The second step is to decompose our proposed model into three separate sub-models – we label them as mediating models – with each one is to examine the "trade-off" effects between a pair of the three dimensions when the construct of IS-enabled capabilities is used as an influence factor on them. The third step is to verify our proposed model by using the outcome of mediating models to serve as our input components for our research models. Our research model is thus derived by combining the results from three mediating models so that we could examine the effects of IS-enabled capabilities on the three dimensions of corporate sustainability.

We verify our research model by using a data-set collected in China. A total of 314 questionnaires are collected from Chinese managers who enrolled their MBA classes in Nanjing University in the Southeast of China.

We develop the measurement items of our constructs through an extensive literature survey. All measurement items undergo vigorous tests of factor analysis and construct validity. At the end, we identify that the proposed construct of IS-enabled capabilities can be represented by two newly constructs; and we label them as IS-enabled innovative learning (ISEIL) and IS-enabled system competitiveness (ISESC).

We test our proposed model by using statistical technique of structural equation modelling (SEM). We confirm that IS-enabled capabilities – which are represented by ISEIL and ISESC – have direct effects on each of three dimensions of corporate sustainability. We also confirm that both social and environmental developments are two dimensions that mediate the relationship between IS-enabled capabilities and economic development.

To conclude, this thesis makes two main contributions. First, it is the first study confirming a set of measurement items for constructs of the IS-enabled capabilities and corporate sustainability. These refined measurement items render

as a useful measurement tool for future researches. Second, it is also the first study verifying empirically the influence of IS-enabled capabilities on the practice of corporate sustainability.

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CHAPTER 1 INTRODUCTION

This chapter presents the objective, justifications, and the organization of this thesis. It composes of the following sections:

a) Purpose, Scope, and Research Justifications;
b) Overview of the Research Models; and
c) Organization of this Thesis.

1.1 Purpose, Scope and Research Justifications

The main objective of this thesis is to develop a confirmatory model for corporate sustainability and to examine the influencing role of Information Systems (IS)-enabled capabilities on corporate sustainability. In this thesis, IS-enabled capabilities refer to a firm's overall competencies that are enabled by IS in which all valuable assets are coordinated effectively so that a better corporate performance can be enhanced (Chan, 2005; Sethi and King, 1994; Sharma and Vredenburg, 1998). Corporate sustainability is represented by the sustainable dimensions of social, economic and environmental developments.

As the natural environment deteriorates in recent years, all countries worldwide have now paid attention to the concept of sustainability that would help to revitalize the quality of living condition on the earth. Corporates worldwide have also actively involved in the practice of sustainability for the following three reasons. The first one is to help to reduce global warming voluntarily, the second one is to comply with government regulations, and the third one is to enrich organizations economically by labelling them as a green company (Hart, 1995). Corporate sustainability refers as a business strategy to which organizations implement the practice of sustainability by meeting the needs of organizational stakeholders without compromising the resources and interests of the local community (Dyllick and Hockerts, 2002).

The research interests of corporate sustainability are mainly focused on the effects of triple bottom line on organizational performance. The triple bottom line in corporate sustainability is referred to the dimensions of social, economic, and environment developments (Elkington, 1997; Melville, 2010). Many literatures have claimed that all these three dimensions should be treated all together when one practices corporate sustainability (Bansal, 2005; Dyllick and Hockerts, 2002). However, most recent publications would still be quantified corporate sustainability models by considering these three dimensions independently. For example, literature which concentrates on only the environmental development includes Chan (2005) and Christmann (2000). Other authors who emphasize in social and economic developments together are Kelm et al. (1995) and Ulaga (2003). Researchers claim that corporate sustainability can be measured in three dimensions of social, economic, and environmental developments. However, there is a lack of literature to integrate them together. The main reasons may due to: (1) The measurement items of these three dimensions are still inconclusive (Baumgartner and Ebner, 2010); and (2) it is difficult to identify corporates that are exercising these dimensions together (Labuschagne et al., 2005). Bansal (2005) is perhaps the first paper attempted to operationalize these three dimensions together through interviews with the forestry industry. In this thesis, we attempt to revisit the significance of these three dimensions of corporate sustainability in practice by firstly conducting an extensive literature survey by following the work of Bansal (2005) as a referral note, and then validating our measurement items by using the statistical method of factor analysis.

Information systems (IS) has always been considered as an important player that contributes the improvement of organizational performance (Sambamurthy et al., 2003). Recent literature has started to link the importance of IS to the performance of corporate sustainability (Melville, 2010; Pavlou and El Sawy, 2010). This thesis follows the definition of IS provided by Melville (2010).

Melville (2010) defines in the following:

> "An information system is a combination of people, processes, and technologies that enable the processing of digitized information" (p. 3).

Melville (2010) has also proposed a research agenda by stating that IS, which is serving as a critical role in organizations, can play a significant role in shaping up on individuals' behaviors about corporate sustainability. Watson et al. (2010) demonstrate theoretically on how the transformative power of IS can be leveraged and created the added values for corporate sustainability. So far, there is a lack of literature to quantify on how IS can be measured as an enabler in shaping up the performance of corporate sustainability. Mata et al. (1995) point out that IS could be served as a key enabler for organizational capabilities. This thesis follows this doctrine and conducts a research study on how IS enabler has an effect on corporate sustainability. Our IS measurement is based on how IS could serve as an enabler for organizational capabilities, and this thesis forms this construct as IS-enabled capabilities. Therefore, our research questions are to examine whether the construct of IS-enabled capabilities has a significant impact on corporate sustainability. If so, how IS-enabled capabilities could effect on corporate sustainability? The objective of this thesis is thus to develop a theoretical framework that confirms the impact of IS-enabled capabilities in corporate sustainability.

1.2 Overview of the Research Models

This thesis develops a theoretical framework that evaluates the significant contributions of IS-enabled capabilities on a company's corporate sustainability. This thesis firstly develops and then confirms the measurement scales of corporate sustainability and IS-enabled capabilities by using the statistical methods of exploratory factor analysis and confirmatory factor analysis. The measurement items for the three dimensions of corporate sustainability are obtained from an extensive literature review. The measurement items of IS-enabled capabilities are based on the measurement items of organizational capabilities that collected from literature of the "resource-based view". In this thesis, we consider corporate sustainability is represented by three dimensions – social, economic, and environmental developments. Our proposed models are then generally referred to the study of 1) the relationship between IS-enabled capabilities and three dimensions of corporate sustainability, and 2) the relationships within three dimensions of corporate sustainability.

In analysing the relationships in our proposed models, the statistical method of Structural Equation Modelling (SEM) is adopted. The SEM permits one to firstly verify the significance of measurement items for each proposed construct and then to confirm the relationships of the proposed models. The verification of the proposed models is based on the data collected from a questionnaire survey in China.

1.3 Organization of this Thesis

This thesis is organized into seven chapters. The objective and the overview of the research models are introduced in Chapter 1. Chapter 2 presents the literature review on the relevant issues of this thesis, including sustainability, corporate sustainability, and the concept of IS, organizational capabilities, and corporate sustainability. The research models and the hypotheses are described in Chapter 3. Chapter 3 also describes the methodology that is adopted to study the proposed research models. Chapter 4 describes the sample profiles of respondents. The results findings of the proposed models are shown in Chapter 5. Chapter 6 presents the discussions and implications. Chapter 7, the last chapter, draws a conclusion on the overall findings, contributions, limitations, and future research directions of this thesis.

CHAPTER 2 LITERATURE REVIEW

This chapter reviews the existing literature that is directly related to this thesis, and it contains the following sections:

a) Sustainability and its Development;

b) Corporate Sustainability; and

c) IS, Organizational Capabilities, and Corporate Sustainability.

2.1 Sustainability and its Development

The first part of this section relates to a literature review that bases on the historical development of sustainability. It also includes definitions and different categorizations of sustainability.

2.1.1 Definitions and Development of Sustainability

The term "sustainability" is used in many different ways. Its definitional diversity is expected during the emergent phase of a radically new idea (Gladwin et al., 1995). The concept of sustainability has been emerged in the 1960s in response to the concern about environmental degradation because of the poor resource management. The study of sustainability has now been a central of philosophy and epistemology (Gladwin et al., 1995). The definitions of sustainability in literature have also been evolved in according to the development of sustainability theory and its applications worldwide.

As the natural environment has become as increasingly important as a world issue, the sustainability is adopted as a common political goal. In 1960, the Organization for Economic Cooperation and Development (OECD) was formed and its mission is to promote policies that would achieve "the highest sustainable economic growth and employment in member countries in order to stimulate employment and increase living standards" (Sustainability, 2001, p. 4).

In early 1980, the theme of sustainability is focused more on the environmental protection and the life support systems maintenance, including those of human beings. The International Union for the Conservation of Nature defines the sustainability as "main agents of habitat destruction and environmental degradation as poverty, population pressure, social inequity and the terms of trade" (IUCN et al., 1980, p. 8).

In 1987, the Brundtland Commision presents a strategic report named as *Our common future (1987)* and defines the sustainability as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 43). Sustainability is thus referred to the development that is more focusing on people, profit and planet; and these three elements are termed as the "triple bottom line" (Elkington, 1997). According to this definition proposed by Brundtland Commision, the sustainability is understood as a harmonious state in which the needs of human (e.g., business, society) can be met without doing harm to the ecological systems (Winsemius and Guntram, 2002).

Now, the definition of sustainability which initiated by the WCED (1987) has been broadly adopted across the nations worldwide. Following this fundamental definition, many business studies have now expanded their definitions of the sustainability to suit for their purposes. As a result, there is a host of different definitions of the sustainability and its philosophies circulating in the literature and around corporations worldwide. For example, the sustainability is regarded as "a process of achieving human development in an inclusive, connected, equitable, prudent, and secure manner" (Gladwin et al., 1995, p. 877), "the result of the growing awareness of the global links between mounting environmental problems, socio-economic issues to do with poverty and inequality and concerns about a healthy future for humanity" (Hopwood et al., 2005, p. 39), and the "development that enables the systems in that it is located to maintain a state of health that is necessary for survival at a higher level of quality" (Ko, 2005, p. 435). Table 2.1 presents a literature of which we surveyed about the different versions of definition of the sustainability.

Table 2.1 Definitions of Sustainability

Sources	Definitions of Sustainability
Hopwood et al., 2005	Sustainability is "the result of the growing awareness of the global links between mounting environmental problems, socio-economic issues to do with poverty and inequality and concerns about a healthy future for humanity."
Ko, 2005	Sustainability is the "development that enables the system in that it is located to maintain a state of health that is necessary for survival at a higher level of quality."
Szekely and Knirsch, 2005	"Sustainability is about building a society in which a proper balance is created between economic, social and ecological aims."
Goodland and Daly, 1996	Sustainability is the "development without growth in throughput of matter and energy beyond regenerative and absorptive capacities."
Gladwin et al., 1995	Sustainability is "a process of achieving human development in an inclusive, connected, equitable, prudent, and secure manner."
UNEP, 1991	Sustainability is about "improving the quality of living of human life while living within the carrying capacity of supporting ecosystems".
WCED, 1987	The World Commission on Environment and Development officially defined sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

2.1.2 Different Categorizations of Sustainability

There are many different approaches to classify and distinguish the concept of sustainability. Table 2.2 reveals the three most common categorizations of sustainability, and we briefly review them here.

Most studies have modelled their sustainability by considering the social, economic, and environmental developments (e.g., Assefa and Frostell, 2007). Social sustainability is referred to the progress of sustainability which enables all human beings to (1) satisfy their essential needs, (2) achieve a reasonable level of comfort, (3) live lives of meaning and interest, and (4) share fairly in opportunities for health and education (Assefa and Frostell, 2007; Chiu, 2003). Economic sustainability is related to the means by which a society should balance the need of human and the availability of natural resources as a form of the pursuit of human welfare (Assefa and Frostell, 2007; Jennings and Zandbergen, 1995). In here, profits and economic growth are two essential elements for the sustainability (Assefa and Frostell, 2007). Environmental sustainability is concerned about the natural capital that it must be maintained, both as a provider of input and as a "sink" sources for a waste management program (Assefa and Frostell, 2007; Chiu, 2003; Jennings and Zandbergen, 1995). Their functions include the goals that are to (1) stabilize the climate within safe ecological limits, (2) reduce the flow of material through conservation, (3) decrease toxic waste loads on the environment, (4) ease the pressure and fresh water resources, and (5) maintain the integrity of ecosystems (Raskin, 2000).

Another categorization of the sustainability considers the commitment of environmental sustainability to be a weak or strong one (Dietz and Neumayer, 2007; Haughton and Hunter, 1994). The difference between the weak and strong sustainability is mainly surrounding to the level of substitutability in environmental issues (Hopwood et al., 2005). A strong sustainability refers to the sustainability under which human and natural capital are the main concern issue

(Dietz and Neumayer, 2007). It is referred to the human-made capital that cannot be replaced with a multitude of processes, such as the ozone layer or water cycle (Rees, 2003). A weak sustainability refers to the sustainability under which a natural capital is similar to a produced capital but can be easily substituted. A weak sustainability sees the natural and manufactured capital as an interchangeable resource with the help of technology (Daly and Cobb, 1989).

The last categorization of sustainability refers to a level of societal involvement. Dyllick and Hockerts (2002) suggest that this sustainability has involved with four different levels: global, national, local and corporate sustainability. Global sustainability is about the sustainability on a global scale. It includes events such as the protection of biodiversity and climate change, free trade on global scale, and alleviation poverty and inequality (Dyllick and Hockerts, 2002). National sustainability is about the sustainability on the level of individual countries. Local sustainability is about the sustainability on a local authority scale. One example is referred to such that German municipalities would have their sustainable practices (Dyllick and Hockerts, 2002). Corporate sustainability is referred to the sustainability on a firm level (Dyllick and Hockerts, 2002).

Table 2.2 Different Categorizations of Sustainability

Sustainability Categories	Definitions	References
Social sustainability	Progress toward enabling all human beings to satisfy their essential needs; to achieve a reasonable level of comfort; to live lives of meaning and interest; and to share fairly in opportunities for health and education	Assefa and Frostell, 2007; Chiu, 2003; Jennings and Zandbergen, 1995
Economic sustainability	The means by which society uses human and natural resources in the pursuit of human welfare	
Environmental sustainability	Natural capital must be maintained, both as a provider of inputs ("sources"), and as a "sink" for waste.	
Strong sustainability	Sustainability under the assumption that natural capital is to a greater or lesser extent non-substitutable.	Dietz and Neumayer, 2007
Weak sustainability	Sustainability under the assumption that natural capital is similar to produced capital and could be easily substituted for it.	
Global sustainability	About sustainability on global scale	Dyllick and Hockerts, 2002
National sustainability	About sustainability on government scale	
Local sustainability	About sustainability on local authority scale	
Corporate sustainability	About sustainability at the firm level	

2.2 Corporate Sustainability

Corporate sustainability is generally considered as a subset of the sustainability and it can be seen as a transfer of the idea of global sustainability onto a business environment (Baumgartner and Ebner, 2010). Corporate sustainability has attracted more and more attention from both practitioners and academic scholars because corporate – from the tiny one-person proprietorship to the largest of corporations – has played a significant role of responsibility towards a society as a whole (Hart, 1997). Nowadays, the corporate, as the most important constituent in business and society, is facing a challenge of changing from a traditional business development to a sustainable development. This field of research interests in sustainable development includes corporate social responsibility (Carroll, 2000), business strategy and the environment (Hart, 1995), eco-efficiency (Chen et al., 2008), societal learning (Waddell, 2002), corporate governance (Wheeler and Davies, 2004), and numerous other streams of research.

In the following, we review definitions, dimensions, and modelling of corporate sustainability.

2.2.1 Definitions of Corporate Sustainability

Corporate sustainability is considered as a broad, multi-dimensional, and multi-disciplinary concept. It has been influenced by a variety of research disciplines such as social science, management science, ecological science (Etzion, 2007; Mulder and Van Den Bergh, 2001). As a result, there is a host of different definitions of corporate sustainability and philosophies circulating in the literature for corporations worldwide. Table 2.3 portrays a list of different definitions of corporate sustainability that we have gathered from a literature review. Most of these definitions are mainly based on the work from the WCED (1987). Dyllick and Hokerts (2002) propose corporate sustainability be defined as "meeting the needs of a firm's direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities etc.), without compromising its ability to meet the needs of future stakeholders as well" (Dyllick and Hockerts, 2002, p. 131). This latter definition has now been commonly cited by many researchers. A company is considered as a sustainable company if it will "not use natural resources more quickly than they can be renewed naturally, than ecosystems' regenerative rates are exceeded before new technologies or sustainable resources can replace, or than recycling rates" (Townsend, 2004, p. 6).

Table 2.3 Definitions of Corporate Sustainability

Sources	Definitions of Corporate Sustainability
Yilmaz and Flouris, 2010	"Corporate sustainability is a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social development."
Will, 2008	Corporate sustainability is "an approach to enhance competitive position by taking opportunities and managing sustainability risks drawn from global trends to ensure that the needs of direct and indirect stakeholders will be met today and in future".
Van Marrewijk, 2003	Corporate sustainability refers to "a company's activities- voluntary by definition-demonstrating the inclusion of social and environmental concerns in business operations and in interactions with stakeholders".
Russo, 2003	"Ecological sustainable industry is a collection of organizations, with a commitment to economic and environmental goals, whose members can exist and flourish (either unchanged or in evolved forms) for lengthy time-frames, in such a manner that the existing and flourishing of other collectivities of entities is permitted at related levels and in related systems."
Dyllick and Hockerts, 2002	Corporate sustainability can be defined as "meeting the needs of a firm's direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities etc.), without compromising its ability to meet the needs of future stakeholders as well".

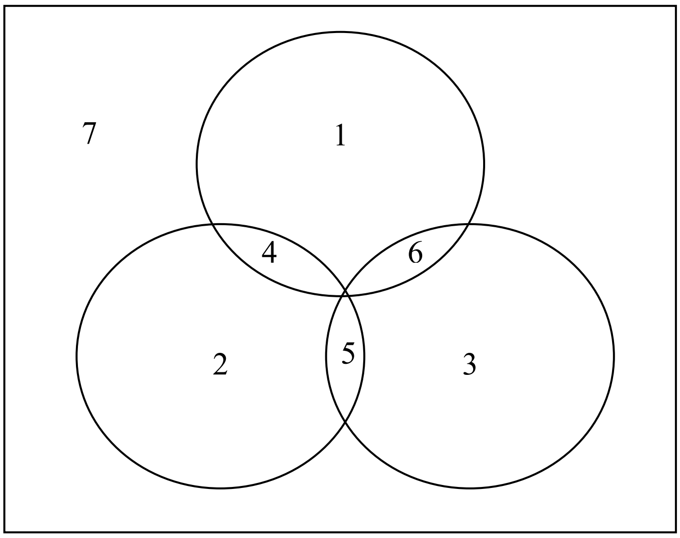
2.2.2 Dimensions of Corporate Sustainability

The concept of corporate sustainability is understood intuitively, however, it remains difficult to be expressed in concrete operational terms (Labuschagne et al., 2005). Companies are needed to be able to measure the sustainability of their current practices as well as the direction at which they are moving (Erol et al., 2009).

Many authors have proposed different ways to measure corporate sustainability (Baumgartner and Ebner, 2010). For instance, Porter (1985) proposes that corporate sustainability is related to financial results and economic growth of a company. Peteraf (1993) has claimed that corporate sustainability is associated to the economic performance, growth, and long-term profitability of companies. Other works have considered corporate sustainability to be more related to operations and ethical issues. For example, Chan (2005) and Christmann (2000) analyze corporate sustainability through the impact of environmental management that bases on corporate daily operations. Molnar and Mulvihill (2003) propose that corporate sustainability can be measured from the learning experience of a company. Brown and Dacin (1997) point out that a success of corporate sustainability can be based on the overall valuation of a company and its products.

Recently, the study of corporate sustainability has suggested that the measure of corporate sustainability should be based on a group of multi-dimensional constructs (Baumgartner and Ebner, 2010). For example, one group of literature holds that companies should consider corporate sustainability to be interrelated with various components, such as the individual, organizational, social, and political components (e.g., Baumgartner, 2009; Linnenluecke et al., 2009). Another group of literature has claimed that corporate sustainability is associated with eco-equity, eco-efficiency, and socio-effectiveness, and that companies should be working toward with the efficiency and equity of the natural environment (e.g., Bansal and Roth, 2000; Chen et al., 2008); while other group suggests that corporate sustainability should be a policy that includes the integration of pollution control, eco-efficiency, recirculation, eco-design, ecosystem stewardship, and business redefinition (e.g., Sharma and Henriques, 2005).

One may ask a question on how many of different ways to measure corporate sustainability. To answer this question, we have conducted an extensive literature review on corporate sustainability. Altogether, we have identified a total of 7 different dimensions that can be used to measure corporate sustainability: social development, economic development, environmental development, institutional development, eco-efficiency, eco-equity, and socio-efficiency. Figure 2.1 reveals these 7 dimensions of corporate sustainability and their relationships. In order to facilitate us to explain these different dimensions better in this chapter, we labelled social, economic, and environmental developments as numbers 1, 2 and 3 in Figure 2.1. Socio-efficiency, as we label it as 4, refers to the common domain between SOC and ECO. Eco-efficiency, as we label it as 5, refers to the common domain between ECO and ENV. Eco-equity, as we label it as 6, refers to the common domain between SOC and ENV. Institutional development, as we label it as 7, refers to the working environment or constraints of the domain. We now review these 7 dimensions below.



1 – Social development, 2 – Economic development, 3 – Environmental development, 4 – Socio- efficiency, 5 – Eco-efficiency, 6 – Eco-equity, 7 – Institutional development

Figure 2.1 Dimensions of Corporate Sustainability

2.2.1.1 Social Development

Social development (SOC) refers to managing a company in such a way that it improves the social inequality and divisions, quality of life, and relationships between their stakeholders (Lindgreen et al., 2009; Steurer et al., 2005). SOC is considered as an important factor in corporate sustainability (Sharma and Ruud, 2003). The objective of SOC aims to establish a policy that would accomplish a positive influence to all present and future relationships with stakeholders (Ebner, 2008). Cuthill (2009) argues that SOC should include measureable components such as social capital, social infrastructure, social justice and equity, and engaged governance. This thesis considers SOC is involved with the issues of moral and ethical imperatives – that is, social justice and equity – and it is a concern for the social goods of stakeholders (Bansal, 2005; Donaldson and Preston, 1995).

Social justice and equity are embodied in an ethical code for human survival and a progress on a par with other high-minded ideas such as democracy, freedom, and human rights (Lafferty and Langhelle, 1999). Social justice and equity require organizations to practice SOC by assuming wider responsibilities toward various stakeholder groups and the need of the society (Baumgartner and Ebner, 2010). Companies with the practice of corporate sustainability should have behaved ethically so that they could develop a good relationship with local communities (Garriga and Mele, 2004). In such, SOC should have paid an attention to local ethical issues such as human rights, labor rights, and the respect for a natural environment (McWilliams et al., 2006). To implement SOC, a company should behave beyond merely towards a legal framework but also be honest with their customers and employees (Salmones et al., 2005). SOC could also be promoting the harmony of the society by donating of cash, equipment, and products to local community's needy (Alford and Naughton, 2002).

Table 2.4 Literature Review on SOC

Applications for SOC	Literature
1. Employee participation	Amaral and La Rovere, 2003; Baumgartner and Ebner, 2010; Geibler et al., 2006; Halme et al., 2006; Hussey et al., 2001; Labuschagne et al., 2005; Sharma et al., 2007; Steurer et al., 2005; Veleva and Ellenbecker, 2001
2. Stakeholder involvement	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Geibler et al., 2006; Halme et al., 2006; Hussey et al., 2001; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Murillo-Luna et al., 2008; Steurer et al., 2005; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
3. Improve transparency	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Erol et al., 2009; Tanzil and Beloff, 2006; Turker, 2009; Veleva and Ellenbecker, 2001
4. Employee health and safety	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Collins et al., 2007; Erol et al., 2009; Geibler et al., 2006; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
5. Community health and safety	Amaral and La Rovere, 2003; Azapagic, 2004; Collins et al., 2007; Erol et al., 2009; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008
6. Equal treatment, discrimination, harassment, violence	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Erol et al., 2009; Halme et al., 2006; Labuschagne et al., 2005; Lindgreen et al., 2009; Steurer et al., 2005; Tanzil and Beloff, 2006; Vera and Langlois, 2007
7. Support local community	Baumgartner and Ebner, 2010; Choi and Sirakaya, 2006; Erol et al., 2009; Geibler et al., 2006; Halme et al., 2006; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008; Sharma and Vredenburg, 1998; Steurer et al., 2005; Tanzil and Beloff, 2006
8. Concern for private brands	Bansal, 2005; Erol et al., 2009
9. Concern for social impact of operation	Lindgreen et al., 2009; Tanzil and Beloff, 2006
10. Invest in social projects	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Erol et al., 2009; Geibler et al., 2006; Jones et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Nordheim and Barrasso, 2007; Sharma and Vredenburg, 1998; Steurer et al., 2005; Veleva and Ellenbecker, 2001
11. Act on customer/local community comfort	Azapagic, 2004; Collins et al., 2007; Erol et al., 2009; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Lindgreen et al., 2009; Schianetz and Kavanagh, 2008; Veleva and Ellenbecker, 2001
12. Notice customer/local community awareness/complaints	Azapagic, 2004; Collins et al., 2007; Erol et al., 2009; Schianetz and Kavanagh, 2008; Veleva and Ellenbecker, 2001

Geibler et al. (2006) claim that it is difficult to measure SOC because the consensus on relevant criteria is lacked. We try to gain our understanding by focusing SOC in areas of social justice and equity so that we could concentrate our study by examining the concept of corporate social responsibility (CSR). CSR refers to a company's activities that are related to their perceived societal or stakeholder's obligations (Luo and Bhattacharya, 2006). The CSR framework which developed by Wood (1991), is a model that bases on socially responsible processes that has been considered as widely accepted model in the business community (Hillman and Keim, 2001). CSR involves with three different management systems: stakeholder management, social issues management, and environmental assessment. To understand their measurement items, we conduct a survey and collect their applications. We have refined a total of 12 SOC applications that are commonly cited in literature. Table 2.4 describes these applications. In the following, we briefly describe them by also considering their components that are associated with CSR processes of stakeholder management and social issues management.

In CSR, stakeholders include, but are not limited to, members such as suppliers, customers, employees, local communities, and governments (Berman et al., 1999). A stakeholder management system involves with the strategic actions that lead to a positive relationship between stakeholders (Garriga and Mele, 2004; Linnenluecke et al., 2009). Table 2.4 reviews some of these strategic actions, and they include (1) to pay attention to the health and safety of the community and employees (Baumgartner and Ebner, 2010), (2) to consider stakeholder interests by involving the participation of stakeholders or employees (Geibler et al., 2006),

(3) to improve public disclosure with making operations processes to be transparent (Erol et al., 2009), and (4) to create and distribute values that promote the equal treatment (Halme et al., 2006). These actions should have clearly outlined that companies should emphasize the genuine needs of stakeholders and that stakeholders' opinions should be consulted before the implementation (Cuthill, 2009). To achieve this goal, it is suggested that the memberships of stakeholders should be constituted from different groups of representatives so that their diverse views can be collected. Stakeholders should also be informed about the company's SOC policy and conditions so that they could understand how the outcome could effect to their daily life in organizations. Companies should be ensured that their resources of distribution should be a fair one. The main focus of SOC should also be a promotion of the quality of life for the aborigine and/or the local community (Azapagic, 2004). Discrimination, harassment, and violence should be totally discouraged in SOC practices. A good SOC practice should elevate the equal opportunities in the society, and that they should exercise the fairness for individual gender, race or disabilities (Steurer et al., 2005). Companies should also be concerned with the health and safety of their employees; which is including the concern of the community that their employees live in and work at so that organizations could prevent them from the risks of possible mental/physical sickness and injury (Halme et al., 2006). Past researches also indicate that a company should clearly entail their SOC policy in the annual report so that their SOC practices could be as open and transparent as possible to their stakeholders (Turker, 2009).

Another way to effectively govern the operations of SOC is through the development of policy and procedure for social issues' management, and it is referred as "the process of addressing social issues" (Bansal, 2005, p. 199). Social issues' management involves with a company's practicing ethical behaviors with respect to (1) human rights (Baumgartner and Ebner, 2010), (2) social impact (Tanzil and Beloff, 2006), and (3) social projects (Lindgreen et al., 2009). Table 2.4 elaborates these ethical behaviors which include activities such as (1) the support to the local community, (2) the concern for private brands and social impact of operations, (3) the investment in social projects, and (4) the action on customer or local community about their comfort, awareness and complaints. SOC should also demonstrate that companies are paying the support to the local community by (1) improving employee opportunities for the local community, (2) increasing community spending and charitable contribution, and (3) increasing community-company partnerships (Veleva and Ellenbecker, 2001). In SOC, companies should pay a particular attention to the impact of their operations processes on the society such as illness reduction, knowledge development, employment enhancement and so on (Lindgreen et al., 2009; Tanzil and Beloff, 2006). Companies should also invest in social projects that could improve the quality of life for their stakeholders through the launch of free services in education, health care and the provision of other infrastructures (Azapagic, 2004).

It is claimed that SOC activities should also be including projects that could ease the discomfort of their customers, and the outcomes could be the improvement of the disturbance (such as noise, odor, and/or pollution) and/or the convenience to local community (Halme et al., 2006).

2.2.1.2 Economic Development

Economic development (ECO) refers to managing a company as a durable participant in the market, with a consideration of a positive impact on the economic circumstances for its stakeholders in a scale at the local, national, and/or global level (Azapagic, 2004; Szekely and Knirsch, 2005). ECO is considered as a critical component for a company because it is a prerequisite for the company's survival (Steurer et al., 2005). Baumgartner and Ebner (2010) claim that ECO "embraces general aspects of an organization that have to be respected – next to environmental and social aspects – in order to remain in the market for long time" (p. 78). Therefore, ECO in the context of corporate sustainability should position a company in a strong, dependent, and durable growth of a participant and it does not work against to other components of sustainability such as ENV and SOC.

Researchers also consider ECO bases on a company's financial performance. For example, Porter (1985) claims that ECO refers to the economic growth and the long-term profitability of a company. Steurer et al. (2005) suggest that the ECO objective is to improve the share earnings. This phenomenon of ECO has clearly demonstrated that companies are more focused on the "short-term" financial returns than on the long term effect of a strategy that involves "valued-added" on their products and services. This, in turn, has in some cases led to a profligate use of energy resources that could cause a greater damage to the natural environment than an economic benefit to the society (Azapagic, 2004).

Recent studies suggest that ECO should now be emphasized more on the economic success than just the financial results (Baumgartner and Ebner, 2010). The value creation is the main way to achieve the economic success (Bansal, 2005). The outcome of value creation is measured by comparing the values between the capital investment and market value of products or services (Hillman and Keim, 2001). Carroll (2000) further iterates that the value creation should also be implemented by considering a balance of human beings in profits and growths which could meet their needs and dignified life, and that it does not prevent others, now and in the future, from doing likewise (Carroll, 2000).

Firms can create value through the products and services they produce (Bowman and Ambrosini, 2000). Bansal (2005) and Hillman & Keim (2001) claim that companies can add their business value by improving the effectiveness and efficiency of their products or services. Table 2.5 reviews a survey about the ECO literature in corporate sustainability. Altogether, there are a total of 7 applications, and they achieve ECO through either the operations strategy of the cost reduction or the value creation. We further discuss them below.

In the cost reduction, the main emphasis of ECO is to achieve it by minimizing their operations cost in organizations (Farrell, 2005; Fowler and Hope, 2007). These operations cost include events such as (1) total employee payments (Erol et al., 2009), (2) tax payment on behalf of employees (Veleva and Ellenbecker, 2001), and (3) environmental cost burden (Tanzil and Beloff, 2006). The first event of total employee payment relates to the expenditures of medical expenses for organizational employees (Erol et al., 2009; Veleva and Ellenbecker, 2001). The second event is to convert the former practice of paying income taxes for their employees by including this amount as a part of their salary so that it reduces the complexity of organizational process and operations (Erol et al., 2009). The last event suggests that companies should also pay attention to their environmental liability while operating their production processes. It is suggested that the reduced costs in environmental liability – such as fine payments, liabilities, worker compensation, waste treatment and disposal, and remediation – could be directly contributed to the economic performance of a company (e.g., Tanzil and Beloff, 2006).

In the value creation, values is created by the mean of generating revenues for organizations (Seth, 1990). Business activities that create values include (1) the stimulation of sales growth (Christmann, 2000), (2) the improvement of the production processes (Porter and Van Der Linde, 1995), and (3) the enhancement of government regulations (Makadok, 2001). Companies could also improve their revenue channel by selling their waste products. By doing so, companies could achieve the targets by gaining revenues while reducing the environmental pollution simultaneously (Bansal, 2005). Ulaga (2003) suggests that the value create could also be based on the active collaboration between stakeholders. Cuthill (2009) and Newman (2007) report that the SOC can also be better achieved through a collaborative approach by inviting local citizens as a member of partnerships that could communicate well with their local government.

Although this practice may not be directly led to a positive financial outcome to companies, it could create a positive value for stakeholders which would enhance a long-term economic success (Bansal, 2005).

Schumpeter (1942) proposes that a value creation could also be based on innovative products, and it is a "reform or revolutionize the pattern of production by exploiting an invention" (p. 132). The new innovative products/services could satisfy the desire of their customers further (Porter, 1985). Many researches supported for this view and provided evidences about innovative products/services could bring fruitful results for companies (Mansfield et al., 1977). López-Gamero et al. (2009) claim that ECO could be promoted by engaging operations such as product or process innovation and differentiation. Sharma (2002) suggests that the emphasis of green technology could be a new wave of innovative products/services which could further contribute to the financial success of the sustainability for companies. It is also suggested that companies should improve their operational processes continuously so that their competitiveness can be sustained (Konrad et al., 2006).

Table 2.5 Literature Review on ECO

Applications for ECO	Literature
1. Collaboration with government	Azapagic, 2004; Bansal, 2005; Baumgartner and Ebner, 2010; Newman, 2007
2. Reduce payments to employees	Amaral and La Rovere, 2003; Azapagic, 2004; Erol et al., 2009; Hussey et al., 2001; Jones et al., 2005; Nordheim and Barrasso, 2007; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
3. Reduce tax paid	Amaral and La Rovere, 2003; Azapagic, 2004; Erol et al., 2009; Hussey et al., 2001; Jones et al., 2005; Nordheim and Barrasso, 2007; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
4. Reduce environmental costs	Amaral and La Rovere, 2003; Azapagic, 2004; Hussey et al., 2001; Milne et al., 2003; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
5. Make clear process and roles	Baumgartner and Ebner, 2010; Milne et al., 2003; Murillo-Luna et al., 2008; Veleva and Ellenbecker, 2001
6. Sell waste products	Bansal, 2005
7. Improve innovation and R&D expenditure	Amaral and La Rovere, 2003; Baumgartner and Ebner, 2010; Erol et al., 2009; Geibler et al., 2006; Hussey et al., 2001; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Murillo-Luna et al., 2008; Schianetz and Kavanagh, 2008; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006

2.2.1.3 Environmental Development

Environmental development (ENV) refers to a company's efforts to manage its operations in such a way that its final products do a little harm to the natural environment, including land, air, and water (Keeble et al., 2003; Lindgreen et al., 2009). Traditional development has already caused mass damages to our natural environment. Its negative effects have created the global warming and the distinction of animal species. The essence of ENV is to develop environmental friendly practices for companies that would (1) consider the earth's carrying capacity, and (2) preserve the integrity of the natural environment for our future generations. The core of ENV for a company is thus to operate within the carrying capacity of the ecosystem by (1) reducing environmental pollution, (2) minimizing resource consumption, and (3) optimizing the company's ecological footprint (Hart, 1995; Lindgreen et al., 2009). To achieve ENV, companies should develop their corporate environmental management system (Bansal, 2005; Linnenluecke et al., 2009; Sharma, 2002).

In general, it is difficult to identify a set of ENV measures because our literature survey shows that many results are based on either anecdotal evidence, case studies or surveys to proprietary data sources (Montabon et al., 2007). In this thesis, we focus on ENV through the survey method because most researches indicate that the survey method could help researchers to understand ENV from a broad and purely perceptual view (e.g., Montabon et al., 2007; Sharma et al., 2007). Another difficulty to formulate ENV measures is that many studies are operationalized and their measures are based on the nature of different industries (Chan, 2005; Sharma and Vredenburg, 1998). It is thus not an easy task to generate ENV measures that suit for all businesses (Ding, 2008).

From a literature survey, we identify two main taxonomies for ENV. They are: (1) reactive to proactive approaches (Sharma and Ruud, 2003) and (2) pollution control, pollution prevention, and product stewardship (Hart, 1995). In the first taxonomy, the reactive approach involves actions that could improve the environmental impact of products and services or dispose of waste responsibly (Hart, 1995; Schianetz and Kavanagh, 2008). The proactive approach requires production processes that could reduce waste and emissions (Bansal, 2005). Such processes include a lesser use of traditional fuels (Lindgreen et al., 2009) that would have a direct impact on animal species and natural habitats (Rueda-Manzanares et al., 2008). In the second taxonomy, Hart (1995) claims that ENV can be measured from views of pollution control, pollution prevention, and product stewardship. Pollution control is considered as a reactive approach, and also known as an end-of-pipe solution (Hart, 1995). Pollution prevention is an example of the proactive approach. It reduces or eliminates waste through innovative processes or technologies that are applied in operations processes (Klassen and Whybark, 1999). Product stewardship focuses on a firm's product in an effort to reduce its cradle-to-grave impact (Gilley et al., 2000; Hart, 1995). It involves practices that are reducing purchases of non-renewable materials, chemicals, and components (Sharma, 2000), decreasing energy consumption (Baumgartner and Ebner, 2010), and so on. This thesis combines all of these approaches and refines a set of possible ENV applications through a literature survey. Table 2.6 describes a total of 23 possible ENV applications that are frequently cited in literature. We further describe them below.

Companies should reduce their negative environmental impacts from products/ services they provided. Steps to reduce negative environmental impacts include (1) reduce products and packaging that pollute our environment, and (2) material recycling program by reusing waste products as their input sources (Azapagic, 2004). Companies should also reduce their waste production and emissions during operations processes. Such business activities include (1) the governance of waste in the production, (2) the reduction of the amount of waste generated (air, water, and land) before recycling, and (3) safety in disposing or handling the waste or toxic waste after production (Baumgartner and Ebner, 2010; Veleva and Ellenbecker, 2001).

As the use of energy has brought to depletion of fossil fuels as well as global warming, acidification and increasing pollution, how to efficiently use the limited energy efficiently becomes an important issue. Therefore, a minimal usage of non-renewable energy and switching to renewable energy sources (solar, wind, tides, biomass) are both critical events for companies to enhance ENV (Veleva and Ellenbecker, 2001).

Companies should also conserve the energy consumption by reducing the use of air resources and water (Vera and Langlois, 2007). The depletion of non-renewable materials (fuels and metals) and over-consumption of renewable resources (wood, fisheries, plants, soil) are also considered as being the limiting factors for companies' growth. Therefore, ENV suggests that companies should reduce the use of natural materials and chemicals but renewable materials as a practice of sustainability (Hussey et al., 2001; Jones et al., 2005).

Murillo-Luna et al. (2008) claim that companies should exercise their ENV by engaging their employees in the educational program of environmental training that would familiar themselves about environmental monitoring, environmental reporting, and environmental legislation. Such actions could achieve the goal by (1) reducing the risk of environmental accidents, spills, and release, and (2) undertaking the environmental audit and immunity. Companies should also implement ENV by practicing the maintain of animal species diversity and the protection of environmentally sensitive locations (Sharma and Vredenburg, 1998). Such practices could reduce the environmental impact on animal species and natural habitats.

Table 2.6 Literature Review on ENV

Applications for ENV	Literature
1. Product and packaging recovery	Azapagic, 2004; Erol et al., 2009; Hussey et al., 2001; Jones et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Rueda-Manzanares et al., 2008; Sharma et al., 2007; Sharma and Vredenburg, 1998; Veleva and Ellenbecker, 2001
2. Material recycling program	Collins et al., 2007; Erol et al., 2009; Hussey et al., 2001; Jones et al., 2005; Lindgreen et al., 2009; Nordheim and Barrasso, 2007; Sharma et al., 2007; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
3. Reduce impact on ecosystem	Azapagic, 2004; Collins et al., 2007; Hussey et al., 2001; Schianetz and Kavanagh, 2008; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006
4. Reduce waste in processing	Baumgartner and Ebner, 2010; Jones et al., 2005; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Rueda-Manzanares et al., 2008; Schianetz and Kavanagh, 2008; Sharma et al., 2007; Sharma and Vredenburg, 1998; Veleva and Ellenbecker, 2001
5. Process emissions to air, water, land, etc.	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Collins et al., 2007; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Lindgreen et al., 2009; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008; Sharma and Vredenburg, 1998; Steurer et al., 2005; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
6. Safe disposal/handling of wastes/toxic waste	Amaral and La Rovere, 2003; Azapagic, 2004; Baumgartner and Ebner, 2010; Hussey et al., 2001; Lindgreen et al., 2009; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
7. Reduce non-renewable energy use	Amaral and La Rovere, 2003; Azapagic, 2004; Collins et al., 2007; Erol et al., 2009; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Steurer et al., 2005; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
8. Use renewable energy	Azapagic, 2004; Baumgartner and Ebner, 2010; Collins et al., 2007; Hussey et al., 2001; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Nordheim and Barrasso, 2007; Rueda-Manzanares et al., 2008; Schianetz and Kavanagh, 2008; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Steurer et al., 2005; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
9. Use recycled materials	Azapagic, 2004; Baumgartner and Ebner, 2010; Collins et al., 2007; Erol et al., 2009; Hussey et al., 2001; Lindgreen et al., 2009; Nordheim and Barrasso, 2007; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
10. Use recycled/waste materials	Azapagic, 2004; Baumgartner and Ebner, 2010; Collins et al., 2007; Erol et al., 2009; Hussey et al., 2001; Lindgreen et al., 2009; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Rueda-Manzanares et al., 2008; Schianetz and Kavanagh, 2008; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001

11. Modify transportation for diversity	Azapagic, 2004; Erol et al., 2009; Hussey et al., 2001; Milne et al., 2003; Schianetz and Kavanagh, 2008; Sharma and Vredenburg, 1998; Tanzil and Beloff, 2006
12. Maintain animals' diversity	Azapagic, 2004; Erol et al., 2009
13. Protect environmentally sensitive locations	Labuschagne et al., 2005; Rueda-Manzanares et al., 2008; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
14. Disposal and treatment of hazardous/toxic wastes	Baumgartner and Ebner, 2010; Geibler et al., 2006; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Sharma, 2000; Sharma et al., 2007; Sharma and Vredenburg, 1998; Veleva and Ellenbecker, 2001
15. Employee environmental training	Amaral and La Rovere, 2003; Azapagic, 2004; Erol et al., 2009; Geibler et al., 2006; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
16. Environmental monitoring	Steurer et al., 2005; Labuschagne et al., 2005; Murillo-Luna et al., 2008
17. Environmental legislation	Azapagic, 2004; Chan, 2005; Labuschagne et al., 2005; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007
18. Reduce use of air resources	Baumgartner and Ebner, 2010; Collins et al., 2007; Labuschagne et al., 2005; Milne et al., 2003; Murillo-Luna et al., 2008; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
19. Reduce water use	Azapagic, 2004; Baumgartner and Ebner, 2010; Collins et al., 2007; Erol et al., 2009; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Labuschagne et al., 2005; Milne et al., 2003; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Rueda-Manzanares et al., 2008; Schianetz and Kavanagh, 2008; Sharma et al., 2007; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007
20. Establish environmental partnerships	Chan, 2005; Hussey et al., 2001; Milne et al., 2003; Murillo-Luna et al., 2008; Sharma and Vredenburg, 1998
21. Environmental monitoring and reporting	Chan, 2005; Erol et al., 2009; Geibler et al., 2006; Labuschagne et al., 2005; Milne et al., 2003; Murillo-Luna et al., 2008; Steurer et al., 2005
22. Public disclosure	Amaral and La Rovere, 2003; Azapagic, 2004; Chan, 2005; Erol et al., 2009; Murillo-Luna et al., 2008; Sharma and Vredenburg, 1998; Steurer et al., 2005; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001
23. Training and immunity	Amaral and La Rovere, 2003; Azapagic, 2004; Erol et al., 2009; Geibler et al., 2006; Halme et al., 2006; Hussey et al., 2001; Jones et al., 2005; Labuschagne et al., 2005; Lindgreen et al., 2009; Milne et al., 2003; Murillo-Luna et al., 2008; Nordheim and Barrasso, 2007; Schianetz and Kavanagh, 2008; Tanzil and Beloff, 2006; Veleva and Ellenbecker, 2001; Vera and Langlois, 2007

2.2.1.4 Institutional Development

Spangenberg et al. (2002) highlight the importance of the linkage between institutional development and other elements. Institutional development calls for the "adoption of national strategies of sustainability and the integration of socio-economic and environmental aspects in decision-making" (Labuschagne et al., 2005, p. 376). Labuschagne et al. (2005) consider the institutional development as a pre-requisite for a success of sustainability, however, they have failed to reveal what exactly are them. United Nation states that companies can address the institutional development by: "(a) mentioning and incorporating sustainability principles within business strategies (i.e. vision, mission, business goals, etc.) that would in line with those of national and international government; (b) openly acknowledging support for global agreements; (c) including external sustainable development objectives in their internal research and development; (d) allocating funds to address sustainability issues beyond the immediate control of the company" (Labuschagne et al., 2005, p. 376).

2.2.1.5 Eco-equity

Eco-equity is an environmental centred principle and it refers to "equity between peoples and generations and, in particular, the equal rights of all peoples to environmental resource" (Gray and Bebbington, 2000, p. 3). Eco-equity needs to be instilled into organizational value systems in order to increase the number of companies embarking on eco-friendly strategies and processes (Chen et al., 2008). A heart of nearly all sustainability conception is referred to the fair distribution of resources, both within and between generations (Gladwin et al., 1995). Eco-equity stands at the nexus of relationship between the management of natural capital and social capital (Dyllick and Hockerts, 2002). To cultivate eco-equity, traditional views of human-nature relationship, such as anthropocentrism and technocentrism, is needed to be re-functionalized (Daly et al., 1994). To operationalize eco-equity, Bansal and Roth (2000) claim that their significant issues should include components such as certainty, transparency, and emotivity.

2.2.1.6 Eco-efficiency

Eco-efficiency "encourages business to search for environmental improvements that yield parallel economic benefits." (WBCSD, 2000, p. 4). It can be achieved by "the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle to a level at least in line with the earth's carrying capacity" (DeSimone and Popoff, 2000, p. 47). Eco-efficiency is a valuable tool because its typical results would be increased the efficiency of energy or resource as per added value (Dyllick and Hockerts, 2002). Bansal and Roth (2000) also claim that the economic opportunities arising from eco-efficiency are a major motivation for companies to be ecologically responsive. The World Business Council for Sustainable Development suggests seven elements for eco-efficiency: which include operations that would (1) reduce the material intensity of goods and services; (2) reduce the energy intensity of goods and services; (3) reduce toxic dispersion; (4) enhance material recyclability; (5)

maximise sustainable use of renewable resources; (6) increase material durability; and (7) increase the service intensity of goods and services.

2.2.1.7 Socio-efficiency

Socio-efficiency is the relationship between a company's economic added value and its societal impact (Young and Tilley, 2006). It is suggested that socio-efficiency leads only to relative social improvements, which can be compensated by economic growth (Schmidt et al., 2004). Dyllick and Hockerts (2002) argue that the social impacts can be either positive (e.g., corporate giving, creation of employment) or negative (e.g., work accidents, mobbing of employees, and human rights abuse). Socio-efficiency requires companies to (1) minimize their negative social impacts (such as accidents at work), and (2) maximize their positive social impacts (such as training and health benefits) (Schaltegger et al., 2002; Young and Tilley, 2006). Socio-efficiency can also be based on issues such as quality of life, stakeholder participation, and community development (Stead and Stead, 2008).

Despite the diversity of these 7 dimensions of corporate sustainability, this thesis considers corporate sustainability is represented by SOC, ECO, and ENV. Two main supported reasons are provided as follows.

First, eco-equity, eco-efficiency, and socio-efficiency are the mixed dimensions among SOC, ECO, and ENV. In general, SOC, ECO, and ENV form a broader domain of corporate sustainability (Dyllick and Hockerts, 2002). This thesis considers broader dimensions of corporate sustainability, which consist of SOC, ECO, and ENV. Even though the institutional development is a strategy that allows companies to accept their responsibility toward sustainability, corporate sustainability should be evaluated as internal initiatives in terms of SOC, ECO, and ENV (Labuschagne et al., 2005). From these views, it is reasonable to assume that the success of corporate sustainability is represented by SOC, ECO, and ENV.

Second, recent researchers have concurred that corporate sustainability can be explained in a framework that is represented by three dimensions, namely SOC, ECO, and ENV (Baumgartner and Ebner, 2010; Erol et al., 2009; Ness et al., 2007). Corporate sustainability literature considers that such a framework is to be widely accepted as well as being the most important one. For example, López et al. (2007) and Marrewijk (2003) point out that corporate sustainability can be achieved through SOC, ECO, and ENV, and that these three dimensions are all interrelated. Melville (2010) argues that corporate sustainability is geared toward the triple bottom line – people, planet, and profit, which could be interpreted as that companies are harmonizing the green environment by addressing their efforts in implementing SOC, ECO, and ENV together (Elkington, 1997).

In conclusion, this thesis considers corporate sustainability as an integration of SOC, ECO, and ENV.

2.2.3 Modelling of Corporate Sustainability

This section introduces the models and theories that have been commonly applied to investigate various issues of corporate sustainability. Altogether, we identify 6 theories, and they are: contingency theory, dynamic capability, ecological modernization, institutional theory, resource-based view and stakeholder theory. Table 2.7 reveals a summary of our findings. We review them as follows.

2.2.3.1 Contingent Theory

Contingent theory posits that organizational performance is a result of the proper alignment of internal organizational design variables with those external context variables (Burns and Stalker, 1994; Lawrence and Lorsh, 1967; Thompson et al., 1992). Companies are required to formulate different levels of effective strategies that could match with their organizational resources for business opportunities and also reduce threats in the general business environment simultaneously (Andrews, 1998; Hofer and Schendel, 1978). It is also suggested that companies should exercise the right response of actions in managing their external environment so that the superior performance could be enhanced. (Miller and Friesen, 1983).

Recent researches tend to study corporate sustainability based on the contingent theory (e.g., Aragon-Correa and Sharma, 2003; Rueda-Manzanares et al., 2008). The contingent theory advises that the study of corporate sustainability should not only be focused on the internal mechanism of a company's operations processes, but also consider the external business environment (Rueda-Manzanares et al., 2008). In such, the extent to which a company should practice corporate sustainability is very much dependent on the influences of factors surrounding their business environment. The determinants of the business environment may require to consider components such as (1) hostility (business environment that can be hostile sustained growth), (2) dynamism (turbulence and instability of the environment), and (3) complexity (number of factors in the business environment) (Dess and Beard, 1984). Past researches have also concluded that the effectiveness for companies practicing corporate sustainability is rested on managerial issues such as (1) the market dynamism or turbulence (Rueda-Manzanares et al., 2008), (2) the environmental uncertainty (Miller and Shamsie, 1999) and (3) the change of regulations and public policy (Aragon-Correa and Sharma, 2003).

Although many researches have documented the importance of contingent theory in corporate sustainability, many scholars have also suggested its limitations that call for the future investigations.

Firstly, the external environmental factors are not restricted to the three hostile factors - namely hostility, dynamism and complexity- and that more investigations should be carried out to identify other factors that may incur in their business environment (Rueda-Manzanares et al., 2008). Secondly, it was claimed that both the external and internal factors of business environments have played a significant role to the success in corporate sustainability; however there is a lack of research to study their interaction (Aragon-Correa and Sharma, 2003). Thirdly, previous studies on corporate sustainability have mainly focused on developed countries (such as Western Europe and North America), and have neglected the developing countries (Sharma et al., 2007).

2.2.3.2 Dynamic Capability

Dynamic capability is defined as a company's ability to adopt the changing business environment by adjusting their internal and external resources (Teece et al., 1997). Dynamic capability is considered as a popular research method because it removes the short fall of static theories of strategy, which fail to explain the mechanism on how companies could create added value or achieve a competitive advantage in an environment with uncertainty and changes (Teece et al., 1997). Dynamic capability is related to carry out essential operations upon their resources and capabilities. Specifically, the model of dynamic capability enables companies to (1) search and select right resources or competencies, (2) extend and modify them to new forms, and (3) exploit them to adapt to environmental changes (Catherine and Pervaiz, 2007).

There are two main viewpoints in which the dynamic capability is appropriate for studying corporate sustainability. The first viewpoint is that the business environment of corporate sustainability is referred as a kind of dynamic capability. Among this view, Newman (2007) claims that since human and natural systems are full of inherent complexity and uncertainty and human society is evolving with inherent innovation, corporate sustainability is related to the treatment of dynamic capability. Aragon-Correa and Sharma (2003) also argue that a proactive environmental strategy of sustainability can be treated as a dynamic capability because it requires to deal with capabilities such as stakeholder integration, high order learning, shared vision, and continuous improvement (Hart, 1995; Sharma and Vredenburg, 1998). The second viewpoint is that dynamic capability can be treated as an antecedent of corporate sustainability. Vollenbroek (2002) remarks that innovation and organizational learning – which can be treated as two important dynamic capabilities – are essentials to the exploration and development of new possibilities for corporate sustainability. Marcus and Anderson (2006) further claim that the dynamic capability of corporate sustainability include (1) the search for new ideas and methods, (2) the comparison of company practices to the best in the industry, (3) the evaluation of practices in other industries, and (4) the experiment that could lead to a social sustainability.

The major limitation of dynamic capability in corporate sustainability is that most researches are mainly referred as qualitative studies (Aragon-Correa and Sharma, 2003). There is a short of quantified research in applying dynamic capability on corporate sustainability. Furthermore, many researches which have conducted their studies based on other kinds of dynamic capability (e.g., collaboration, market responsiveness, and organizational learning) are considered as haste reports.

2.2.3.3 Ecological Modernization

Ecological modernization focuses on the relationship between industrial development and the natural environment (Mol, 1997; Murphy and Gouldson, 2000). As the natural environment becomes a worldwide issue, ecological modernization has become a main issue that would respond to the change of environment (Janicke, 2008). The study of ecological modernization in corporate sustainability is mainly focused on two main issues: (1) environmental policies (Gibbs, 2000; Jackson and Roberts, 1999) and (2) technological innovation (Berger et al., 2001; Murphy and Gouldson, 2000).

Ecological modernization highlights the importance of environmental policies in corporate sustainability. Weale (1992) treats environmental policies as the new politics of pollution and identifies on how ecological modernization could help a government to foster programme of action that bases on strategic planning and innovation policy instruments. It is suggested that economic development and environmental policy could be reconciled so that there is a lesser conflict between environmental protection and economic growth (Weale, 1992). In ecological modernization, ecological regulations and policies could serve as a channel for the competitive dynamics of advanced market economies – that is through producing new products with a new format of operations processes – in corporate sustainability (Kassolis, 2007; Pataki, 2009).

Ecological modernization also puts a heavy emphasis on technological innovation. Treated as a series of waves of innovations, industrial ecology could help companies to achieve a sustainability through industrial processes that mimic the closed material cycles of natural systems (Huber, 2008). Except for the investments in new technologies, companies can also improve their environmental performance through the organizational change and managerial techniques (Murphy and Gouldson, 2000). Using ecological modernization as an exploratory theory, Pataki (2009) reports a case study on a Hungarian chemical company and shows that environmental technology and invention for re-use of mixed plastics waste are considered to be the embodiments of the integration of industry and ecology. Environmental innovation could also build new competencies that could solve environmental problems as well (Murphy and Gouldson, 2000).

Ecological modernization also explains how an environmental policy can promote the adoption of corporate sustainability. Pataki (2009) demonstrates that corporate sustainability can bring both the benefits of economic and environmental performances. However, two main limitations can be identified as future researches. First, there is a lack of research for the discussion on how the processes of corporate sustainability could take place through the mean of ecological modernization. Extant researches have discussed about the applications of ecological modernization in corporate sustainability ranging from the policy to technical innovation, however these researches did not spell out their refinement processes. Second, there is a lack of evaluation and description on how ecological modernization's 'win – win' theoretical foundation is formed. So far, the study of ecological modernization has mainly focused on ECO and ENV. The diffusion mechanism on SOC has not been addressed.

2.2.3.4 Institutional Theory

In explaining corporate behaviour, institutional theory posits that external forces could persuade companies to undertake similar strategic actions (Hoffman, 2001; Scott, 2001). In operations processes, companies may modify their organizational characteristics to cater the changes of environmental characteristics (Hawley, 1968). There are three types of "isomorphic" change: (1) coercive, (2) mimetic and (3) normative drivers (DiMaggio and Powell, 1983). Coercive driver is referred to the pressures of formal and informal external environment (DiMaggio and Powell, 1983). Among it, the government agency is an example of such external pressures. Mimetic driver is related to standard responses to environmental uncertainty, which can be a powerful force that encourages imitation (DiMaggio and Powell, 1983). When a company faces a problem with ambiguous causes or unclear solutions, it tends to imitate the actions of successful competitors in the industry (Aerts et al., 2006). Normative driver is referred to professionalization, which makes the companies' actions similar to counterparts (DiMaggio and Powell, 1983).

Institutional theory is important for corporate sustainability because it "helps to understand how consensus is built around the meaning of sustainability and how concepts or practices associated with sustainability are developed and diffused among organizations" (Jennings and Zandbergen, 1995, p. 1016). Researches have reported the impacts of different actions of institutional theory in corporate sustainability. For example, Darnall (2006) argues that the regulatory and market pressures could push organizations to adopt a standard of environmental management system (such as ISO 14001 certification). Menguc et al. (2010) conclude that governmental regulations and customer environmental sensitivity are external drivers of institutional theory, which could have impacts on a company's proactive environmental strategy. Bansal (2005) finds that media attention is considered as a more important element for a company to practice corporate sustainability. Christmann and Taylor (2001) claim that the practice of globalization could create opportunities for manufacturers to learn about how to practice environmental development from their foreign competitors for developing countries.

There are still some unsolved research questions. First, it has claimed that the external and internal factors could interactively affect a company's environmental management (Menguc et al., 2010), it is, however, not clear how these external and internal factors could promote corporate sustainability. Second, the research of institutional theory has been neglected the consideration of ethical value and ecological thinking (Ball and Craig, 2010).

2.2.3.5 Resource-based View

Resource-based view (RBV) is considered as an important theory to explain a competitive development for a company (Penrose, 1959; Rumelt, 1984). In RBV, companies could sustain competitive advantage through the acquisition or generation resources that are valuable, rare, imperfect inimitable and non-substitutable (Amit and Schoemaker, 1993; Barney, 1991; Wernerfelt, 1984). RBV composes of organizational assets, organizational capabilities, organizational processes, organizational attributes, organizational information, and knowledge (Barney, 1991).

Most ENV researches are related to the application of organizational capabilities. Organizational capabilities are referred to the competencies and/or skills of a company that could trigger and sustain a superior performance (Darnall and Edwards, 2006; Ethiraj et al., 2005; Russo and Fouts, 1997). Hart (1995) emphasizes that organizational capabilities play an important role for companies to practice ENV. Specially, effective management of organizational capabilities could develop a set of proactive environmental strategies that go beyond compliance with environmental regulations and also achieve a high competitive advantage (Aragon-Correa, 1998; Hart and Ahuja, 1996; Porter and Van Der Linde, 1995). Russo and Fouts (1997) argue that SOC can also be constituted as a source of competitive advantage. Bansal (2005) claims that the development of a capital management system, which bases on organizational capabilities, has a positive impact on a company's SOC.

Although recent research has a tendency to apply RBV for modelling corporate sustainability, some limitations can be observed. First, these researches are mainly considered dimensions of corporate sustainability independently (e.g., SOC or ENV). Second, the RBV research has only considered the impact of organizational capabilities on corporate sustainability; their interdisciplinary studies (e.g., corporate governance and information system) is neglected and thus deserved for future investigation.

2.2.3.6 Stakeholder Theory

Stakeholders refer as "those groups who can affect or are affected by the achievement of an organization's purpose" (Freeman, 1984, p. 49). Stakeholders include, but are not limited to, suppliers, customers, employees, local communities, and governments (Berman et al., 1999), and that they are the fulcrum of the stakeholder theory (Russo and Perrini, 2010). Stakeholder theory addresses "the overall stakeholder relationship as a multifaceted, multi-objective, complex phenomenon" (Harrison and Freeman, 1999, p. 483). In the stakeholder theory, companies could produce externalities which could cause stakeholders to give pressure on companies to take rectifying actions that would improve the negative impact of outcome to a company (Sarkis et al., 2010). It is suggested that a company should develop a stakeholder management system so that they could establish a strong relationship with their stakeholders with the practice of events such as transparent of business operations, representation of stakeholder interests, and equal creation and distribution of values (Bansal, 2005).

Extant studies have applied stakeholder theory in corporate sustainability. The reason is being that the pressures from stakeholders would have a directly impact on how an environmental strategy is being implemented in an organization (Buysse and Verbeke, 2003; Kassinis and Vafeas, 2002; Kassolis, 2007). Companies could improve their environmental practice by (1) analysing their product life cycles and (2) designing products and services that are environmental friendly (Bansal and Roth, 2000; Roome and Wijen, 2006; Sharma et al., 2007). Studies also claimed that there is a different level of influences form stakeholders (Bansal and Roth, 2000; Timur and Getz, 2009). For example, a local community, media, and public concern may pay more attention on companies' environmental development and social visual operation (Banerjee et al., 2003). Government, in another view, is directly concerned with the optimum economic use of natural resources while the jobs are guaranteed and the resources are protected (Timur and Getz, 2009). The government has mandated companies to compliance their environmental standards so that the agents of development do not destroy the future basis for corporate sustainability (Banerjee et al., 2003).

There are two main areas which deserve further researches. First, it is claimed that stakeholders are playing a critical role in a company's corporate sustainability; however, empirical studies are lacked. Second, there is no research revealed on how stakeholders' pressures could impact on the adoption of technology and innovation diffusion in corporate sustainability.

Table 2.7 Theories applied to Corporate Sustainability

Theory	General conceptualization	Current corporate sustainability related study and theory application	Future research and theory application
Contingent theory	Contingent theory posits that organizational performance is a result of the proper alignment of internal organizational design variables with external context variables (Burns and Stalker, 1961; Thompson, 1967).	1. Whether a company should practice corporate sustainability and the extent to which the company should practice corporate sustainability depend on influences of business environmental factors. 2. Business environmental factors, such as complexity, dynamism, and hostility have impacts on a company's corporate sustainability practices (Aragon-Correa and Sharma, 2003).	1. Other characteristics of the general business environment could also be possible to influence firms' action on the process of corporate sustainability. 2. It is unclear how the external and internal factors interactively promote corporate sustainability from integral level. 3. Further studies on developing counties are needed to understand the impact patterns of business environment on corporate sustainability.
Dynamic capability	Dynamic capability is defined as a company's ability of adapting to changing environment by altering internal and external resources (Teece et al., 1997).	1. Some studies treated corporate sustainability as a kind of dynamic capability (e.g., Aragon-Correa and Sharma, 2003; Newman, 2007). 2. Other studies treated the dynamic capability as an antecedent of corporate sustainability (e.g., Marcus and Anderson, 2006; Vollenbroek, 2002).	1. Extant studies only analysed corporate sustainability as a dynamic capability from qualitative studies. 2. There is haste that how other kinds of dynamic capability can impact on or trigger practices of corporate sustainability.
Ecological modernization (EM)	EM focuses on the relationship between industrial development and the natural environment (Mol, 1997; Murphy and Gouldson,	1. In EM, Ecological regulations and policies could be reconciled with economic development (Pataki, 2009). 2. EM puts heavy emphasis upon	1. More discussions by EM are needed on how processes of corporate sustainability take place. 2. It is unclear what kind of diffusion mechanism on social development

	2000).	technology advancement; Practice of corporate sustainability is consistent with the concept of environmental innovation (Weidner, 2002).	should be developed under EM
Institutional theory	In explaining corporate behaviour, institutional theory posits that external forces persuade organizations to undertake similar strategic actions (Hoffman, 2001; Scott, 2001).	1. Institutional theory is important for corporate sustainability studies (Jennings and Zandbergen, 1995). 2. Different studies come from different points of view based on institutional theory.	1. It is not clear how the external and internal factors could promote corporate sustainability. 2. It is not clear about the impact of new institutional theory on corporate sustainability.
Resource - based View	Companies can achieve sustained competitive advantage through the acquisition or generation resources that are valuable, rare, imperfect inimitable and non-substitutable in unique combinations (Amit and Schoemaker, 1993; Barney, 1991; Wernerfelt, 1984).	1. Organizational capabilities play an important role for companies on the process of ENV. (Hart, 1995; Sharma and Vredenburg, 1998). 2. SOC can constitute a source of competitive advantage (Russo and Fouts, 1997).	1. An integration of all the dimensions of corporate sustainability together is needed. 2. Interdisciplinary studies with resource-based view are needed for future investigation of corporate sustainability.
Stakeholder theory	In the stakeholder theory, companies could produce externalities which could cause stakeholders to give pressure on companies to take rectifying actions that would improve the negative impact of outcome to a company (Sarkis et al., 2010).	1. The pressures from stakeholders would have directly impact on how an environmental strategy is being implemented in an organization (Buysse and Verbeke, 2003; Kassinis and Vafeas, 2002). 2. Studies also claimed that there is a different level of influences form stakeholders on corporate sustainability.	1. Empirical studies are lacked to confirm the impacts of stakeholders on corporate sustainability. 2. There is no research has revealed on how stakeholders' pressures could impact on the adoption of technology and innovation diffusion by companies that practicing corporate sustainability.

2.3 IS, Organizational Capabilities, and Corporate Sustainability

This section introduces the role of IS in organizational capabilities and corporate sustainability as follows.

2.3.1 Role of IS in Organizational Capabilities

This section firstly introduces organizational capabilities from the perspective of resource-based view, and then proceeds to discuss the role of IS in organizational capabilities.

2.3.1.1 Organizational Capabilities and Resource-based View

The theory of resource-based view (RBV), developed by Barney (1991), is considered as a very useful tool in explaining the antecedents and consequences of various companies' strategic management (Chan, 2005). RBV has been applied, tested, and developed by many researchers through empirical and conceptual analysis in research fields such as management (Hart, 1995), marketing (Vorhies and Morgan, 2005), information systems (Wade and Hulland, 2004), supply chain management (Bowen et al., 2001), and accounting (Henri, 2006). Barney (1991) regards resources as organizational assets and organizational capabilities controlled by the company that enable it to conceive of, and implement strategies that improve its efficiency and effectiveness. However, Grant (1991) states that RBV should not treat organizational capabilities be the same as resources. In his opinion, organizational capabilities constitute as what organizations can do as a result of bundles of resources working together (Grant, 1991). Chan (2005) also claims resources as the antecedents of organizational capabilities. This thesis adopts these two doctrines and treats resources as the enablers of organizational capabilities. Table 2.8 summarizes the structure of the RBV from an extensive literature review. Table 2.8 suggests that RBV has three branches of measurements: resources, organizational capabilities and competitive advantage. Resources are referred as the input value to production processes (Barney, 1991), which could be divided into tangible and intangible resources. Organizational capabilities are competencies or skills that a company could employ to transfer inputs (e.g., resources) to outputs (e.g., performance) (Barney, 1991). Competitive advantage is referred as how a company evaluate its value creating strategy such as cost or differentiation (Barney, 1991). To conclude, companies could consider resources as inputs, deploy their organizational capabilities to transfer resources into outputs, and obtain competitive advantage as the performance (Grant, 1991). In the following, we further elaborate the concept of organizational capabilities further.

Table 2.8 Literature Review on RBV

Resource- based View		**References**
Resources		
Tangible resources	Financial resources	Barney, 1991; Chan, 2005; Grant, 1991; Judge and Douglas, 1998; Tomer, 1987; Williamson, 1975
	Physical resources	
	Technological resources	
	Organizational resources	
Intangible resources	Human resources	
	Innovation resources	
	Reputation resources	
Organizational capabilities		
	Technology	Andrews, 1971; Bowen et al., 2001; Dutta et al., 2005; Kogut and Zander, 1992; Kuemmerle, 1997; Lorenzoni and Lipparini, 1999; Sharma et al., 2007; Ulrich and Lake, 1991
	Production	
	Design	
	Distribution	
	Procurement	
	Service	
Competitive advantage		
	Cost or differentiation	Amit and Schoemaker, 1993; Barney, 1991; Porter, 1985; Rumelt, 1984; Wernerfelt, 1984
	Pre-emption	
	Future position	

Organizational capabilities are playing an important role in RBV. Organizational capabilities are formally defined as the firm's overall competencies to coordinate its complex human and non-human resource effectively to achieve corporate performance (Grant, 1991). Table 2.9 portrays a list of definitions of organizational capabilities. Most researches share the same positions that organizational capabilities are firm-specific characteristics (that is, it is not easily obtained and duplicated), path-dependent characteristics (that is, it is long-term accumulation and continuous learning), and source of competitive advantage on long-term basis (Kusunoki et al., 1998). In other words, companies can obtain a sustained competitive advantage through the acquisition or generation organizational capabilities which are valuable, rare, imperfect inimitable and non-substitutable in unique combinations (Amit and Schoemaker, 1993; Barney, 1991). These capabilities also are of history dependence, causal ambiguity and social complexity (Barney, 1991).

Table 2.9 Definitions of Organizational Capabilities

Sources	Definitions of Organizational Capabilities
Dutta et al., 2005	Organizational capabilities refer to "an organization's capacity to deploy tangible and intangible resources over time and generally in combination and to leverage those capabilities to bring about a desired end".
Helfat and Peteraf, 2003	"An organizational capability refers to the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result."
Sharma and Vredenburg, 1998	Organizational capabilities are "the coordinating mechanisms that enable the most efficient and competitive use of the firm's assets-whether tangible or intangible".
Teece et al., 1997	Organizational capabilities are "the internal and external organizational skills, resources, and functional competences developed within firms to match the requirements of a changing environment".
Collis, 1994	Organizational capabilities are defined as "the socially complex routines that determine the efficiency with which firms physically transform inputs into outputs".
Day, 1994	"Organizational capabilities are the coordinating mechanisms that enable the most efficient and competitive use of the firm's assets-whether tangible or intangible."
Amit and Schoemaker, 1993	Organizational capabilities "refer to a firm's capacity to deploy resources, usually in combination, using organizational processes to affect a desired end".
Grant, 1991	Organizational capabilities are defined as the firm's overall competencies to coordinate its complex human and non-human resource effectively to achieve corporate performance.

2.3.1.2 IS and Organizational Capabilities

This thesis follows Melville (2010) to define information systems (IS) as "a combination of people, processes, and technologies that enable the processing of digitized information" (p. 3). Information technology (IT) refers to "the information technologies that comprise the technological foundation of information systems" (Melville, 2010, p. 4). IS include many different varieties of software platforms and databases, which "encompass enterprise-wide systems designed to manage all major functions provide by companies such as SAP, PeopleSoft, JD Edwards, and so on, to more general purpose database products targeted towards specific uses such as the products offered by Oracle, Microsoft, and many others" (Dewett and Jones, 2001, p.313). "IT encompasses a broad array of communication media and devices which link IS and people including voice mail, e-mail, video conferencing, the internet and intranet, group ware, car phone, fax machines, personal digital assistants, and so on" (Dewett and Jones, 2001, p. 314). Based on the definitions of IS and IT, IS includes IT (Melville, 2010). In this thesis, we refer to them jointly as information systems (IS).

RBV started to appear in IS research in the mid-1990s (Wade and Hulland, 2004). In IS literature, researchers have conceptualized the relationship between IS and organizational capabilities from different perspectives. Based on Sethi and King's (1994) logic, this thesis separates the measurement of IS related capabilities into two fundamental approaches. One approach is the outcome or functional approach which is reflected in concepts such as IS infrastructure, IS – partnership relationship, and IS management. In this approach, the relationship between IS and organizational capabilities is called IS capability (Bharadwaj, 2000).

Bharadwaj (2000) defines IS capability as the "ability to mobilize, and deploy IT-based resources in combination or co present with other resources and capabilities" (p. 171). According to this definition, IS is treated as an important role the same as the other resources and capabilities. This outcome approach argues that a given functional aspect of IS capability is valuable, rare, inimitable and non-substitutable, and this approach argues that IS capability can be quantified as the amount of IS capability possessed by a company (Newbert, 2007). Past studies on measuring IS related organizational capabilities have mainly relied on outcome or functional measurement, a trend also seen in the broader area of IS research (e.g., Bharadwaj, 2000; Bharadwaj et al., 1999). However, this approach has many limitations. First, this approach gauges the impact of IS at lower operational levels (e.g., IS infrastructure, IS management) which is a lack of reliance on any underlying theory for variable selection (Crowston and Treacy, 1986; Sethi and King, 1994). Second, the measurements of this approach have limited applicability in context; in other words, it is lack of generalizability. It is impossible to enumerate all IS related organizational capabilities because each business develops its own configuration of IS related capabilities (Daly et al., 1994). Third, not all the measurements from this approach obtain the characteristics of value, rareness, inimitability and non-substitute based on RBV (Wade and Hulland, 2004). For example, IS-business partnership could be easily imitated and thus be substituted, while IS technical skills could be hard to imitate and substitute (Wade and Hulland, 2004).

The other approach is trait approach, which identifies key characteristics of IS related organizational capabilities (Sethi and King, 1994). The trait approach applies a broader systems resource model, which defines the effectiveness as the attainment of a normative state and advocates the measurement of "mean" (Hamilton and Chervany, 1981). The trait approach underpins construct development and measurement, which can lay the foundation for theory construction and thus contribute more to the development of the field at the current field (Sethi and King, 1994). In this approach, we called the relationship between IS and organizational capabilities as "IS-enabled capabilities" (ISEC) (Mata et al., 1995). This thesis applies ISEC as the relationship between IS and organizational capabilities. This thesis focuses on how IS as an enabler help to improve organizational capabilities, which in turns it has an impact on a company's strategic practices. Among this view, Ordanimi and Rubera (2010) claim that a company can increase their IS values, which can then leverage the value of the company's capabilities when embedding IS in the company.

More recently, there are growing evidences to reveal that a competitive advantage often depends on whether or not companies can take advantages of their new capabilities that are enabled by IS (Tippins and Sohi, 2003; Wu et al., 2006). For example, Wu et al. (2006) conclude that companies whose embed IS within their supply chains could improve their performance in supply-chain capabilities, which is considered as an unique set of organizational capabilities. Sher and Lee (2004) point out that IS can enrich their knowledge management system, which is facilitated by their organizational capabilities. These organizational capabilities are firm-specific and hard to duplicate by their competitors. Embedding IS that maximizes the usage of organizational capabilities make IS assets hard to inimitable by their competitors (Ravichandran and Lertwongsatien, 2005). Mata et al. (1995) and Thambusamy and Salam (2010) point out that IS could be served as a key enabler for organizational capabilities. Day (1994) also argues that IS help companies to develop their organizational capabilities further, but it is impossible to enumerate all organizational capabilities because each company would develop their own capabilities with their configurations (Day, 1994). By summing all kinds of capabilities into a whole, this thesis focuses on the overall organizational capabilities that enabled by IS.

This thesis considers ISEC to be the company's overall competencies enabled by IS which coordinates asset effectively so that corporate performance can be enhanced (Chan, 2005; Grant, 1991; Sethi and King, 1994). Instead of identifying the actual ISEC that confers an advantage to a company, this thesis considers how well managers could operate their companies effectively using their ISEC (King and Zeithaml, 2001; Newbert, 2007). IS, by itself, cannot be the sole instrument in shaping up the company's core capabilities. However, with incorporating IS effectively with company's organizational context, the outcomes make all available resources be apparent to all personnel and also generate meaningful knowledge that could facilitate the learning processes efficiently (Andreu and Ciborra, 1996).

2.3.2 Role of IS in Corporate Sustainability

IS is considered as a greatest force for improving organizational productivity in the last half century (Watson et al., 2010). Recent studies highlighted that IS has also played a critical role in revising the practice of corporate sustainability that could improve the poor performance of their waste products (e.g., resources waste, energy inefficiency, noise, and emissions) (Watson et al., 2010). For example, Melville (2010) claims that IS plays a critical role in shaping individuals' behavior about the environment, and also transform corporate sustainability processes effectively. Watson et al. (2010) support to this view and state that companies could make use of IS to collect relevant data that would allow them to analyzing energy consumption effectively. Huang (2009) states that one way to achieve this goal is to revisit their environmental practices though applying the system development lifecycle as a measuring tool in every stage of development processes. IS could improve the practice of corporate sustainability in the following ways. IS enables and strengthens the measurement and monitoring system of daily operational phase of a supply chain system (Watson et al., 2008). IS could support organizational functions effectively through the systems such as a partnership collaboration system , group document management system, and a cooperative knowledge management system (Watson et al., 2008). IS could also help companies to (1) track environmental information (e.g., toxicity, energy used, water used, etc.), and (2) support team work of meetings worldwide (Watson et al., 2010). IS can also be served as a tool that facilitates connectivity and communication between the organization and stakeholders (Hart et al., 2003). Malhotra et al. (2010) conclude that IS could enable a company to achieve the following benefits in corporate sustainability: (1) to reduce transportation cost, (2) to support team work via telecommunications that would reduce the traveling time for staff, (3) to track down relevant environmental information (such as toxicity, energy used, water used, air pollution), (4) to monitoring emissions and waste production, (5) to provide information that encourages green choices by consumers, (6) to improve decision making by executives through highlighting sustainability issues, (7) to reduce energy consumption, (8) to support the generation and distribution of renewable energy, (9) to limit carbon and other emissions, and (10) to identify the role IS in energy policy.

CHAPTER 3 METHODOLOGY

This chapter serves two objectives. First, it explains our proposed research models and hypotheses. Second, it elaborates the research methodology, data collection method, and data analysis procedures. This chapter contains the following sections:

a) Research Model Development;
b) Research Models and Hypotheses;
c) Instrument Development;
d) Research Sampling and Data Collection Procedure; and
e) Statistical Analysis Methods.

3.1 Research Model Development

Recently, many research studies agree that Information systems (IS) has an influence on a company's corporate sustainability practices (e.g., Melville, 2010; Watson et al., 2010). However, there is yet no research to show evidently. This thesis attempts to develop a theoretical framework to confirm the significance of IS impact on corporate sustainability. In the following, we introduce our development of research models from three stages.

First, researches have linked the importance of IS to a company's performance on corporate sustainability. Melville (2010) develops a research agenda and stated that IS can play a significant role in shaping up individuals' behavior about corporate sustainability. Watson et al. (2010) demonstrate theoretically on how to transform the power of IS that can be used as a leverage to create the value of corporate sustainability. However, there is a lack of literature to quantify on how IS can be measured as an enabler and impact on the performance of corporate sustainability. Mata et al. (1995) point out that IS could be served as a key enabler of organizational capabilities. This thesis follows this doctrine and conducts a study on the impact of IS on corporate sustainability by considering their organizational capabilities. This thesis terms this construct as IS-enabled capabilities (ISEC). Therefore, this thesis intends to examine empirically whether the construct of ISEC has a significant impact on corporate sustainability. If so, how ISEC could effect on corporate sustainability.

Second, literature claims the opinion that corporate sustainability should be considered from wider viewpoints. In this thesis, we consider corporate sustainability consists of three dimensions, and they are social development (SOC), economic development (ECO), and environmental development (ENV). However, recent publications still consider the study of corporate sustainability models by studying these three dimensions independently. For example, literature considering only ENV includes Chan (2005) and Christmann (2000). Other authors considering only SOC and ECO include Kelm et al. (1995) and Ulaga (2003). In this thesis, we propose to study these three dimensions of corporate sustainability altogether. To achieve this objective, we will first attempt to conduct an extensive literature review on these three dimensions, and then validate their measurement items before applying them in our proposed models.

After the above works, we then confirm the relationship between the constructs of ISEC and corporate sustainability. In this thesis, corporate sustainability is consisted of three dimensions: SOC, ECO, and ENV. Figure 3.1 shows the basic concept of our study.

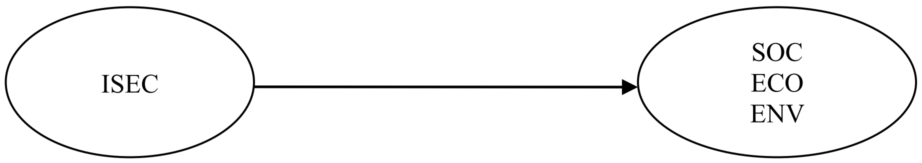


Figure 3.1 Direct Relationships between ISEC, SOC, ECO, and ENV

Third, even though some researchers hold the view that corporate sustainability should be considered from three dimensions of corporate sustainability (i.e., SOC, EOC, and ENV), many of the researchers still reported their findings on these three dimensions independently (e.g., Watson et al., 2010). Some researchers also argue that these three dimensions of corporate sustainability may have impact on each other (e.g., Gladwin et al., 1995; Starik and Rands, 1995), so that each of these three dimensions may not have an equal role in corporate sustainability (Townsend, 2004). For example, Littig and Grießler (2005) argue that these three dimensions of corporate sustainability should not be treated equally because such equalities do not exist in the real world. Littig and Grießler (2005) state that the economic arguments often tend to be more convincing one, and the equal ranking of priorities is rarely an issue in the political context. Gladwin et al. (1995) claim that the improvement of SOC is necessary as it is a precedent factor to motivate ENV. Gladwin et al. (1995) also claim that the enhancement of welfare in ECO and ENV are the requirements to facilitate SOC. Nattrass and Altomare (1999) state that "our industrial economy, indeed any human economy, is contained within and dependent upon the natural world" (p. 4). However, there is no empirical study has shown evidently that the exact relationships between these three dimensions in corporate sustainability. In this thesis, we consider the relationships between these three dimensions of corporate sustainability as the concept of three "trade-off" relationships proposed by Cho and Pucik (2005). Figure 3.2 shows these three "trade-off" relationships. For each pair of "trade-off" relationships, the two dimensions of corporate sustainability could have a significant impact on each other (Cho and Pucik, 2005).

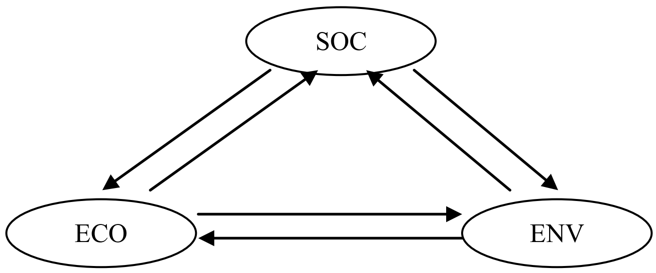


Figure 3.2 Trade-off Relationships between SOC, ECO, and ENV

Our research models are to empirically study whether these three dimensions have significantly impact on each other when we introduce the construct of ISEC as an influencing factor. In other word, under the effect of ISEC, we want to know which dimension of corporate sustainability has a more impact on the other two dimensions. Figure 3.3 shows the relationships between ISEC and these three dimensions of corporate sustainability. In Figure 3.3, ISEC is proposed to have a positive relationship with each of these three dimensions of corporate sustainability, together with the consideration of the "trade-off" relationships between these three dimensions of corporate sustainability.

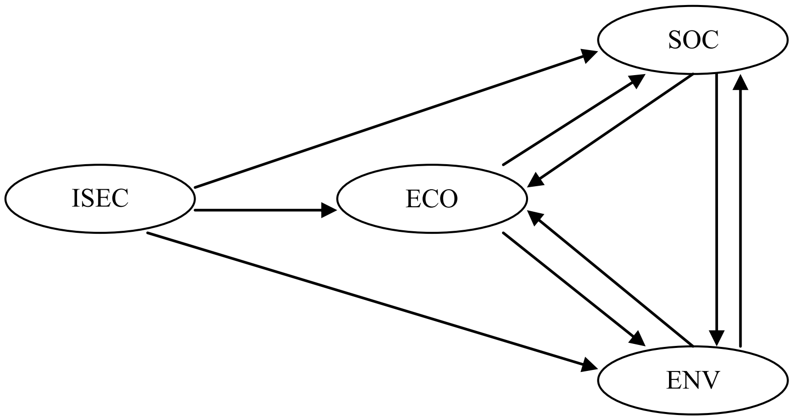


Figure 3.3 Integrated Relationships between ISEC, SOC, ECO, and ENV

3.2 Research Models and Hypotheses

Figure 3.4 depicts the proposed research models of this thesis. We intend to explain the logic for having these models here. Altogether, we have a total of three set of hypotheses. The first set of hypotheses, which constitutes of hypotheses. H1a, H1b and H1c, is to test the prerequisite requirement for our final model (i.e., H5) that if ISEC has a direct effect on each of the three dimensions. The second set of hypotheses, which consists of hypotheses H2, H3 and H4, is to test the "trade-off" effects for any two constructs of SOC, ECO, and ENV that have influenced by the ISEC. The last set is our final model (i.e., Hypothesis H5), which is formulated by combining the results from hypotheses H2, H3 and H4. We further describe each of these tests below.

We firstly confirm the direct relationships between the construct of ISEC and the three dimensions of corporate sustainability. We then consider three mediating relationships between ISEC and a pair of dimensions of corporate sustainability. To test these three mediating relationships, we follow Cho and Pucik's (2005) method to test each pair of their "trade-off" relationship. Last, we combine all these three mediating relationships together to form "one" integrated model. All hypotheses are discussed as follows.

3.2.1 Direct Relationships between ISEC and Corporate Sustainability

Embedding IS within a company's organizational capabilities could make a company to be more competitiveness when comparing with its competitors (Ravichandran and Lertwongsatien, 2005). ISEC plays an important role in organizational strategy (Grant, 1991). For example, IS-enabled coordination abilities could allow manufactures to redesign their production processes that would reduce their environmental pollution in the practice of ENV (Buchholz, 1993). IS-enabled capital management capabilities have a significant impact on a local community because these capabilities have a direct effect to SOC, ECO and ENV of corporate sustainability (Bansal, 2005). IS-enabled supply chain capabilities could serve as a catalyst in transforming IS-related resources into high values for a company to adopt a new strategic management, which subsequently could directly influence on corporate sustainability (Wu et al., 2006). ISEC could also help to promote the market and customer information, which in turns could help companies to SOC practice in the sustainable development (Tippins and Sohi, 2003). IS could also elevate companies' capabilities for sustainability (Russo, 2003), such as a knowledge integration (Grant, 1996) and a change-readiness (Clark et al., 1997). In this thesis, we thus develop to test if ISEC has a direct relationship with the three dimensions of corporate sustainability. Figure 3.4 shows these three proposed hypotheses H1a, H1b, and H1c.

H1a: There will be a positive relationship between a company's ISEC and SOC.

H1b: There will be a positive relationship between a company's ISEC and ECO.

H1c: There will be a positive relationship between a company's ISEC and ENV.

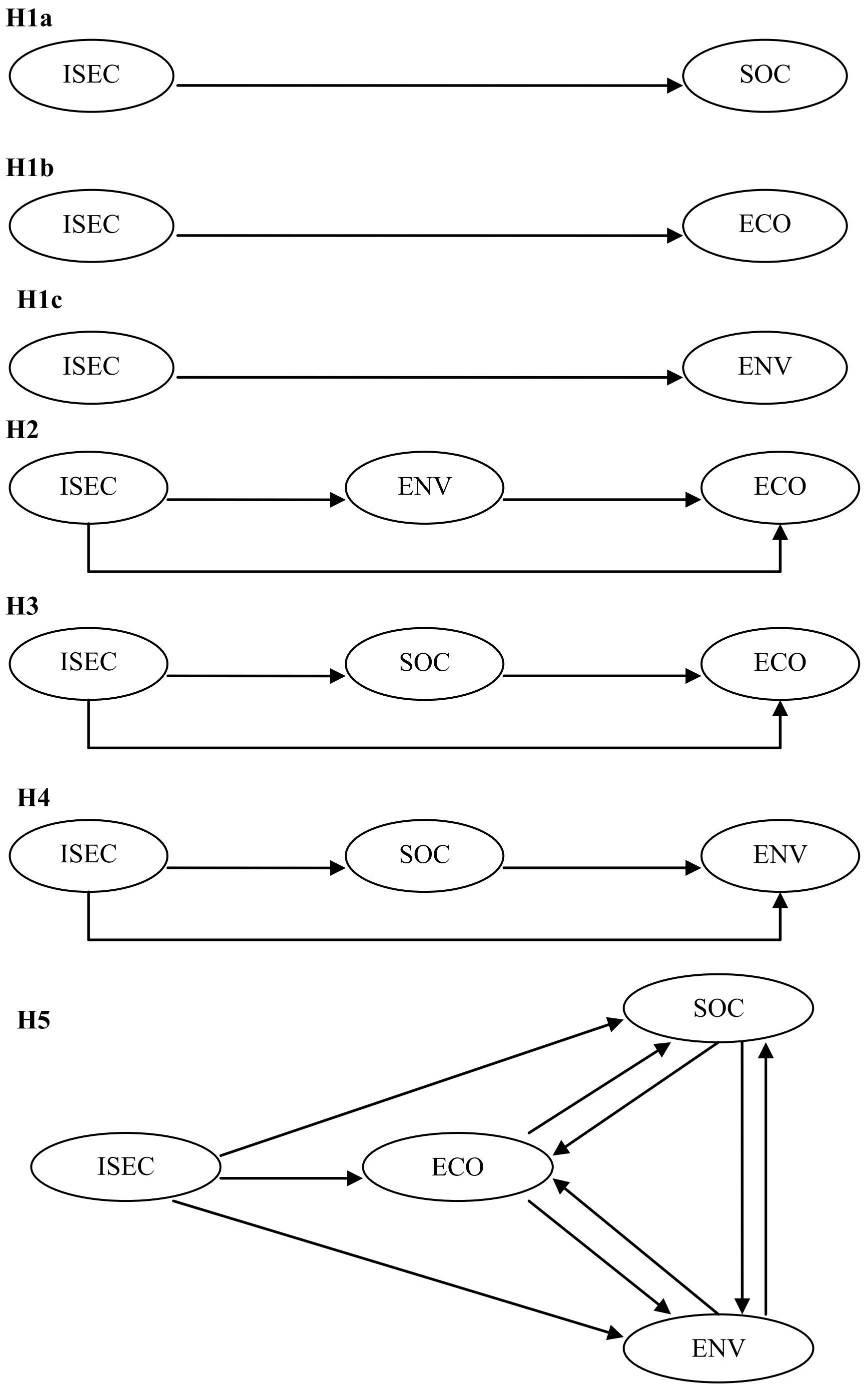


Figure 3.4 Summaries of Hypotheses: Direct Relationships (H1a, H1b, H1c), Mediation Models (H2, H3, H4) and Integrated Model (H5)

3.2.2 Mediating Relationships between ISEC and Corporate Sustainability

Though the use of environmental technology, IS-enabled innovative capabilities could strengthen companies' competence in such a way that the outcome could improve the companies' ENV which would also indirectly influence on their ECO capabilities (Dewett and Jones, 2001; Shrivastava, 1995). IS enables companies' capabilities through the innovation and communication features, which could modify their existing business processes that make the end product becomes more environmental friendly (Esty, 2004; Gladwin, 1992). A company whose operates on the features of environmental friendly could help companies to create sustainable economic structures as well to reduce their operations costs (Aragon-Correa, 1998; Davenport and Short, 1990). To achieve a corporate sustainability, it is suggested that companies are required to incorporate ecological costs into their measures of economic welfare, while the ecological costs are directly related to the company's ENV (Daly et al., 1994). One way to achieve such an objective is through the use of ISEC to develop a capital management system that could help to monitor the waste production and emission (Bansal, 2005; Melville, 2010). Therefore, an essential step for the processes of cost reduction could straightly be based on the construct of ENV that engineers by ISEC (Hilty et al., 2005). Considering the importance of understanding the impact of "trade-off" relationship between the pair of constructs of ECO and ENV, we propose to examine how companies practiced ECO and ENV, speculating that both ISEC and ENV drive ECO.

H2: A company's ISEC has a direct and positive relationship with ECO and an indirect and positive relationship with ECO through ENV.

ISEC could have a direct improvement on SOC by improving the social network, customer-relationship management, and public linkage. The use of ISEC could enhance people to communicate more flexible and efficient within and between companies (Hilty et al., 2005; Waage et al., 2003). ISEC could also help companies to (1) concentrate on after-sale feedback by interconnecting business and consumers in a more efficient manner, and (2) strengthening the link between business and public authorities (Hilty et al., 2005; Waage et al., 2003). With ISEC, companies' SOC can further improve ECO through the promotion of product differentiation and the gaining a reputation (McWilliams et al., 2006; McWilliams et al., 2002). ISEC could help companies to address their social responsibility so as to improve the companies' ECO in terms of value creation. For example, to meet consumers' interest and demand, companies may regime to introduce new products or services through the applications of ISEC (Conner, 1991; Porter, 1985). ISEC improves companies' competence from aspects such as innovation, collaborate learning, and information collection. Based on these aspects, companies could collect information from customers by learning about customers' interest and designing products that based on customers' interest from ISEC. After meeting customers' needs and gaining SOC reputation, companies could improve their ECO on aspects of costs reduction and profits increase (Birchard, 1995; Hillman and Keim, 2001). ISEC provides a way to monitor SOC processes and to help communicate with the public which could further improve companies' reputation. Considering the trade-off relationship between ECO and SOC, we hypothesize that SOC mediates the relationship between ISEC and ECO.

H3: A company's ISEC has a direct and positive relationship with ECO and an indirect and positive relationship with ECO through SOC.

ISEC could have a direct impact on ENV by monitoring emissions and waste production, tracking environmental information, supporting generation and distribution of renewable energy, and so on (Hilty et al., 2005; Melville, 2010). On the other hand, ISEC can also impact on ENV through SOC. SOC, which focuses more on moral and ethical dimensions (Donaldson and Preston, 1995), is a concern for the societal goodness and it involves with the steps for taking the initiative to be ecologically responsible (Bansal and Roth, 2000). ISEC could make SOC matters efficiently and effectively. For example, an environmental strategy responds to customers and other stakeholders' demands to mitigate the adverse effects of pollution (Buysse and Verbeke, 2003; Murillo-Luna et al., 2008; Sharma and Henriques, 2005). ISEC provides information processing that could also keep stakeholders better informed about the environmental footprint of a business's operations (Chen et al., 2008). The attention of stakeholders sometimes encourages organizations – or even forces them, through laws and regulations – to be more ecologically responsible. The function of IS-enabled capabilities could also enhance the communication capability that could educate stakeholders about the environmental issues (Chen et al., 2008). To conclude, ISEC has the potential to maximize stakeholder satisfaction and to improve social equity (a part of SOC). These gains in SOC further impact the extent or the pattern of each company's ENV. In analyzing the impact of "trade-off" relationship between a pair of SOC and ENV, we thus hypothesize that ENV is driven by ISEC and SOC.

H4: A company's ISEC has a direct and positive relationship with ENV and an indirect and positive relationship with ENV through SOC.

3.2.3 Integrated Model

We build the integrated model bases on the evidences from the previous studies of Chan (2005), Hilty et al. (2005), Watson et al. (2010), and Bhatt and Grover (2005). Despite the importance of relationships between ISEC and corporate sustainability, there is no research has been examined empirically about the direct and indirect relationships between ISEC and (SOC, ENV, and ECO). Our integrated model includes these relationships by combining the results of H2 to H4. Our integrated model implies that an optimal path may exist that ISEC has the impact on SOC, ENV, and ECO. We thus hypothesize that:

H5: A company's ISEC has positive direct and indirect relationships with SOC, ECO, and ENV.

3.3 Instrument Development

In this thesis, we test the above proposed hypotheses/models by using a dataset collected from a questionnaire survey. This section elaborates on how to develop measurement items for our model constructs and also our questionnaire design. The model constructs are referred to ISEC, SOC, EOC, and ENV.

3.3.1 Measurement Items of the Model Constructs

This section presents the measurement items of the model constructs.

3.3.1.1 SOC Construct

The measurement items of SOC are based on the works in Chapter 2. Table 2.4 shows a total of 12 applications of SOC. In this section, we study these applications and match similar applications together so that we could develop the operationalized items for SOC. Table 3.1 reviews the results for such a matching. In Table 3.1, column 3 refers to those 12 applications of SOC, and column 2 refers to our matched measurement items. We combine the applications of "employee health and safety" and "community health and safety" into one measurement item and call "SOC1: Employee or community health and safety". We combined the applications of "invest in social projects", "act on customer comfort" and "notice customer awareness or complaints" into one measurement item and we call "SOC2: Recognize and act on the need to fund local community initiatives". We combine the applications of "support local community" and "equal treatment, discrimination, harassment, violence" into one measurement item and call "SOC3: Protection claims and rights of aboriginal peoples or local community". We combine the applications "concern for private brands" and "concern for social impact of operation" into one measurement item and we call "SOC4: Show concern for visual aspects of facilitates and operations". We consider the application "improve transparency" and call it as "SOC5: Make public disclosure". We combine applications of "employee participation" and "stakeholder involvement" into one measurement item and call "SOC6: Consider stakeholder interests". At the end, it is interested to note that our measurement items of SOC matched perfectly with those proposed by Bansal (2005), and we conclude that our measurement items of SOC are generic.

Table 3.1 Measurement Items of SOC

Construct	Measurement Items	Applications from Table 2.4
SOC	SOC 1: Improve health and safety	1. Employee health and safety
		2. Community health and safety
	SOC 2: Recognize and act on the need to fund local community initiatives	3. Invest in social projects
		4. Act on customer comfort
		5. Notice customer awareness/complaints
	SOC 3: Protect claims and rights of aboriginal peoples or local community	6. Support local community
		7. Equal treatment, discrimination, harassment, violence
	SOC 4: Show concern for visual aspects of facilities and operations	8. Concern for private brands
		9. Concern for social impact of operation
	SOC 5: Make public disclosures	10. Improve transparency
	SOC 6: Consider stakeholder interests	11. Employee participation
		12. Stakeholder involvement

3.3.1.2 ECO Construct

The measurement items of ECO are based on the works in Chapter 2. Table 2.5 shows a total of 7 applications of ECO. In this section, we study these applications and match similar applications together so that we could develop measurement items for ECO. Table 3.2 reviews the results of such matching. In Table 3.2, column 3 refers to those 7 applications of ECO, and column 2 refers to our matched measurement items. To be specific, the application of "sell waste products" is interchangeable with the measurement item "ECO1: Sell waste products for revenue". We thus combine the applications of "reduce payments to employees or per share" and "reduce tax paid" into one measurement item and call "ECO2: Reduce cost of input". We consider "reduce environmental costs" and call "ECO3: Reduce cost of waste management". We consider the application of "collaboration with government" as the same as the measurement item "ECO4: Connect with government over company interests". The application "improve innovation and R&D expenditure" can be understood as the measurement item "ECO5: Apply spin-off technologies to other areas". We call the application of "make clear process and roles" as the measurement item "ECO6: Differentiate products/processes". Again, our measurement items of ECO have also matched perfectly with those proposed by Bansal (2005), and we conclude that our measurement items of ECO are generic.

Table 3.2 Measurement Items of ECO

Construct	Measurement Items	Applications from Table 2.5
ECO	ECO 1: Sell waste products for revenue	1. Sell waste products
	ECO 2: Reduce cost of input	2. Reduce payments to employees
		3. Reduce tax paid
	ECO 3: Reduce cost of waste management	4. Reduce environmental costs
	ECO 4: Connect with government over company interests	5. Collaboration with government
	ECO 5: Apply spin-off technologies to other areas	6. Improve innovation and R&D expenditure
	ECO 6: Differentiate products/processes	7. Make clear process and roles

3.3.1.3 ENV Construct

The measurement items of ENV are based on the works in Chapter 2. Table 2.6 shows a total of 23 applications of ENV. In this section, we study these applications and match similar applications together so that we could develop the operationalized measurement items for ENV. Table 3.3 reviews the results of such a matching. In Table 3.3, column 3 refers to those 23 applications of ENV, and column 2 refers to our matched measurement items. To be specific, we combine the applications of "Reduce use of air resources" and "reduce use of water" into one measurement item and call "ENV1: Reduce energy consumption". We combine the applications of "reduce waste in processing", "process emissions to air, water, land, etc." and "safe disposal/handing of wastes/toxic waste" into one measurement item and we call "ENV2: Reduce waste and emissions from operations". We combine the applications of "modify transportations for diversity" and "maintain animals' diversity" into one measurement item and we call "ENV3: Reduce impact on animal species and natural habitats". We combine the applications of "product and packaging recovery", "material recycling program" and "reduce impact on ecosystem" into one measurement item and call "ENV4: Reduce environmental impacts of products/services". We do not change the application of "establish environmental partnership" and still call "ENV5: Establish environmental partnership". We combine the applications of "employee environmental training", "environmental monitoring" and "environmental legislation" into one measurement item and call "ENV6: Reduce risk of environmental accidents, spills and releases". We combine the applications of "use recycled materials" and "use recycled waste material" into one measurement item and call "ENV7: Reduce purchases of non-renewable materials, chemicals, and components". We combine the applications of "reduce non-renewable energy use" and "use renewable energy" into one measurement item and call "ENV8: Reduce the use of traditional fuels by substituting less polluting energy sources." We combine the applications of "protect environmentally sensitive locations and land use" and "disposal and treatment of hazardous/toxic wastes" into one measurement item and call "ENV9: Undertake voluntary actions for environmental restorations". We combine the applications of "environmental monitoring and reporting", "public disclose" and "training and immunity" into one measurement item and call "ENV10: Undertake environmental audit, public disclosure, employee training and immunity". In the end, all the 23 applications of ENV are combined into 10 measurement items. It is interested to note that our measurement items of ENV have matched perfectly with those proposed by Chan (2005) and Sharma and Vredenburg (1998), and we conclude that t our measurement items of ENV are generic.

Table 3.3 Measurement Items of ENV

Construct	Measurement Items	Applications from Table 2.6
ENV	ENV 1: Reduce energy consumption	1. Reduce use of air resources
		2. Reduce water use
	ENV 2: Reduce waste and emissions from operations	3. Reduce waste in processing
		4. Process emissions to air, water, land, etc.
		5. Safe disposal/handling of wastes/toxic waste
	ENV 3: Reduce impact on animal species and natural habitats	6. Modify transportation for diversity
		7. Maintain animals' diversity
	ENV 4: Reduce environmental impacts of products/services	8. Product and packaging recovery
		9. Material recycling program
		10. Reduce impact on ecosystem
	ENV 5: Establish environmental partnerships	11. Establish environmental partnerships
	ENV 6: Reduce risk of environmental accidents, spills, and releases	12. Employee environmental training
		13. Environmental monitoring
		14. Environmental legislation
	ENV 7: Reduce purchases of non-renewable materials, chemicals, components	15. Use recycled materials
		16. Use recycled/waste materials
	ENV 8: Reduce use of traditional fuels by substituting less polluting energy sources	17. Reduce non-renewable energy use
		18. Use renewable energy
	ENV 9: Undertake voluntary actions for environmental restoration	19. Protect environmentally sensitive locations
		20. Disposal and treatment of hazardous/toxic wastes
	ENV 10: Undertake environmental audit, public disclosure, training, and immunity	21. Environmental monitoring and reporting
		22.Public disclosure
		23. Training and immunity

3.3.1.4 ISEC Construct

In Section 2.3.2, we have studied the measurement items for ISEC. To develop our measurement items for ISEC, we adopt similar methods of Chan (2005) and Sharma and Vredenburg (1998). The reasons are being that: 1) these measurement items have often been used to describe the strength of the coordinating competences that a firm possesses (Sharma and Vredenburg, 1998); 2) these measurement items, form the foundation for theory, have contributed to the development of RBV (Sethi and King, 1994). In total, we obtain and modify 11 measurement items from Chan's (2005) and Sharma and Vredenburg's (1998) items. Table 3.4 outlines the measurements items of ISEC. In this table, the third column refers to the original measurement items from Chan's (2005) and Sharma and Vredenburg's (1998) studies; whereas column 2 refers to the modified version that we finalize and adopt in this thesis.

Table 3.4 Measurement Items of ISEC

Construct	Modified Measurement Items	Original Measurement Items	Reference
ISEC	The capabilities of our firms enabled by IS processed the following characteristics	The capabilities of our firms possess the following characteristics	Chan (2005); Sharma and Vredenburg (1998)
	ISEC1: Take a long period of time to build up.	These capabilities take a long period of time to build up.	
	ISEC2: Cannot be built up faster by competitors through a greater application of resources.	Competitors cannot be built up faster by competitors through a greater application of resources.	
	ISEC3: Cannot be easily be identified or imitated by competitors.	These capabilities cannot be easily be identified or imitated by competitors.	
	ISEC4: Provide benefits to several functional areas/departments of the firm.	These capabilities provide benefits to several functional areas/departments of the firm.	
	ISEC5: Provide benefits to different levels within the firm.	These capabilities provide benefits to different levels within the firm.	
	ISEC6: Cannot take away these capabilities with employees when leaving the firm.	An employee cannot take away these capabilities with him when leaving the firm.	
	ISEC7: Can facilitate collective learning within the company.	These capabilities can facilitate collective learning within the company.	
	ISEC8: Can facilitate or trigger innovation within the firm.	These capabilities can facilitate or trigger innovation within the firm.	
	ISEC9: Can help establish trust-based collaborative relationships among a wide variety of stakeholders for solving problems.	These capabilities can help establish trust-based collaborative relationships among a wide variety of stakeholders for solving problems.	
	ISEC10: Can help develop a shared or long-range vision within the firm.	These capabilities can help develop a shared or long-range vision within the firm.	
	ISEC11: Combine with other assets to generate benefits for the firm, e.g. improved reputation combines with an established retail network.	These capabilities combine with other assets to generate benefits for the firm, e.g. improved reputation combines with an established retail network.	

3.3.2 Questionnaire Design

In this section, we first introduce the proposed steps to test and validate our questionnaire, and then describe the final structure of our questionnaire.

3.3.2.1 Questionnaire Validity

The questionnaire validity is observed in its content validity and the reliability (Li et al., 2005). Content validity refers to the assessment of the correspondence of the measurement items to be included in a construct and its conceptual definition (Li et al., 2005). Reliability refers to the extent to which measurement items are free from error thus being able to produce consistent results (Li et al., 2005). To enhance questionnaire validity, we follow the method proposed by Bock et al. (2005) and Li et al. (2005) and implement them in the following two steps: 1) pilot study, and 2) translation and back translation.

3.3.2.1.1 Pilot Study

Our proposed measurement items have been examined by an expert panel which consists of three local professors, who are IS and strategic management researchers. Item wordings are revised after considering their feedbacks. A pilot study has been then conducted with 30 MBA students at Hong Kong Baptist University. The main objectives in the pilot study are the scrutiny and a check thoroughly on the appropriateness and language of the research constructs in the Chinese environment. We have asked our respondents to complete our proposed questionnaire and collected their responses after they completed. Based on their feedbacks, we have then incorporated their comments so that our questionnaire can be improved for the readability and clarity. We have also altered the original format of our proposed questionnaire so that the final format becomes more friendly reading.

3.3.2.1.2 Translation and Back Translation

As our target respondents are managers from Chinese companies in China, the draft questionnaire has been firstly translated into Chinese version by an independent translator. A back translation from the Chinese version has also been conducted to compare the English version with original items. We discuss any conflicts until an agreement has been reached for each question. Further, both original English and Chinese version of questionnaire have been sent to a bilingual IS expert and a bilingual strategic management expert to confirm on their consistence, clarity and accuracy of wordings.

3.3.2.2 Questionnaire Structure

Appendix A shows the final format of our questionnaire, which consists of three sections. Section one consists of eleven questions, which are used to collect data for measurement items of ISEC. These eleven measurement items are measured in a seven-point Likert scale; where value "1" represents a very low degree of ISEC, and value "7" represents a very high degree of ISEC. The section two consists of twenty-two questions, which are used to collect the measurement items for corporate sustainability. These twenty-two measurement items are measured in a seven-point Likert scale, where "1" represents a very small extent of corporate sustainability practices, and value "7" represents a very large extent of corporate sustainability practices. Lastly, in section three, the demographic data is collected. The collected information includes industry type, ownership structure, and size of company.

3.4 Research Sampling and Data Collection Procedure

The sample of this thesis consists of Chinese managers who were enrolled evening MBA classes in Nanjing University in the Southeast of China. They were conversant in corporate sustainability practices because all companies in this region were closely monitored by these Chinese environmental agencies (Dutton, 1998). For managers to attend the MBA program in this university, they had to meet the standards of having a bachelor degree with at least three years of working experience. Furthermore, they were knowledgeable in the current IS management and strategic management of their companies. Thus, it was reasonable to assume that these participants were conversant with the operations of their firms and could understand the content of our questionnaire and answer them accordingly to corporate sustainability practices in their organizations. We contacted these managers through the MBA program that they enrolled. With the permission of the course instructors, we distributed the questionnaire to them in the evening MBA classes that they attended. MBA instructors allowed them to read and complete our questionnaire in a period of 30 minutes, after which they returned the questionnaires to us. Despite the potential response bias, key informant from each company was used as the data source to avoid potential perceptual discrepancies between multiple respondents. To ensure that only one response from each company is used for our analysis, respondents were asked to report the name of their companies. Any responses without firm name were considered as invalid questionnaires. If multiple respondents from the same company were identified, we would only consider the respondents whose holding the highest position as the valid response. Respondents were clearly informed of the academic research objective of this survey and their responses would be treated confidentially. The respondents were also ensured that they would receive a summarized report about this research, if it is applied.

3.5 Statistical Analysis Methods

This section analyses our models by using the following two procedural steps as outlined by Hair et al. (2010).

(a) Validation of Measurement Models; and

(b) Testing of Proposed Models.

3.5.1 Validation of Measurement Models

The measurement models refer to the relationships between measurement items (i.e. observed variables) and the model constructs (i.e. latent variables) (Igbaria et al., 1997). In order to validate the measurement models, we follow instructions of

Hair et al. (2010) and Dyre et al. (2005) for assessing statistical techniques of factor analysis and construct validity.

3.5.1.1 Factor Analysis of Measurement Models

Factor analysis refers to a set of statistical techniques that can be used to explore, or confirm the underlying structure among a set of measurement items so that we can determine those measurement items which tap onto a latent construct (Dyer et al., 2005; Hair et al., 2010). In this thesis, we follow Lin et al.'s (2005) and Nunnally and Bernstein's (1994) two steps of procedure to implement factor analysis for our measurement models. We first identify measurement models by using the approach of exploratory factor analysis (EFA), and then we validate the measurement models by using the approach of confirmatory factor analysis (CFA).

3.5.1.1.1 Identification of Measurement Models

This thesis adopts the method of EFA to identify our measurement models. EFA is broadly characterized as a set of multivariate statistical methods for data reduction and also for reaching a more parsimonious understanding of measured variables by determining the number and nature of common factors needed to account for the patterns of observed correlations (Fabrigar et al., 1999). There is a variety of approaches to extract the underlying factors exists, but the most commonly used is the principle components analysis. This thesis implements EFA by using SPSS 16.0 software with principal components factors analysis. Promax rotation of measurement items of constructs is deployed because it is reasonable to assume that any extracted factors for the three dimensions of corporate sustainability and/or ISEC are inter-correlated. This thesis follows Dixon's (1992) method for applying EFA technique on the three dimensions of corporate sustainability and the construct of ISEC. Table 3.5 presents those five factor retention criteria that we apply for verifying our model constructs. In Table 3.5, column 2 refers to the minimal requirement for each of our selected criterion.

Table 3.5 Factor Retention Criteria in EFA

Criteria	Requirement	References
1) Keiser's Criterion or Eigen Value (EV) Rule	Eigen Value ≥ 1	Hair et al., 2010; Malhotra, 2008
2) Significant factor loading	Based on Sample Size	Hair et al., 2010
3) No cross-loading	Significant factor loading on only one construct	Hair et al., 2010
4) Cumulative Variance	≥ 50%	Hair et al., 2010
5) Item-total correlation	≥ 0.40	Hair et al., 2010

3.5.1.1.2 Validation of Measurement Models

This thesis applies CFA method to validate the measurement models, and we run our data by using the LISREL 8.80 software. Analytical framework of CFA provides an appropriate means of assessing the soundness of a measurement models for the theoretical constructs (Chin and Todd, 1995). Upon estimating a measurement model, the CFA method provides the fullest evidence of measurement efficacy (Bentler, 1989). The CFA consists of two stages of analysis: item purification and assessment of measurement models.

Item Purification

This thesis follows Min and Mentzer's (2004) instruction to carry out item purification – which is based on the maximum likelihood estimation (MLE) method - for each measurement model that identified in Section 3.5.1.1. Item purification refers to the process in which unsuitable items are to be deleted from the measurement models with a theoretical justification. In the process of item purification, Bollen (1989) proposes to use following methods as the basis for the purification steps.

Step 1: Evaluation through Exploratory Statistical Indicators

This step provides a systematic approach to examine the appropriateness of measurement models by specifying their structure and components through the use of exploratory statistical indicators. In general, there are three statistical indicators that can be applied for assessing their fitness; namely, standardized residual, squared multiple correlation, and modification index. These indicators are further explained below:

a) Standardized Residual

Standardized residual is a value which represents the discrepancy of a pair of measurement items between its sample covariance and estimated covariance. A standardized residual is zero if a pair of measurement items is perfectly fitted. Joreskog and Sorbom (1996) state that a standardized residual which greater than a value of 2.58 implies that there is a significant error of model construction by relating that pair of measurement items together. The error may be due to the problems of non-linearity, non-normality, or path-specification. The use of this indicator to re-define the model structure is also highly recommended by many researchers such as Baumgartner and Homburg (1996) and Bollen and Arminger (1991). One way to apply this indicator for model modification is to identify and to remove a measurement item that shares in the most numbers of pair of significant standardized residuals in the model.

b) Squared Multiple Correlation (SMC)

SMC refers to the linear relationship between a measurement item and its correspondent variable(s) (Joreskog and Sorbom, 1996). The SMC is also referred as the lower bound of reliability for a measurement item to be considered as the variable(s). The SMC value is ranging from 0 to 1. A measurement item with a SMC value closes to 1 represents a high level of reliability. Kettinger and Lee (1994) suggest that a measurement item with the lowest SMC value in the model should be identified and removed in the refinement process.

c) Modification Index (M.I.)

M.I. refers to the different measurement of χ^2 values by subtracting the χ^2 value of a suggested model (for which a new relational path is added) from χ^2 value of the original model. Marsh and Hocevar (1985) suggest that a new path should be added as a modified solution if the M.I. value is large than 5. However, when there is no theoretical support to add the new path, it is strongly recommended that the suggestion of M.I. value should be ignored (Hair et al., 2010).

The above three statistical indices are commonly used as a guideline to improve the overall model fit in literature. However, there is no consensus as to which index is more superior. Researchers, such as Sethi and King (1994) and Kettinger and Lee (1994), recommend that these three indices should be adopted together so that we could improve the model fit.

Sethi and King (1994) and Anderson and Gerbing (1982) also suggest additional methods that can also be adopted together with the above refinement process. They claim that if a model structure is complex, the above purification process can be executed by firstly decomposing each variable separately. The above purification process is then applied to individual variable in turn. After the refinement process is done, variables are combined together so that the original structure is maintained. This purification process is known as the piecewise model fitting method. This method is a more effective approach for the purification because it allows the detection of errors of measurement items much more easily. In addition, the proposed piecewise model would reduce the work of checking the measurement items of M.I. values because there is no new path can be added since all variables are independent.

Step 2: Theoretical Assessment for Item Deletion

In this step, the theoretical assessment should be evaluated together with the process of item deletion. The theoretical assessment can be based on the theoretical supports from literature. This step is necessary to check whether it is reasonable to delete one item based on the evaluation revealed in Step 1 (Hair et al., 2010; Shi et al., 2005).

Assessment of Measurement Models

This thesis assesses the measurement models by using six model fit indices as suggested by Hair et al. (2010) and Wisner (2003). The reason is that these multiple indices of differing types can be easily verified if a model is fitted with a given sample data (Hair et al., 2010; Wisner, 2003). Table 3.6 reveals the six indices and their recommended threshold value for model acceptance.

Table 3.6 Model Fit Indices for Measurement Models

Type of Measure	Fit index	Recommended value	References
Absolute fit measures (How well the specified model reproduces data)	1) χ^2/d.f.	≤ 3**; ≤ 5*	Hair et al., 2010; Wheaton et al., 1977
	2) GFI	≥ 0.90**; ≥ 0.80*	Hair et al., 2010; Marcoulides and Schumacker, 1996
	3) SRMR	≤ 0.08**	Hu and Bentler, 1999
	4) RMSEA	≤ 0.08**; ≤ 0.10*	Hair et al., 2010; MacCallum et al., 1996
Incremental fit measures (How well the specified model fits relative to alternative baseline model)	5) NFI	≥ 0.90**	Bentler and Bonett, 1980; Hair et al., 2010
	6) CFI	≥ 0.90**	Hair et al., 2010

Acceptability: ** Acceptable. * Marginal.

3.5.1.2 Construct Validity of the Overall Model

Construct validity of the overall model involves the assessment of the degree to which a measure item correctly measures its targeted theoretical construct (Hair et al., 2010; O'Leary-Kelly and Vokurka, 1998). In this thesis, construct validity involves the testing of all theoretical constructs together. Construct validity is made up of several important tests: content validity, substantive validity, unidimensionality, reliability, convergent validity, and discriminant validity (Hair et al., 2010). To achieve construct validity, all of these tests must be examined and satisfied. We introduce these tests as follows.

i) Content Validity and Substantive Validity

Content validity refers to an assessment of the correspondence of the measurement items to be included in a construct and its conceptual definition (Hair et al., 2010). Substantive validity refers to theoretical linkage between the construct and its measurement items (Hair et al., 2010; O'Leary-Kelly and Vokurka, 1998). Content validity and substantive validity are identifications of their theoretically base (i.e., measurement items that are expected to measure construct) and the theoretical linkage between the construct and its measurement items, receptively (Anderson and Gerbing, 1988). To enhance content validity and substantive validity, a thorough literature review on measurement items, ratings by expert judges and pilot study are required in the testing. The row one of Table 3.7 gives the summarized steps of the testing of content validity and substantive validity.

ii) Unidimensionality

Unidimensionality refers to whether the measurement items are significantly associated with an underlying construct, and whether each measurement item associated with one construct (Anderson and Gerbing, 1988). In this thesis, we follow steps suggested by Hair et al. (2010), O'Leary-Kelly and Vokurka (1998) and Phillips and Bagozzi (1986) to assess our unidimensionality through the use of EFA and CFA methods. For EFA method, we use principle components analysis, whereby factor loadings of measurement items should be above a pre-defined cut-off point (e.g., Hair et al. (2010) suggest that a value of 0.35 is suggested for a sample size of less than 300). For CFA method, all the regression weights should be above a value of above 0.50 with a significant t-value. The row two of Table 3.7 gives the summarized steps for testing the unidimensionality.

iii) Reliability

Reliability refers to the extent to which measurement items are free from error, thus are being able to produce consistent results (Hair et al., 2010). Reliability consists of two dimensions: repeatability and internal consistence. Reliability can be assessed by using EFA and CFA methods (Hair et al., 2010; Nunally, 1978). For using EFA, Cronbach's α with a value above 0.7 is used. For using CFA, construct reliability with a value above 0.7 indicates a construct has a good reliability. The row three of Table 3.7 gives the summarized steps for testing the reliability.

iv) Convergent Validity

Convergent validity refers to the extent to which the measurement items share a high proportion of variance in common (Anderson and Gerbing, 1988; Hair et al., 2010). Convergent validity is conducted to determine whether all measurement items converged onto their constructs. In this thesis, convergent validity is assessed by using EFA and CFA methods (Anderson and Gerbing, 1988; Hair et al., 2010). For EFA method, principle components analysis should be used, whereby items with factor loadings above a proposed cut-off point (e.g., Hair et al. (2010) suggest that a value of 0.35 is for a sample size of less than 300). Cronbach's α value which is above a value of 0.7 is also applied. For CFA method, construct reliability with a value above 0.7 is recommended, variance extracted with a value which is above 0.5 is suggested, and their six model fit indices (i.e., χ^2/d.f., RMSEA, SRMR, GFI, NFI, and CFI) should also be met for the test of good convergent validity. The row four of Table 3.7 gives the summarized steps for testing the convergent validity.

v) Discriminant Validity

Discriminant validity refers to the degree to which measurement items of distinct constructs differ to each other (Bagozzi and Phillips, 1982). Discriminant validity can be inferred when the measurement items of each construct converge on their respective true scores, which are distinct from the scores of others (Churchill, 1979). This thesis follows Hair et al. (2010) to assess discriminant validity by measuring whether square root of variance extracted values for each construct are higher than its correlation with other constructs. The row five of Table 3.7 gives the summarized steps for testing the discriminant validity.

Table 3.7 Construct Validity Assessment

Validity Aspects	Test Procedures/Description/Requirement	References
1. Content validity: Assessment of the correspondence of the items to be included in a construct and its conceptual definition. Substantive validity: theoretical linkage between the construct and its measurement items.	- Subjectively assessed through the ratings by expert judges, pilot study with multiple sub-populations, or other means. - Linkage between measurement items and the latent construct assessed through literature review	Hair et al., 2010; O'Leary-Kelly and Vokurka, 1998
2. Unidimensionality: Existences of a single construct underlying a set of measurement items.	- Measurement items are significantly associated with an underlying construct, as well as each measurement item being associated with one and only one latent construct. - Using EFA • Significant factor loadings should be based on sample size (e.g., sample size ≥ 250, significant factor loadings ≥ 0.35). - Using CFA • Critical ratios (t-value ≥ 1.96 at $\alpha = 0.05$) • Regression weight ($\lambda \geq 0.6$; sometimes 0.5)	Hair et al., 2010; O'Leary-Kelly and Vokurka, 1998; Phillips and Bagozzi, 1986
3. Reliability: Extent to which measurement items are free from error thus being able to produce consistent results	- Has repeatability and internal consistency dimensions. - Using EFA, Cronbach's Alpha, $\alpha \geq 0.7$ imply good reliability - Using CFA, construct reliability, CR ≥ 0.7, indicate good reliability.	Hair et al., 2010; Nunally, 1978
4. Convergent validity: the extent to which the measurement items share a high proportion of variance in common.	- Measure the similarity or convergence between the individual items measuring the same construct. - Using EFA • Significant factor loadings should be based on sample size (e.g., sample size ≥ 250, significant factor loadings ≥ 0.35). • Reliability, $\alpha \geq 0.7$. - Using CFA • Construct reliability, CR ≥ 0.7; Variance extracted, VE ≥ 0.5 • Use of multiple fits criteria (refer to Table 3.6)	Hair et al., 2010; Anderson and Gerbing, 1988
5. Discriminant validity: Measures the degree to which a construct is truly distinct from other constructs	- Using CFA • Square root of Variance extracted, Square root of VE greater than correlation between two constructs	Hair et al., 2010

3.5.2 Testing of Proposed Models

This thesis verifies our proposed models by using the structural equation modeling (SEM) technique. This technique is selected because of its ability to examine a series of dependence relationships simultaneously while providing statistical efficiency (Hair et al., 2010). SEM is a collection of statistical techniques that enables one to analyze a set of relationships between dependent variables (that is three dimensions of corporate sustainability) and independent variables (that is IS-enabled capabilities) together with the function of the purification for measurement items of significant variables (Ullman and Bentler, 1996). The testing of proposed models involves two stages of analysis: one is the testing methods of SEM; and the other one is the assessment of proposed models (Cho and Pucik, 2005). They are discussed below.

3.5.2.1 Testing Methods of SEM

To test the proposed models, this thesis follows Cho and Pucik's (2005) and Anderson and Gerbing's (1988) methods to firstly test direct relationships between ISEC and SOC, ECO, and ENV (H1a – H1c), secondly test mediating relationships between ISEC and a pair of SOC, ECO, and ENV (H2, H3, and H4), thirdly test integrated model (H5), and lastly, compute the direct, indirect and total effects of ISEC on SOC, ECO, and ENV. In the following, we explain these procedural steps for the direct relationships, mediation models, the integrated model, and their direct, indirect and total effects.

3.5.2.1.1 Direct Relationships

The direct relationships refer to the direct linkages between ISEC and the three dimensions of corporate sustainability (i.e., SOC, ECO, and ENV). These tests are the requirement before we could proceed to the testing of mediation models (Baron and Kenny, 1986). The three hypotheses H1a, H1b, and H1c, could be supported when they satisfy two tests outlined by Hair et al. (2010): i) the proposed threshold values of six model fit indices (i.e., χ^2/d.f., RMSEA, SRMR, GFI, NFI, and CFI) are satisfied; and ii) the proposed paths are significant $p \leq 0.05$.

3.5.2.1.2 Mediation Models

To test hypothesized H2, H3, and H4, this thesis applies the two-step SEM approach as proposed by Cho and Pucik (2005). The basic concept of two-step SEM approach is to determine a mediating relationship among three constructs, say A on B and C. Cho and Pucik (2005) suggest the following steps to test a mediating relationship among a construct of A on B and C.

Step 1: (a) We develop three models, namely F, M1, and M2, that can be used to represent a complete testing of a mediating effect of A on B and C as shown in Figure 3.5. Model F represents the full model, which is similar to the one we hypothesized in Section 3.2, whereas models M1 and M2 are the "trade-off" models which test the mediation effects of B on A and C, respectively.

(b) We test the significance of Model F, M1, and M2 using SEM with the six model fit indices (i.e., χ^2/d.f., RMSEA, SRMR, GFI, NFI, and CFI).

Step 2: (a) We compute the value of chi-square difference ($\Delta\chi^2$) between (F and M1) and the value between (F and M2). We accept the hypothesized model F when it has a significant value of chi-square difference ($\Delta\chi^2$), which is a measurement value of chi-square difference ($\Delta\chi^2$) between (F and M1) is smaller than the one between (F and M2).

(b) We analyse the significance of path coefficient between (A and C) and conclude whether the hypothesis should be supported.

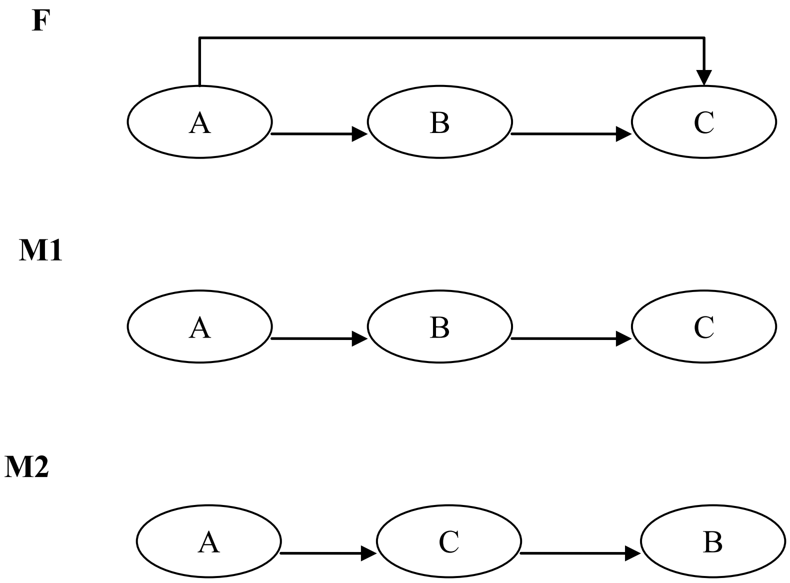


Figure 3.5 Mediation Model Testing

3.5.2.1.3 Integrated Model

To test the integrated model (H5), we adopt the “model trimming” approach as proposed by Cho and Pucik (2005) and Kelloway (1998). The “model trimming” approach has two basic procedural steps as describe as below.

Step 1: We form two hypothesized models F and M as follows.

Model F: Model F is formed by combining all result findings from mediating models above.

Model M: Model M is formed by removing “the” most unfit path, which is the most insignificant path from Model F.

Step 2: **(a)** We apply SEM to test the significance of Model F and Model M and each model is evaluated by using the six model fit indices: χ^2/d.f., RMSEA, SRMR, GFI, NFI, and CFI.

(b) If both Model F and Model M meet minimal requirements of the six criteria above, we select one model as the final one by considering the chi-square differences ($\Delta\chi^2$) between Model F and Model M as follows:

a. If the value of chi-square difference ($\Delta\chi^2$) is significant at $p \leq 0.05$, we stop and select Model F as the final model;

b. Otherwise we treat Model M as the final model. We repeat the above steps by considering model M as Model F until no unfit path or insignificant path can be considered.

(c) This process is terminated if Model F is the only model that meet the requirements of the six model fit indices above.

3.5.2.1.4 Direct, Indirect and Total Effects

Based on the integrated model above, we compute the values of three different effects, namely direct effect, indirect effect, and total effects. Direct effect relates to the relationship between two constructs without consideration of any intervention from the third construct. Whereas, indirect effect refers to the study of relationship between two constructs that are transmitted or mediated by the third construct(s) in a proposed model (Alwin and Hauser, 1975). While the total effect is simply the summation of a construct related to its respective direct and indirect effects.

3.5.2.2 Criteria of Assessing Proposed Models

To test proposed models using SEM, this thesis follows Hair et al. (2010) and assesses the model with six model fit indices. Table 3.8 reveals these fit measures and their recommended threshold value for the acceptance.

Table 3.8 Model Fit Indices for Proposed Models

Type of Measure	Fit index	Recommended value	References
Absolute fit measures (How well the specified model reproduces data)	1) χ^2/d.f.	≤ 3**; ≤ 5*	Hair et al., 2010; Wheaton et al., 1977
	2) GFI	≥ 0.90**; ≥ 0.80*	Hair et al., 2010; Marcoulides and Schumacker, 1996
	3) SRMR	≤ 0.08**	Hu and Bentler, 1999
	4) RMSEA	≤ 0.08**; ≤ 0.10*	Hair et al., 2010; MacCallum et al., 1996
Incremental fit measures (How well the specified model fits relative to alternative baseline model)	5) NFI	≥ 0.90**	Bentler and Bonett, 1980; Hair et al., 2010
	6) CFI	≥ 0.90**	Hair et al., 2010

Acceptability: ** Acceptable. * Marginal.

CHAPTER 4 SAMPLING PROFILES

This chapter describes the sampling profiles of the respondents. It consists of the following section:

a) Demographic and Organizational Information of Respondents; and
b) Mean Scores and Standard Deviations of Model Constructs.

4.1 Demographic and Organizational Information of Respondents

This thesis collects 314 questionnaires. Table 4.1 reveals the demographic data of our respondents. Manufacturing companies make up 22.9% of the survey respondents, followed by IT (computers, telecommunications, and networking) and the financial services sector (banking, financial, and insurance) at 17.8% and 15%, respectively. Ownership types include state owned (39.8%), privately owned (20.1%), and foreign owned (36.9%). Average annual income for 71.3% of the companies is larger than RMB 100 million. Of the companies represented, 28.4% have operated for less than or equal to 10 years and 76.5% for more than 11 years. As for firm size, 11.5% have 11-50 employees and 64.3% over 100 employees.

Table 4.1 Characteristics of the Study Sample

Organizational Information			
Measure	**Items**	**Frequency**	**Percentage**
Type of Industry	Academic/ Education	9	2.9
	Computers/Tele-communications/Networking	56	17.8
	Manufacturing	72	22.9
	Medicine/Health	8	2.5
	Restaurant/Hotel	0	0
	Textile/Garment	9	2.9
	Utilities	9	2.9
	Banking/Finance/Insurance	47	15.0
	Electrics/Electronics	12	3.8
	Engineering/Architecture	8	2.5
	Mass Media/Publishing	1	0.3
	Real Estate	14	4.5
	Retailing/Wholesaling	25	8.0
	Transport/Shipping/Logistics	14	4.5
	Others	29	9.2
	Missing	1	0.3
Ownership Structure	Stately owned	125	39.8
	Privately owned	63	20.1
	Foreign owned	116	36.9
	Missing	10	3.2
Average organizational annual revenue *(HK$ in millions)*	< 10	19	6.1
	10-49.9	39	12.4
	50-99.9	19	6.1
	100-499.9	45	14.3
	500-999.9	33	10.5
	≥ 1000	146	46.5
	Missing	13	4.1
Operational Period of the Organization*(in years)*	< 1	4	1.3
	1-5	44	14.0
	6-10	41	13.1
	11-15	68	21.7
	16-20	44	14.0
	> 20	100	31.8
	Missing	13	4.1
Size of Organization (*numbers of employees*)	≤10	9	2.9
	11-50	39	12.4
	51-100	28	8.9
	> 100	202	64.3
	Missing	36	11.5

4.2 Mean Scores and Standard Deviations of Model Constructs

Table 4.2 shows the mean scores and standard deviations of model constructs, which include ISEC, SOC, ECO, and ENV, and their corresponding measurement items. It can be observed that the average scores of all model constructs and measurement items are greater than "4". That means the respondents, averagely, have an agreeable view on the constructs and measurement items. Model construct "ISEC" obtains the highest mean score of 4.79, whilst "ECO" has the lowest mean score of 4.47. Model construct "ECO" obtains the highest standard deviation score of 1.24, whilst "ISEC" has the lowest standard deviation score of 0.97.

Table 4.2 Mean Scores and Standard Deviations of Model Constructs

Constructs and Scale Items*	Mean scores	Standard deviations
IS-enabled capabilities (ISEC)	**4.79**	**0.97**
ISEC1	4.60	1.50
ISEC2	4.66	1.33
ISEC3	4.70	1.33
ISEC4	4.86	1.23
ISEC5	4.83	1.21
ISEC6	4.97	1.51
ISEC7	4.69	1.50
ISEC8	4.74	1.39
ISEC9	4.96	1.22
ISEC10	4.86	1.21
ISEC11	4.83	1.37
Social development (SOC)	**4.50**	**1.22**
SOC1	4.42	1.44
SOC2	4.25	1.55
SOC3	4.32	1.54
SOC4	5.00	1.35
SOC5	4.42	1.35
SOC6	4.59	1.40
Economic development (ECO)	**4.47**	**1.24**
ECO1	3.74	1.72
ECO2	4.56	1.48
ECO3	4.51	1.64
ECO4	4.92	1.55
ECO5	4.61	1.63
ECO6	4.49	1.52
Environmental development (ENV)	**4.60**	**1.33**
ENV1	4.73	1.53
ENV2	4.60	1.46
ENV3	4.20	1.63
ENV4	4.77	1.55
ENV5	4.60	1.58
ENV6	4.85	1.60
ENV7	4.57	1.60
ENV8	4.61	1.61
ENV9	4.50	1.65
ENV10	4.52	1.68

* 7-point scales ranging from “much smaller extent” to “much larger extent”
Sample size = 314

CHAPTER 5 RESULTS

This chapter describes the results of validation of measurement models, and the test of our proposed models. This chapter consists of two sections as follows:

a) Validation of Measurement Models; and
b) Testing of Proposed Models.

5.1 Validation of Measurement Models

This section adopts factor analysis and construct validity to verify the validation of our measurement models. These two tests are implemented as follows.

5.1.1 Factor Analysis of Measurement Models

This thesis uses two methods of factor analysis to analyze measurement models: an identification of measurement models through exploratory factor analysis (EFA), and a validation of measurement models through confirmatory factor analysis (CFA). In the following two sub-sections, the results of the two approaches are discussed.

5.1.1.1 Identification of Measurement Models

This thesis uses exploratory factor analysis (EFA) to "identify" measurement models. The procedure FACTOR ANALYSIS of SPSS 16.0 is applied to test EFA and the objective is to ensure that all measurement items were loaded onto their respective constructs only. Since we have collected a total of 314 samples, measurement items that have a lower value of 0.35 factor loading and that they have cross-loaded with other constructs at a value of 0.35 or higher were excluded for further data analysis (Hair et al., 2010). This thesis also removes measurement items with a value lower than 0.40 for item-total correlation (Hair et al., 2010). This thesis then follows Dixon's (1992) method and applies EFA method to verify the three dimensions of corporate sustainability and the construct of ISEC. This thesis first verifies the three dimensions of corporate sustainability, and then for the construct of ISEC. The results of EFA are as follows.

Altogether, we have a total of 22 measurement items for the three dimensions of corporate sustainability, namely SOC, ECO, and ENV. Table 5.1 summarizes the factor loadings for these 22 measurement items. Column 1 refers the labels for the 22 measurement items. Column 2 reveals factor loadings of the principle components factor analysis with the Promax rotation. The values marked in bold color are referred to factor loadings that are significant, in which they have a value higher than 0.35. Column 3 describes the item-total correlations for all the 22 measurement items. We have identified three constructs because these three constructs have an Eigen value higher than 1. The values of cumulative variance explained for these three identified constructs are 53.56%, 62.25%, and 69.52%, and all these values are a higher than a value of 50%. The significant loadings for all measurement items are all above a value of 0.35 and there is no measurement item reported to have multiple cross-loadings on other constructs. The item-total correlations for all the three dimensions of corporate sustainability are above a value of 0.40, which indicates that we could accept its reliability (Hair et al., 2010).

Table 5.1 Exploratory Factor Analysis for Corporate Sustainability

Measurement items	**Promax-rotated loadings factor**			**Item-total correlation**
	SOC	**ECO**	**ENV**	
SOC1	**0.89**	-0.09	0.05	0.80
SOC2	**0.90**	-0.10	0.11	0.86
SOC3	**0.84**	-0.04	0.08	0.80
SOC4	**0.73**	0.22	-0.14	0.67
SOC5	**0.79**	0.04	0.07	0.79
SOC6	**0.75**	0.22	-0.13	0.71
ECO 1	0.06	**0.52**	0.13	0.55
ECO 2	-0.02	**0.95**	-0.14	0.72
ECO 3	-0.06	**0.90**	0.01	0.76
ECO 4	0.09	**0.71**	-0.04	0.62
ECO 5	0.10	**0.60**	0.12	0.65
ECO 6	0.14	**0.54**	0.26	0.73
ENV 1	-0.12	0.26	**0.71**	0.77
ENV 2	-0.03	0.15	**0.79**	0.84
ENV 3	0.07	-0.17	**0.86**	0.74
ENV 4	-0.08	0.19	**0.82**	0.86
ENV 5	0.05	0.14	**0.73**	0.81
ENV 6	-0.06	0.19	**0.76**	0.81
ENV 7	-0.01	-0.11	**0.97**	0.85
ENV 8	-0.08	-0.05	**0.97**	0.85
ENV 9	0.21	-0.17	**0.78**	0.76
ENV 10	0.20	-0.06	**0.67**	0.71
Eigen value	11.78	1.91	1.60	-
Cumulative variance explained (%)	53.56	62.25	69.52	-

This thesis conducts a similar EFA test for the ISEC. Table 5.2 summarizes the preliminary factor loadings for the 11 measurement items of ISEC. Column 1 describes the labels of 11 measurement items of ISEC. Column 2 reveals factor loadings of the principle components factor analysis with the Promax rotation.

The bold values are referred to significant factor loadings, which have a value higher than 0.35. Column 3 describes the item-total correlations for all the 11 measurement items. We explain our results as follows.

i) This thesis splits these 11 measurement items into two separate newly constructs because our results show that we have two constructs that have an Eigen Value greater than 1.
ii) This thesis removes the measurement items ISEC9, ISEC10, ISEC11 from Table 5.2 because they are cross-loadings between constructs. We also remove the measurement item ISEC1 from Table 5.2 because its item-total correlation is less than a value of 0.40.
iii) This thesis repeats the EFA test based on the retained measurement items of ISEC2, ISEC3, ISEC4, ISEC5, ISEC6, ISEC7, and ISEC8, and Table 5.3 reveals the final EFA results.
iv) This thesis accepts Table 5.3 as our final results because the Eigen value of the second construct is 1.36, which is higher than 1. It also reveals that the significant factor loadings are all higher than a value of 0.35, and there are no cross-loadings between constructs. The values of cumulative variance explained are reported as having a value higher than 50%, and all their item-total correlations are higher than a value of 0.40.

Table 5.3 reveals that the first newly construct consists of measurement items ISEC2, ISEC3, ISEC4, and ISEC5. These measurement items are mainly described IS-enabled innovation and learning in organizations, this thesis thus labels this new construct as “IS-enabled innovative learning” (ISEIL).

Furthermore, Table 5.3 reveals that the second newly construct consists of measurement items ISEC1, ISEC6, ISEC7, and ISEC8. These measurement items are mainly described IS-enabled competitiveness and uniqueness in organizations, this thesis thus labels this new construct as "IS-enabled system competitiveness" (ISESC).

Table 5.2 Exploratory Factor Analysis for ISEC

Measurement items	Promax-rotated loadings factor		Item-total correlation
	ISEIL	ISESC	
ISEC1*	0.25	**0.45**	0.39
ISEC2	**0.84**	0.15	0.77
ISEC3	**0.85**	0.23	0.84
ISEC4	**0.85**	0.22	0.83
ISEC5	**0.79**	0.27	0.74
ISEC6	0.21	**0.79**	0.63
ISEC7	0.19	**0.86**	0.73
ISEC8	0.23	**0.84**	0.71
ISEC9*	**0.56**	**0.51**	-
ISEC10*	**0.64**	**0.48**	-
ISEC11*	**0.67**	**0.44**	-
Sum of squares (eigenvalue)	5.92	1.36	-
Cumulative variance explained (%)	53.84	66.19	-

*measurement items ISEC9, ISEC10, ISEC11 are removed because they are crossing loading, which are more than 0.35; ISEC1 is removed because its item-total correlation is less than 0.40.

Table 5.3 Exploratory Factor Analysis for ISEC after Deletion

Measurement items	Promax-rotated loadings factor		Item-total correlation
	ISEIL	ISESC	
ISEC2	**0.87**	0.15	0.77
ISEC3	**0.88**	0.24	0.84
ISEC4	**0.87**	0.24	0.83
ISEC5	**0.80**	0.28	0.74
ISEC6	0.22	**0.81**	0.66
ISEC7	0.21	**0.88**	0.76
ISEC8	0.24	**0.85**	0.74
Sum of squares (eigenvalue)	4.13	1.33	-
Cumulative variance explained (%)	58.91	78.02	-

Table 5.4 Factor Retention in EFA

EFA Criteria	Requirement	Constructs					Remarks
		ISEIL	ISESC	ECO	SOC	ENV	
Eigen Value (EV) Rule	≥ 1	4.13	1.33	11.78	1.91	1.60	All accepted
Significant factor loading	≥ 0.35	0.80-0.88	0.81-0.88	0.52-0.90	0.73-0.90	0.67-0.97	All accepted
No cross-loading	Significant factor loading on only one construct	All the significant factor loadings for the five constructs only measure respective constructs, indicating no cross-loadings are found.					All accepted
Cumulative variance explained	≥ 50%	58.91%	78.02%	53.56%	62.25%	69.52%	All accepted
Item-total correlation	≥ 0.40	0.74-0.84	0.66-0.76	0.55-0.76	0.67-0.86	0.71-0.86	All accepted

Table 5.4 summarizes the result findings of EFA for constructs of corporate sustainability and ISEC. All the results pass the required criteria.

5.1.1.2 Validation of Measurement Models

This thesis adopts confirmatory factor analysis (CFA) to validate measurement models. In the following section, this thesis performs the tests of item purification for SOC, ECO, ENV, ISEIL, and ISESC.

5.1.1.2.1 Item Purification

This thesis performs the purification of items by following the steps that discussed in the section 3.5.1.2.1. This thesis applies the two procedural steps of item purification that proposed by Bollen (1989) to purify constructs of SOC, ECO, ENV, ISEIL, and ISESC. The results are shown as follows.

SOC Construct

Step 1: Evaluation through Exploratory Statistical Indicators

i) Table 5.5 shows the standardized residual and SMC of all measurement items of SOC.

ii) In Table 5.5, the pairwise of measurement items of SOC2 and SOC4 share the most number of pairs of standardized residuals (i.e., 3 pairs) and SOC4 has the lowest SMC value. We thus propose to delete SOC4.

iii) This thesis re-assesses the model fit of SOC. Table 5.6 shows values of the model fit indices.

iv) This thesis accepts all model fit indices and then stops the process of item purification. Table 5.7 reveals all iterations of purification steps for SOC. A total of 2 iterations are executed.

Table 5.5 Values of Standardized Residual and SMC of SOC

Social development (SOC)		
Iteration No.	**Significant standardized residuals**	**SMC values**
1	SOC4 and SOC2 = -3.14 SOC6 and SOC2 = -2.94 SOC2 and SOC1 = 3.99 SOC5 and SOC4 = 5.16 SOC6 and SOC4 = 3.91	SOC1= 0.76 SOC2= 0.88 SOC3= 0.75 SOC4= 0.51 SOC5= 0.70 SOC6= 0.57

Table 5.6 Model Fit Indices after Item Purification for SOC

Type of Measure	Fit index	Results	Recommended value	Remarks
Absolute fit measures	1) χ^2/d.f.	2.85	≤ 3**; ≤ 5*	satisfied
	2) GFI	0.98	≥ 0.90**; ≥ 0.80*	satisfied
	3) SRMR	0.018	≤ 0.08**	satisfied
	4) RMSEA	0.077	≤ 0.08**; ≤ 0.10*	satisfied
Incremental fit measures	5) NFI	0.99	≥ 0.90**	satisfied
	6) CFI	0.99	≥ 0.90**	satisfied

Table 5.7 Item Purification Process for SOC

Social development (SOC)				
Iteration No.	**Questions included**	**Model fit indices**	**Results**	**Remedy actions**
1	SOC1, SOC2, SOC3, SOC4, SOC5, SOC6	$\chi^2/d.f.$ = 6.99 GFI = 0.94 SRMR = 0.035 RMSEA = 0.138 NFI = 0.98 CFI = 0.98	not satisfied satisfied satisfied not satisfied satisfied satisfied	SOC2and SOC4 shares in most no. of pairs of standardized residuals (3 pairs) but SOC4 has a lower SMC value, and is thus deleted.
2	SOC1, SOC2, SOC3, SOC5, SOC6	$\chi^2/d.f.$ = 2.85 GFI = 0.98 SRMR = 0.018 RMSEA = 0.077 NFI = 0.99 CFI = 0.99	satisfied satisfied satisfied satisfied satisfied satisfied	Stop. All indices fulfil the criteria.

Step 2: Theoretical Assessment for Item Deletion

This step is to assess whether the deleted items (i.e., SOC4) have a theoretical justification.

In step 1, we delete measurement item SOC4, which is referred to the concern about visual aspects of facilities and operations. The meaning of SOC4 could be covered largely by SOC2, SOC5, and SOC6, which measure a company's concern about external community initiatives, the environmental impacts of operations, and stakeholder interests by transparent with a formal dialogue. Thus, we remove SOC4.

We conclude that it is reasonable to remove the item SOC4 from our study.

ECO Construct

Step 1: Evaluation through Exploratory Statistical Indicators

i) Table 5.8 shows the standardized residual and SMC for all measurement items of ECO.

ii) In Table 5.8, the pairwise of measurement item of ECO6 share the most number of pairs of standardized residuals (i.e., 4 pairs). We thus propose to delete ECO6.

iii) This thesis re-assesses the model fit for ECO. Table 5 reveals values of the model fit indices.

iv) This thesis accepts all model fit indices and then stops the process of item purification for ECO. Table 5.10 reveals all iterations of purification steps for ECO. A total of 2 iterations are executed.

Table 5.8 Values of Standardized Residual and SMC of ECO

Economic development (ECO)		
Iteration No.	**Significant standardized residuals**	**SMC values**
1	ECO4 and ECO3 = -4.04 ECO6 and ECO2 = -5.78 ECO6 and ECO3 = -4.23 ECO3 and ECO2 = 8.51 ECO6 and ECO4 = 7.84 ECO6 and ECO5 = 6.01	ECO1= 0.37 ECO2= 0.70 ECO3= 0.76 ECO4= 0.45 ECO5= 0.49 ECO6= 0.55

Table 5.9 Model Fit Indices after Item Purification for ECO

Type of Measure	Fit index	Results	Recommended value	Remarks
Absolute fit measures	1) χ^2/d.f.	1.64	$\leq 3^{**}$; $\leq 5^{*}$	Satisfied
	2) GFI	0.99	$\geq 0.90^{**}$; $\geq 0.80^{*}$	Satisfied
	3) SRMR	0.022	$\leq 0.08^{**}$	Satisfied
	4) RMSEA	0.045	$\leq 0.08^{**}$; $\leq 0.10^{*}$	Satisfied
Incremental fit measures	5) NFI	0.99	$\geq 0.90^{**}$	Satisfied
	6) CFI	1.00	$\geq 0.90^{**}$	Satisfied

Table 5.10 Item Purification Process for ECO

Economic development (ECO)				
Iteration No.	**Questions included**	**Model fit indices**	**Results**	**Remedy actions**
1	ECO1, ECO2, ECO3, ECO4, ECO5, ECO6	$\chi^2/d.f.$ = 14.23 GFI = 0.88 SRMR = 0.060 RMSEA = 0.206 NFI = 0.91 CFI = 0.92	not satisfied satisfied satisfied not satisfied satisfied satisfied	ECO6 shares in most no. of pairs of standardized residuals (4 pairs) and is thus deleted.
2	ECO1, ECO2, ECO3, ECO4, ECO5	$\chi^2/d.f.$ = 1.64 GFI = 0.99 SRMR = 0.022 RMSEA = 0.045 NFI = 0.99 CFI = 1.00	satisfied satisfied satisfied satisfied satisfied satisfied	Stop. All indices fulfil the criteria.

Step 2: Theoretical Assessment for Item Deletion

This step is to assess whether the deleted items (i.e., ECO6) have a theoretical justification.

In step 1, we delete item ECO6, which is referred to differentiate the process/product based on the marketing efforts of the process/product's environmental performance. The meaning of ECO6 have partially represented by other items such as ECO1, ECO3, and ECO5, which in part measure how organizations increase revenue and decrease costs by managing waste and technology that relate to environmental performance. Thus, we remove ECO6.

We conclude that it is reasonable to remove the item ECO6 from our study.

ENV Construct

Step 1: Evaluation through Exploratory Statistical Indicators

i) Table 5.11 shows the standardized residual and SMC for all measurement items of ENV.

ii) In Table 5.11, the pairwise of measurement items of ENV2 and ENV8 share the most number of pairs of standardized residuals (i.e., 7 pairs) and ENV8 has the lowest SMC value. We thus propose to delete ENV8.

iii) This thesis re-assesses the model fit of ENV. Table 5.12 reveals values of the model fit indices.

iv) Not all model fit indices are met. This thesis repeats the above Steps (1) to (3). Table 5.13 shows the results for all iterations of purification steps for ENV. Table 5.11 reveals the standardized residual and SMC for all measurement items of ENV. This thesis stops this process when all model fit indices are met. A total of 6 iterations are executed.

Table 5.11 Values of Standardized Residual and SMC of ENV

Environmental development (ENV)		
Iteration No.	**Significant standardized residuals**	**SMC values**
1	ENV3 and ENV1 = -3.25 ENV6 and ENV1 = -3.35 ENV7 and ENV1 = -3.63 ENV7 and ENV2 = -5.73 ENV8 and ENV2 = -4.83 ENV8 and ENV4 = -4.33 ENV8 and ENV5 = -3.42 ENV8 and ENV6 = -3.03 ENV9 and ENV2 = -2.78 ENV9 and ENV4 = -5.47 ENV9 and ENV6 = -3.69 ENV10 and ENV2 = -3.54 ENV10 and ENV4 = -3.66 ENV10 and ENV6 = -3.52 ENV2 and ENV1 = 6.38 ENV3 and ENV2 = 4.61 ENV4 and ENV1 = 3.66 ENV4 and ENV2 = 3.65 ENV6 and ENV4 = 5.14 ENV6 and ENV5 = 4.28 ENV8 and ENV7 = 8.27 ENV9 and ENV8 = 7.03 ENV10 and ENV8 = 4.15 ENV10 and ENV9 = 8.93	ENV1= 0.67 ENV2= 0.78 ENV3= 0.60 ENV4= 0.83 ENV5= 0.72 ENV6= 0.75 ENV7= 0.79 ENV8= 0.77 ENV9= 0.63 ENV10= 0.54

2	ENV3 and ENV1 = -3.60 ENV6 and ENV1 = -4.31 ENV7 and ENV2 = -4.98 ENV9 and ENV4 = -4.47 ENV9 and ENV6 = -2.62 ENV10 and ENV2 = -3.26 ENV10 and ENV4 = -3.16 ENV10 and ENV6 = -2.91 ENV2 and ENV1 = 5.92 ENV3 and ENV2 = 4.01 ENV4 and ENV1 = 2.95 ENV6 and ENV4 = 3.70 ENV6 and ENV5 = 3.47 ENV9 and ENV7 = 4.44 ENV10 and ENV7 = 2.96 ENV10 and ENV9 = 9.66	ENV1= 0.67 ENV2= 0.81 ENV3= 0.60 ENV4= 0.85 ENV5= 0.73 ENV6= 0.77 ENV7= 0.75 ENV9= 0.58 ENV10= 0.51
3	ENV3 and ENV1 = -3.42 ENV6 and ENV1 = -4.63 ENV7 and ENV2 = -4.90 ENV9 and ENV4 = -3.38 ENV2 and ENV1 = 5.87 ENV3 and ENV2 = 4.03 ENV4 and ENV1 = 2.80 ENV6 and ENV4 = 2.87 ENV6 and ENV5 = 3.21 ENV9 and ENV7 = 5.36	ENV1= 0.67 ENV2= 0.81 ENV3= 0.60 ENV4= 0.86 ENV5= 0.73 ENV6= 0.78 ENV7= 0.74 ENV9= 0.56
4	ENV6 and ENV3 = -3.68 ENV7 and ENV2 = -4.21 ENV9 and ENV4 = -2.75 ENV3 and ENV2 = 4.18 ENV9 and ENV7 = 5.38	ENV2= 0.79 ENV3= 0.61 ENV4= 0.85 ENV5= 0.75 ENV6= 0.80 ENV7= 0.75 ENV9= 0.55
5	ENV5 and ENV4 = -2.84 ENV6 and ENV3 = -4.07 ENV7 and ENV2 = -3.31 ENV3 and ENV2 = 4.17	ENV2= 0.79 ENV3= 0.61 ENV4= 0.86 ENV5= 0.74 ENV6= 0.80 ENV7= 0.73

Table 5.12 Model Fit Indices after Item Purification for ENV

Type of Measure	Fit index	Results	Recommended value	Remarks
Absolute fit measures	1) χ^2/d.f.	10.26	$\leq 3^{**}$; $\leq 5^{*}$	not satisfied
	2) GFI	0.84	$\geq 0.90^{**}$; $\geq 0.80^{*}$	Satisfied
	3) SRMR	0.048	$\leq 0.08^{**}$	Satisfied
	4) RMSEA	0.172	$\leq 0.08^{**}$; $\leq 0.10^{*}$	not satisfied
Incremental fit measures	5) NFI	0.94	$\geq 0.90^{**}$	Satisfied
	6) CFI	0.95	$\geq 0.90^{**}$	Satisfied

Table 5.13 Item Purification Process for ENV

Environmental development (ENV)				
Iteration No.	**Items included**	**Model fit indices**	**Remarks**	**Purification actions**
1	ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, ENV7, ENV8, ENV9, ENV10	χ^2/d.f.=13.24 GFI=0.77 SRMR=0.048 RMSEA=0.198 NFI=0.94 CFI=0.94	not satisfied not satisfied satisfied not satisfied satisfied satisfied	ENV2and ENV8 shares in most no. of pairs of standardized residuals (7 pairs) but ENV8 has a lower SMC value, and is thus deleted.
2	ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, ENV7, ENV9, ENV10	χ^2/d.f.=10.26 GFI=0.84 SRMR=0.048 RMSEA=0.172 NFI=0.94 CFI=0.95	not satisfied satisfied satisfied not satisfied satisfied satisfied	ENV10 shares in most no. of pairs of standardized residuals (5 pairs) and is thus deleted.
3	ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, ENV7, ENV9	χ^2/d.f.=7.66 GFI=0.89 SRMR=0.033 RMSEA=0.146 NFI=0.95 CFI=0.96	not satisfied satisfied satisfied not satisfied satisfied satisfied	ENV1 shares in most no. of pairs of standardized residuals (4 pairs) and is thus deleted.
4	ENV2, ENV3, ENV4, ENV5, ENV6, ENV7, ENV9	χ^2/d.f.=5.84 GFI=0.93 SRMR=0.027 RMSEA=0.124 NFI=0.98 CFI=0.98	not satisfied satisfied satisfied not satisfied satisfied satisfied	ENV2, ENV3, ENV7, ENV9 share in most no. of pairs of standardized residuals (2 pairs) but ENV9 has a lower SMC value, and is thus deleted.
5	ENV2, ENV3, ENV4, ENV5, ENV6, ENV7	χ^2/d.f.=4.98 GFI=0.95 SRMR=0.021 RMSEA=0.113 NFI=0.98 CFI=0.99	satisfied satisfied satisfied not satisfied satisfied satisfied	ENV2, ENV3 share in most no. of pairs of standardized residuals (2 pairs) but ENV3 has a lower SMC value, and is thus deleted.
6	ENV2, ENV4, ENV5, ENV6, ENV7	χ^2/d.f.=3.04 GFI=0.98 SRMR=0.012 RMSEA=0.080 NFI=0.99 CFI=0.99	satisfied satisfied satisfied satisfied satisfied satisfied	Stop. All indices fulfil the criteria.

Step 2: Theoretical Assessment for Item Deletion

This step is to assess whether the deleted items (i.e., ENV1, ENV2, ENV8, ENV9, and ENV10) have a theoretical justification.

In step 1, this thesis proposes to delete ENV1, ENV2, ENV8, ENV9, and ENV10. First, our results reveal the same outcome as reported by Chan (2005), in which ENV8 and ENV10 are deleted in the process of the interviews. This means that ENV8 and ENV10 are not strongly related to ENV in Chinese firms. In line with items in Sharma and Vredenburg (1998), the meaning of ENV1 could be executed largely by ENV2, ENV4, and ENV7 in actions by (1) adopting a comprehensive product life cycle analysis, combining functions of more than one product, (2) changing process technology, (3) making product specifications, making input material specifications, (4) reducing total materials used, and so on. Following the same logic, ENV3 and ENV9 could also be covered largely by ENV2, ENV4, and ENV5 in actions by refining facilities, treating hazardous/toxic wastes, making technology and research alliances with other companies on oil and gas production, eliminating packaging that damages the ozone layer, making production processes less environmentally damaging, and so on. Thus, we remove ENV1, ENV3, ENV8, ENV9, and ENV10.

This thesis concludes that it is reasonable to remove the items ENV1, ENV3, ENV8, ENV9, and ENV10 from our study.

ISEIL Construct

Step 1: Evaluation through Exploratory Statistical Indicators

i) Table 5.14 shows the standardized residual and SMC for all measurement items of ISEIL.

ii) In Table 5.14, the pairwise of measurement items of ISEC2, ISEC3, ISEC4, and ISEC5 share the most number of pairs of standardized residuals (i.e. 2 pairs) and ISEC5 has the lowest SMC value. We thus propose to delete ISEC5.

iii) This thesis re-assesses the model fit for ISEIL. Table 5.15 shows values of the model fit indices.

iv) This thesis accepts all model fit indices and then stops the process of item purification for ISEIL. Table 5.16 reveals all iterations of purification steps for ISEIL. A total of 2 iterations are executed.

Table 5.14 Values of Standardized Residual and SMC of ISEIL

IS-enabled Innovativeness Learning (ISEIL)		
Iteration No.	**Significant standardized residuals**	**SMC values**
1	ISEC4 and ISEC3 = -2.73 ISEC5 and ISEC2 = -2.73 ISEC3 and ISEC2 = -4.94 ISEC5 and ISEC4 = -4.94	ISEC2 = 0.73 ISEC3 = 0.84 ISEC4 = 0.80 ISEC5 = 0.65

Table 5.15 Model Fit Indices after Item Purification for ISEIL

Type of Measure	Fit index	Results	Recommended value	Remarks
Absolute fit measures	1) χ^2/d.f.	--	$\leq 3^{**}$; $\leq 5^{*}$	satisfied
	2) GFI	1.00	$\geq 0.90^{**}$; $\geq 0.80^{*}$	satisfied
	3) SRMR	0.000	$\leq 0.08^{**}$	satisfied
	4) RMSEA	0.000	$\leq 0.08^{**}$; $\leq 0.10^{*}$	satisfied
Incremental fit measures	5) NFI	1.00	$\geq 0.90^{**}$	satisfied
	6) CFI	1.00	$\geq 0.90^{**}$	satisfied

Three items represented ISEIL, therefore, there are not enough degrees of freedom to estimate the model; Goodness-of-fit indicators are considered perfect (Shi et al., 2005).

Table 5.16 Item Purification Process for ISEIL

IS-enabled Innovative Learning (ISEIL)				
Iteration No.	**Questions included**	**Model fit indices**	**Results**	**Remedy actions**
1	ISEC2, ISEC3, ISEC4, ISEC5	$\chi^2/d.f.$ = 11.45 GFI = 0.96 SRMR = 0.022 RMSEA = 0.190 NFI = 0.98 CFI = 0.98	not satisfied satisfied satisfied not satisfied satisfied satisfied	ISEC2, ISEC3, ISEC4, ISEC5 share in most no. of pairs of standardized residuals (2 pairs) but ISEC5 has a lower SMC value, and is thus deleted.
2	ISEC2, ISEC3, ISEC4	$\chi^2/d.f.$ = -- GFI = 1.00 SRMR = 0.000 RMSEA = 0.000 NFI = 1.00 CFI = 1.00	satisfied satisfied satisfied satisfied satisfied satisfied	Stop. All indices fulfil the criteria.

Step 2: Theoretical Assessment for Item Deletion

This step is to assess whether the deleted items (i.e., ISEC5) have a theoretical justification.

In step 1, this thesis proposes to delete item ISEC5, which is referred to establish trust-based collaborative relationships among stakeholders. The meaning of ISEC5 can be covered by a large degree of ISEC3 and ISEC4 (i.e., ISEC could help to develop a long-range vision within the firm, and promote the collective learning within the company). Thus, this thesis removes it.

This thesis concludes that it is reasonable to remove the item ISEC5 from our study.

ISESC Construct

Step 1: Evaluation through Exploratory Statistical Indicators

i) This thesis assesses the model fit for ISESC. Table 5.17 reveals values for the model fit indices.

ii) This thesis accepts all model fit indices and then stops the process of item purification for ISESC. Table 5.18 reveals all iterations of purification steps for ISESC. No iteration is executed.

Table 5.17 Model Fit Indices after Item Purification for ISESC

Type of Measure	Fit index	Results	Recommended value	Remarks
Absolute fit measures	1) χ^2/d.f.	--	$\leq 3^{**}$; $\leq 5^{*}$	satisfied
	2) GFI	1.00	$\geq 0.90^{**}$; $\geq 0.80^{*}$	satisfied
	3) SRMR	0.000	$\leq 0.08^{**}$	satisfied
	4) RMSEA	0.000	$\leq 0.08^{**}$; $\leq 0.10^{*}$	satisfied
Incremental fit measures	5) NFI	1.00	$\geq 0.90^{**}$	satisfied
	6) CFI	1.00	$\geq 0.90^{**}$	satisfied

Three items represented ISESC, therefore, there are not enough degrees of freedom to estimate the model; Goodness-of-fit indicators are considered perfect (Shi et al., 2005).

Table 5.18 Item Purification Process for ISESC

IS-enabled System Competitiveness (ISESC)				
Iteration No.	**Questions included**	**Model fit indices**	**Results**	**Remedy actions**
1	ISEC6, ISEC7, ISEC8	$\chi^2/d.f.$ = -- GFI = 1.00 SRMR = 0.000 RMSEA = 0.000 NFI = 1.00 CFI = 1.00	satisfied satisfied satisfied satisfied satisfied satisfied	Stop. All indices fulfil the criteria.

Step 2: Theoretical Assessment for Item Deletion

Since there is no measurement item is proposed to be deleted, this step has not been executed.

Table 5.19 presents the final results of the purification for each construct of the proposed model.

Table 5.19 Final Indices of Individual Fitness of the Constructs

Construct	Initial indices	Initial items	Items Deleted	No of items retained	Final Indices	Remark
SOC	$\chi^2/d.f.$=6.99 GFI=0.94 SRMR=0.035 RMSEA=0.138 NFI=0.98 CFI=0.98	SOC 1, SOC 2, SOC 3, SOC 4, SOC 5, SOC 6	SOC 4	5	$\chi^2/d.f.$=2.85 GFI=0.98 SRMR=0.018 RMSEA=0.077 NFI=0.99 CFI=0.99	All accepted
ECO	$\chi^2/d.f.$=14.23 GFI=0.88 SRMR=0.060 RMSEA=0.206 NFI=0.91 CFI=0.92	ECO 1, ECO 2, ECO 3, ECO 4, ECO 5, ECO 6	ECO 6	5	$\chi^2/d.f.$=1.64 GFI=0.99 SRMR=0.022 RMSEA=0.045 NFI=0.99 CFI=1.00	All accepted
ENV	$\chi^2/d.f.$=13.24 GFI=0.77 SRMR=0.048 RMSEA=0.198 NFI=0.94 CFI=0.94	ENV1, ENV 2, ENV 3, ENV 4, ENV 5, ENV 6, ENV 7, ENV 8, ENV 9, ENV 10	ENV1, ENV 3, ENV 5, ENV 9, ENV 10	5	$\chi^2/d.f.$=3.04 GFI=0.98 SRMR=0.066 RMSEA=0.080 NFI=0.99 CFI=0.99	All accepted
ISEIL*	$\chi^2/d.f.$=11.45 GFI=0.96 SRMR=0.022 RMSEA=0.190 NFI=0.98 CFI=0.98	ISEC2, ISEC3, ISEC4, ISEC5	ISEC5	3	$\chi^2/d.f.$ = -- GFI=1.00 SRMR=0.000 RMSEA=0.000 NFI=1.00 CFI=1.00	All accepted
ISESC*	$\chi^2/d.f.$= -- GFI=1.00 SRMR=0.000 RMSEA=0.000 NFI=1.00 CFI=1.00	ISEC6, ISEC7, ISEC8	-	3	$\chi^2/d.f.$= -- GFI=1.00 SRMR=0.000 RMSEA=0.000 NFI=1.00 CFI=1.00	All accepted

* Three items represented ISEIL and ISESC each, therefore, there are not enough degrees of freedom to estimate the model; Goodness-of-fit indices are considered perfect (Shi et al., 2005).

5.1.2 Construct Validity of the Overall Model

This thesis performs construct validity of measurement models based on the results of identification and validation of measurement models performed in section 5.1.1. The assessment of construct validity is also outlined in Chapter 3. We explain our result findings as follows.

i) Content Validity and Substantive Validity

This section implements the standards as outlined in Table 3.7. Our measurement items support the content validity and substantive validity because our measurement items are derived from the following steps: (1) our measurement items are selected from literature reviews; (2) the item wordings are assessed by an expert panel that consisted of three local professors; and (3) measurement items are revised and improved the readability through a pilot study.

Table 5.20 Construct Validity Assessment

Validity Aspect	Test Procedures	Requirement	Constructs					Remarks
			ISEIL	ISESC	SOC	ECO	ENV	
1. Content validity and Substantive Validity	Qualitative test	Thorough literature review, rated by expert judge, pretest.	The measurement items are selected based on thorough literature review; the item wordings are assessed by an expert panel consisting of three local professors; and measurement items are revised to improve the readability and understandability based on pretest.					All accepted
2. Unidimensionality	EFA: Factor loading	0.35 at sample size is 314	0.87-0.93	0.84-0.88	0.68-0.94	0.55-0.94	0.81-0.91	All accepted
	CFA: Regression weight	$\lambda \geq 0.5$	0.87-0.94	0.75-0.90	0.75-0.94	0.62-0.90	0.85-0.93	All accepted
	: Critical ratios	$t \geq 1.96$ at $\alpha = 5\%$	20.63-22.82	15.16-15.60	16.67-25.17	9.39-11.83	21.04-25.34	All accepted
	: Multiple fits criteria	Refer to Table 3.6	$\chi^2/d.f. = 3.55$, RMSEA = 0.090, SRMR = 0.058, CFI = 0.97, GFI = 0.84, NFI = 0.96					All accepted
3. Reliability	EFA: Cronbach's Alpha	$\alpha \geq 0.7$	0.90	0.85	0.92	0.84	0.94	All accepted
	CFA: Construct reliability	CR $\geq$ 0.7	0.92	0.88	0.93	0.86	0.95	All accepted
4. Convergent validity	EFA: Factor loading	0.35 at sample size is 314	0.87-0.93	0.84-0.88	0.68-0.94	0.55-0.94	0.81-0.91	All accepted
	: Reliability	$\alpha \geq 0.7$	0.90	0.85	0.92	0.84	0.94	All accepted
	CFA: Construct reliability	CR $\geq$ 0.7	0.92	0.88	0.93	0.86	0.95	All accepted
	: Variance extracted	VE $\geq$ 0.5	0.80	0.70	0.73	0.56	0.79	All accepted
5. Discriminant validity	CFA: Square root of Variance extracted compared to correlation between two variables	Square root of Variance extracted greater than correlation	Square root of values of variance extracted range from 0.75 to 0.89, while those of correlation are from 0.38 to 0.66. The results show that all square roots of variance extracted values for each construct are higher than its correlation with other constructs. Details of these results are presented in Table 5.21.					All accepted

ii) **Unidimensionality**

This thesis follows procedures as outlined in Table 3.7. The row two of Table 5.20 shows the full results of unidimensionality. Specifically, the retained measurement items have significant loadings with all the values higher than a value of 0.35 (i.e., 0.55 to 0.94). In the CFA results, all the regression weights are reported to have values higher than a value of 0.50 (i.e., 0.62 to 0.94; with their significant t-values). This thesis thus confirms that there is enough evidence to support that we passed the test of unidimensionality.

iii) **Reliability**

This thesis follows the procedures as outlined in Table 3.7. The row three of Table 5.20 summarizes the Cronbach's α values and construct reliability values for each construct. Specifically, we use Cronbach's α value to assess the reliability of constructs. The results of EFA show that Cronbach's α values are all having a value higher than 0.70 (i.e., 0.84 to 0.94). In the CFA results, the values of construct validity are higher than a value of 0.70 (i.e., 0.86 to 0.95). This thesis thus confirms that our constructs have achieved a high reliability.

iv) **Convergent Validity**

This thesis follows the procedures as outlined in Table 3.7. The row four of Table 5.20 summarizes these values for each construct. The results of EFA show: 1) factor loadings range are having a value higher than 0.35 (i.e., 0.55 to 0.94); 2) Cronbach's α values are higher than a value of 0.70 (i.e. 0.84 to 0.94). The results of CFA show: 1) construct validity values are higher than a value of 0.70 (i.e., 0.86 to 0.95); 2) Variance extracted values are higher than a value of 0.50 (i.e., 0.56 to 0.80). This thesis thus confirms that the results indicate strong convergent validity of constructs.

v) Discriminant Validity

This thesis follows the procedures as outlined in Table 3.7. Table 5.21 summarizes the major descriptive statistics and the correlations derived from the sample. Table 5.21 shows that square root of variance extracted values for each construct are higher than its correlation with other constructs. Thus, all constructs have passed adequate discriminant validity.

Table 5.21 Pearson Correlation Matrix of Constructs

Constructs	1	2	3	4	5
1. ISEIL	**0.89**				
2. ISESC	0.47**	**0.84**			
3. SOC	0.49**	0.57**	**0.86**		
4. ECO	0.44**	0.38**	0.57**	**0.74**	
5. ENV	0.43**	0.39**	0.61**	0.66**	**0.88**

Diagonal elements are the square roots of average variance extracted;
** $p \leq 0.01$; * $p \leq 0.05$

5.3 Testing of Proposed Models

This thesis revises our proposed models by incorporating our findings that ISEC has now decomposed into two newly constructs: ISEIL and ISESC. In the following, we provide our revised research models and hypotheses. Figure 5.1 reveals the full picture of our revised models and hypotheses.

H1a: There will be a positive relationship between a company's ISEC (ISEIL and ISESC) and SOC.

H1b: There will be a positive relationship between a company's ISEC (ISEIL and ISESC) and ECO.

H1c: There will be a positive relationship between a company's ISEC (ISEIL and ISESC) and ENV.

H2: A company's ISEIL and ISESC have a direct and positive relationship with ECO and an indirect and positive relationship with ECO through ENV.

H3: A company's ISEIL and ISESC have a direct and positive relationship with ECO and an indirect and positive relationship with ECO through SOC.

H4: A company's ISEIL and ISESC have a direct and positive relationship with ENV and an indirect and positive relationship with ENV through SOC.

H5: A company's ISEIL and ISESC have positive direct and indirect relationships with SOC, ECO, and ENV.

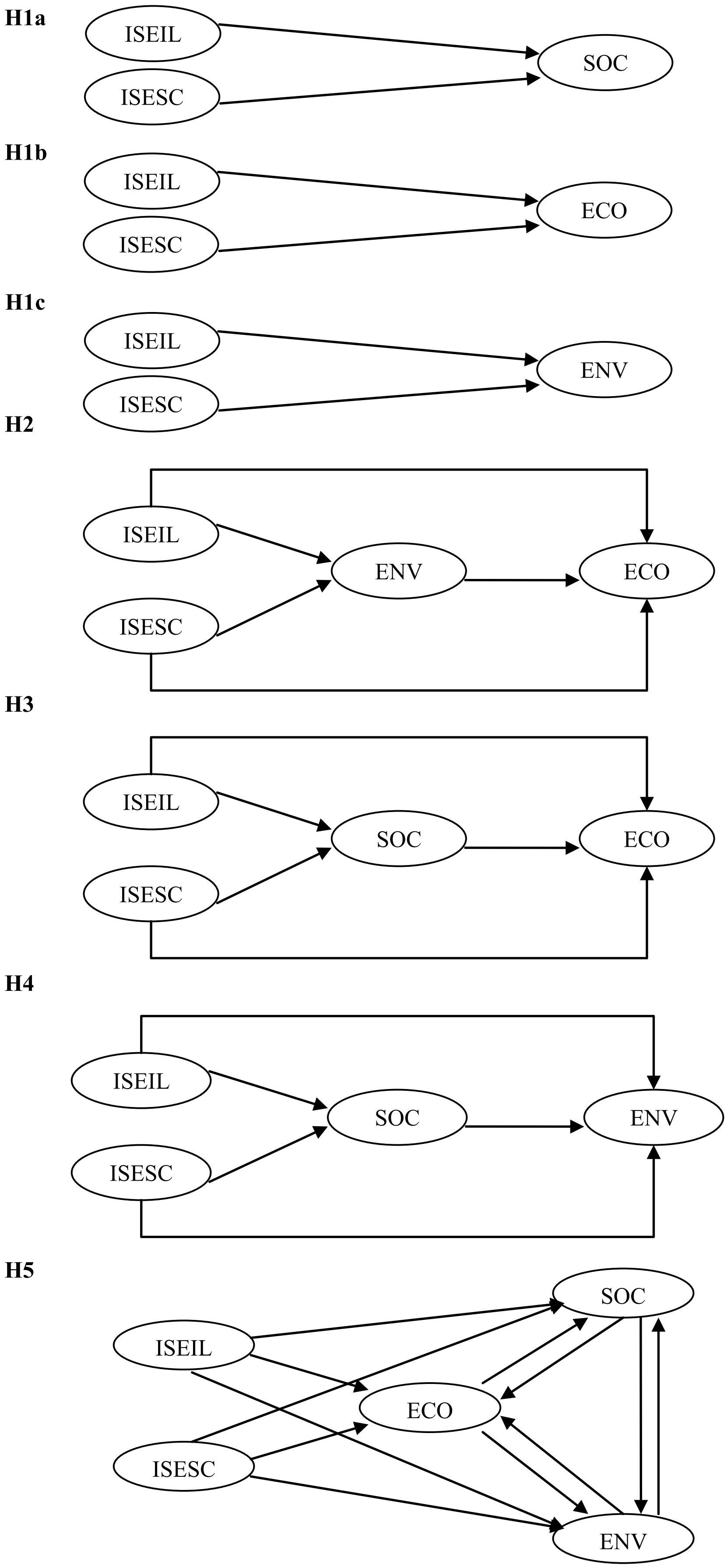


Figure 5.1 Revised Research Models after Validation of Measurement Model

5.3.1 Testing Methods of SEM

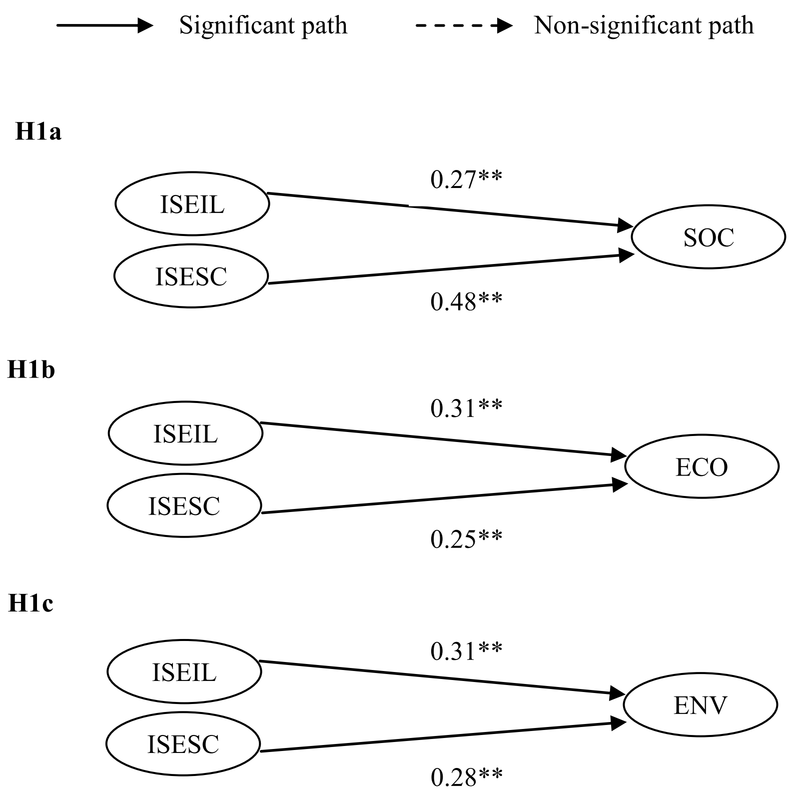
In the following, we present the finding results of direct relationship, mediating models, and the integrated model.

5.3.1.1 Direct Relationships

This thesis tests hypotheses H1a, H1b, and H1c by using SEM. Table 5.22 shows the six model fit indices for hypotheses H1a, H1b, and H1c. We evaluate these six indices based on the criteria outlined in Table 3.8. All the hypotheses meet the criteria. Figure 5.2 reveals the significant paths for the direct relationships of H1a, H1b, and H1c. All the paths are reported as significant. This thesis concludes that our models have reached an acceptable level of fitness. This thesis thus accepts Hypotheses H1a, H1b, and H1c, and concludes that the more ISEIL and ISESC a company has, the more likely it is to adopt SOC, ECO, and ENV.

Table 5.22 Structural Analysis Results for Hypothesis 1a-1c

Model description		χ^2	**d.f.**	χ^2**/d.f.**	**RMSEA**	**SRMR**	**GFI**	**NFI**	**CFI**
Hypothesis 1a-1c									
H1a	ISEIL->SOC & ISESC->SOC	88.01	41	2.15	0.060	0.031	0.95	0.98	0.99
H1b	ISEIL->ECO & ISESC->ECO	145.34	41	3.54	0.088	0.058	0.92	0.96	0.97
H1c	ISEIL->ENV & ISESC->ENV	142.52	41	3.48	0.081	0.031	0.93	0.97	0.98



** p ≤ 0.01; * p ≤ 0.05

Figure 5.2 Standardized Parameter Estimates of Direct Relationships (H1a, H1b, H1c)

5.3.1.2 Mediation Models

This thesis assesses the procedures of mediation models of F, M1, and M2 as outlined in Figure 3.5 for hypotheses H2, H3, and H4.

Hypothesis H2

This thesis tests hypothesis H2 as follows.

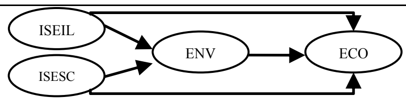
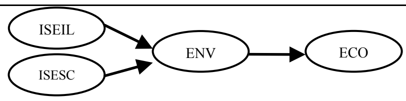
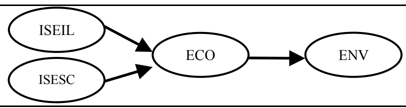
Step 1: **(a)** We have three models, namely 2F, 2M1, and 2M2. Table 5.23 shows their relationships. Model 2F represents the full model of hypothesis H2, whereas models 2M1 and 2M2 are the "trade-off" models that are to be used to test the mediation effects between ECO and ENV.

(b) Table 5.23 reveals the model fit indices and all the three models meet the requirements.

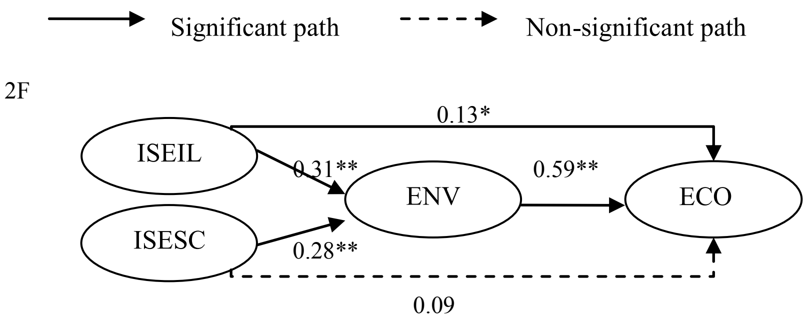
Step 2: **(a)** This thesis computes the values of chi-square difference ($\Delta\chi^2$) between Model (2F and 2M1) and between Model (2F and 2M2), and their values are 12.10 and 17.32 respectively. The two values of chi-square difference ($\Delta\chi^2$) are above 5.99, which mean that the two values of chi-square difference ($\Delta\chi^2$) are both significant at $p \leq 0.05$. The value of chi-square difference ($\Delta\chi^2$) between (2F and 2M1) is smaller than that the value between (2F and 2M2). This thesis thus accepts Model 2F as our final model, and uses it to explain our findings.

(b) Figure 5.3 reveals the significant paths for model 2F. The ISESC-ECO path is not significant at $\rho \leq 0.05$. This result reveals that hypothesis H2 is only partial supported. This thesis concludes that a company's ISEIL has direct relationships with ENV and ECO, and also an indirect relationship with ECO through ENV; ISESC only has an indirect relationship with ECO through ENV.

Table 5.23 Structural Analysis Results for Hypothesis 2

Mediation model		χ^2	d.f.	χ^2/ d.f.	RMSEA	SRMR	GFI	NFI	CFI
Hypothesis 2									
2F		386.69	98	3.95	0.095	0.055	0.87	0.96	0.96
2M1		398.79	100	3.99	0.095	0.071	0.87	0.96	0.96
2M2		404.01	100	4.04	0.097	0.070	0.86	0.95	0.96
$\Delta\chi^2$	χ^2 (2M1) - χ^2 (2F) = 12.10(2)**	$\Delta\chi^2$	χ^2 (2M2) - χ^2 (2F) = 17.32(2)**						

$\Delta\chi^2$, chi-square difference test; ** $p \leq 0.01$; * $p \leq 0.05$.



** $p \leq 0.01$; * $p \leq 0.05$

Figure 5.3 Standardized Parameter Estimates of Mediation Model 2F

Hypothesis H3

This thesis tests hypothesis H3 as follows.

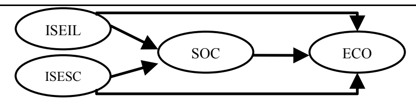
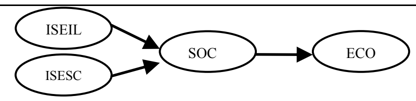
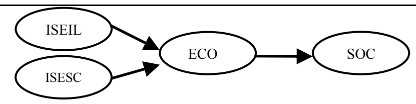
Step 1: (a) We have three models, namely 3F, 3M1, and 3M2. Table 5.24 shows their relationships. Model 3F represents the full model of hypothesis H3, whereas models 3M1 and 3M2 are the "trade-off" effects of models that are to be used to test the mediation effects between ECO and SOC.

(b) Table 5.24 shows the model fit indices for all models. All models meet the minimal requirements except the Model 3M2

Step 2: (a) This thesis computes the values of chi-square difference ($\Delta\chi^2$) between Models (3F and 3M1) and between Models (3F and 3M2), and their respective values are 11.67 and 86.92. The value of chi-square difference ($\Delta\chi^2$) for these two values is 5.99, which is reported as significant at $p \leq 0.05$. At the same time, the value of chi-square difference ($\Delta\chi^2$) between models (3F and 3M1) is smaller than of between models (3F and 3M2). This thesis thus accepts Model 3F as our final model and used it to explain our findings.

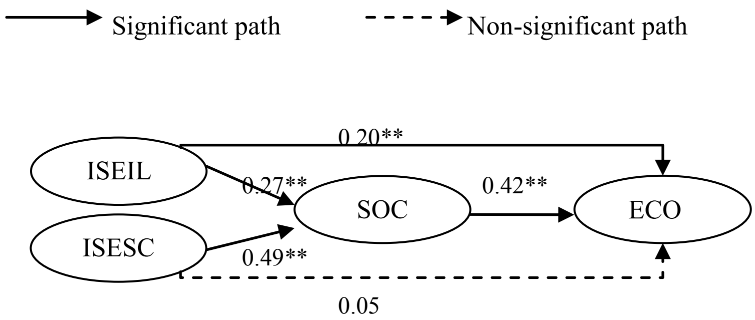
(b) Figure 5.4 reveals the significant paths for the model 3F. The ISESC-ECO path is not significant at $\rho \leq 0.05$. This result reveals that hypothesis H3 is only partially supported. This thesis concludes that ISEIL has direct relationships with SOC and ECO, as well as an indirect relationship with ECO through the effect on SOC. ISESC has an indirect relationship with ECO through the effect on SOC.

Table 5.24 Structural Analysis Results for Hypothesis 3

Mediation model		χ^2	d.f.	χ^2/ d.f.	RMSEA	SRMR	GFI	NFI	CFI
Hypothesis 3									
3F		332.53	98	3.39	0.087	0.063	0.88	0.96	0.97
3M1		344.20	100	3.44	0.088	0.076	0.88	0.96	0.97
3M2		419.45	100	4.19	0.097	0.12	0.86	0.95	0.96
$\Delta\chi^2$	χ^2 (3M1) - χ^2 (3F) = 11.67(2)**	$\Delta\chi^2$	χ^2 (3M2) - χ^2 (3F) = 86.92(2)**						

$\Delta\chi^2$, chi-square difference test; ** $p \leq 0.01$; * $p \leq 0.05$.

3F



** $p \leq 0.01$; * $p \leq 0.05$

Figure 5.4 Standardized Parameter Estimates of Mediation Model 3F

Hypotheses H4

This thesis tests hypothesis H4 as follows.

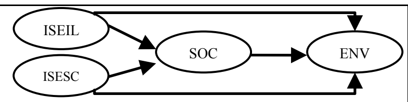
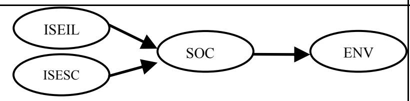
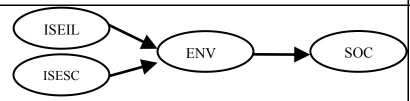
Step 1: (a) We have three models, namely 4F, 4M1, and 4M2. Table 5.25 shows their relationships. Model 4F represents the full model of hypothesis H4, whereas models 4M1 and 4M2 are the "trade-off" effects of models that are to be used to test the mediation effects between ENV and SOC.

(b) Table 5.25 reveals the model fit indices. All models meet the requirements except model 4M2.

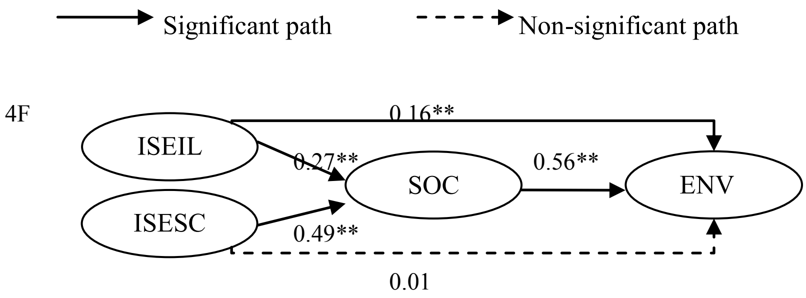
Step 2: (a) This thesis computes the values of chi-square difference ($\Delta\chi^2$) between Model (4F and 4M1) and between Model (4F and 4M2), and their respective values are 7.44 and 78.12. The chi-square difference ($\Delta\chi^2$) for these two values is 5.99, and it is significant at $p \leq 0.05$. Also, the value of chi-square difference ($\Delta\chi^2$) between models (4F and 4M) is smaller than that between model (4F and 4M2). This thesis thus accepts Model 4F as our final model and uses it to explain our findings.

(b) Figure 5.5 reveals the significant paths for model 4F. The ISESC-ENV path is not significant at $\rho \leq 0.05$. This result reveals that hypothesis H4 is only partially supported. This thesis thus concludes that ISEIL has direct relationships with SOC and ENV, as well as an indirect relationship with ENV through the effect of SOC; ISESC has an indirect relationship with ENV through the effect of SOC.

Table 5.25 Structural Analysis Results for Hypothesis 4

Mediation models		χ^2	d.f.	χ^2/ d.f.	RMS EA	SRM R	GFI	NFI	CFI
Hypothesis 4									
4F		308.39	98	3.15	0.080	0.036	0.89	0.97	0.98
4M1		315.83	100	3.16	0.081	0.046	0.89	0.97	0.98
4M2		386.56	100	3.87	0.092	0.110	0.87	0.97	0.97
$\Delta\chi^2$	χ^2 (4M1) - χ^2 (4F) = 7.44(2)*	$\Delta\chi^2$	χ^2 (4M2) - χ^2 (4F) = 78.17(2)**						

$\Delta\chi^2$, chi-square difference test; ** $p \leq 0.01$; * $p \leq 0.05$.



** $p \leq 0.01$; * $p \leq 0.05$

Figure 5.5 Standardized Parameter Estimates of Mediation Model 4F

5.3.1.3 Integrated Model

This thesis tests hypothesis H5 as follows.

Step 1a: This thesis forms the final integrated model 5F which bases on the final results of mediation models 2F, 3F, and 4F. Figure 5.6 reveals our final model, and it consists of both significant and insignificant paths. This thesis removes the most insignificant path ISEC-ENV and labels it as Model 5M1.

Step 2a: (a) This thesis applies SEM to test the significant of models 5M1 and 5F. Table 5.26 shows that the model fit indices for models 5M1 and 5F. Both models 5M1 and 5F meet the minimal requirements.

(b) This thesis compares the chi-square difference values ($\Delta\chi^2$) for models (5F and 5M1). The value of chi-square difference value ($\Delta\chi^2$) has a value less than 3.84 and thus we conclude that it is not significant at 95% of confidence interval. This thesis thus accepts the Model 5M1 and treats it as the final model. This thesis repeats the above steps.

Step 1b: This thesis treats model 5M1 as our model F. Figure 5.6 shows our result which consists of both significant and insignificant paths. Our next step is to form model 5M2 by removing the most insignificant path the ISEC-ECO.

Step 2b: (a) This thesis applies SEM to test models 5M1 and 5M2. Table 5.26 shows that the model fit indices for models (5M1 and 5M2). Both models meet the minimal requirements. This thesis then compares the chi-square difference values ($\Delta\chi^2$) for models (5M1 and 5M2). The chi-square difference value ($\Delta\chi^2$) is reported to have a value < 3.84 and it is not significant at 95% of confidence interval. This thesis stops the operations and considers model 5M2 as our final model. All paths in the model 5M2 are significant and meet the requirement for model fit indices. This thesis thus accepts model 5M2 and considers it as our result. This result is interpreted as follows: ISEIL has a direct effect on SOC, ENV, and SOC; and ISESC has a direct effect on SOC and indirect effects on ENV and ECO.

Figure 5.7 reveals our final results. It depicts that the regression weights of each path in the model is significant (i.e. all t-value are having a value greater than 1.96 which implies that they are significant at $p \leq 0.05$). All model indices are met and thus this thesis concludes that our final model is acceptable.

Table 5.26 Structural Analysis Results for Hypothesis 5

Model description		χ^2	**d.f.**	χ^2/ **d.f.**	**RMSEA**	**SRMR**	**GFI**	**NFI**	**CFI**
Integrated model									
Hypothesis 5									
5F	Integrated model (initial)	652.13	179	3.64	0.090	0.058	0.84	0.96	0.97
5M1	Integrated model (remove ISESC-ENV)	652.14	180	3.62	0.090	0.058	0.84	0.96	0.97
5M2	Integrated model (remove ISESC-ENV and ISESC-ECO)	652.46	181	3.60	0.090	0.058	0.84	0.96	0.97
$\Delta\chi^2$	χ^2 (5M2) - χ^2 (5F) = 0.33(2)								

$\Delta\chi^2$, chi-square difference test; ** $p \leq 0.01$; * $p \leq 0.05$.

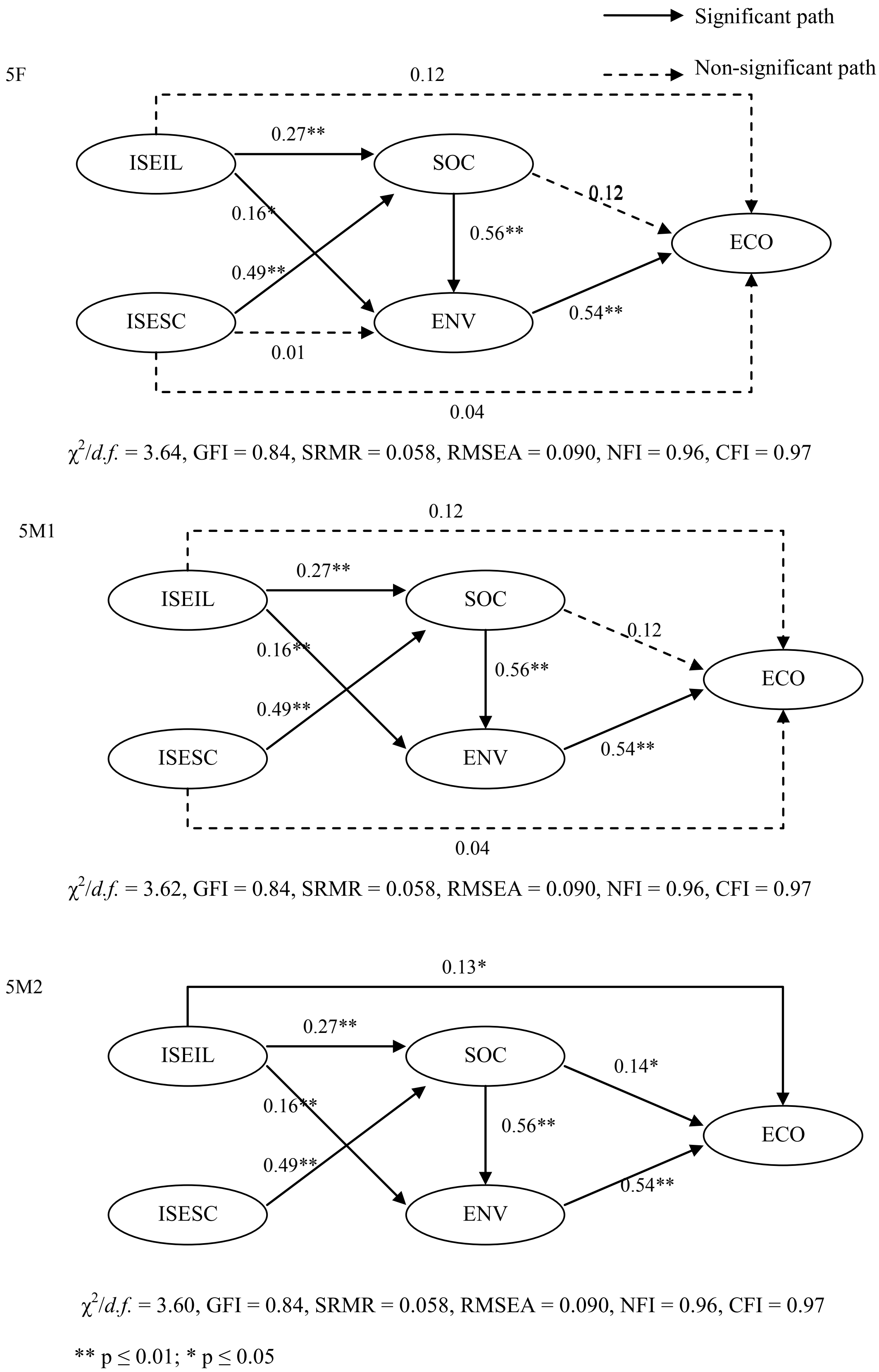


Figure 5.6 Summarized Results of the Integrated Structural Analysis

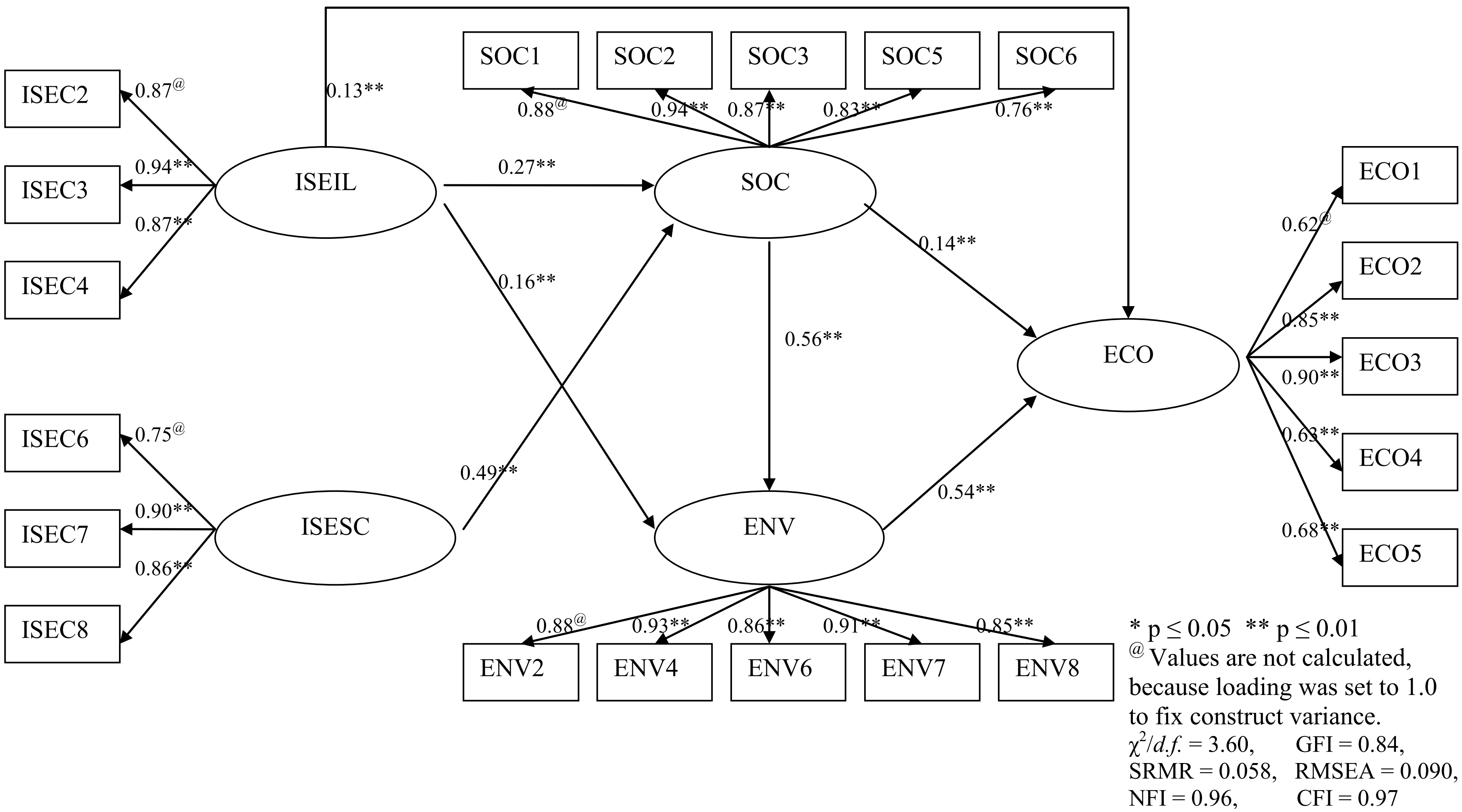


Figure 5.7 Final Results of the Research Model

5.3.1.4 Direct, Indirect, and Total Effects

Table 5.27 shows the results of the direct, indirect, and total effects for all model constructs. Our results reveal that ISEIL and ISESC have indirect effects on ECO through the effects of ENV and SOC.

Table 5.27 Direct, Indirect, and Total Effects

Constructs	**SOC**			**ENV**			**ECO**		
	Direct effect	*Indirect effect*	*Total effect*	*Direct effect*	*Indirect effect*	*Total effect*	*Direct effect*	*Indirect effect*	*Total effect*
ISEIL	0.27	-----	0.27	0.16	0.15	0.31	0.13	0.21	0.34
ISESC	0.49	-----	0.49	-----	0.27	0.27	-----	0.15	0.15
SOC	-----	-----	-----	0.56	-----	0.56	0.14	0.30	0.44
ENV	-----	-----	-----	-----	-----	-----	0.54	-----	0.54

CHAPTER 6 DISCUSSIONS AND IMPLICATIONS

This chapter presents the discussions and implications of the result findings. It comprises of the following section:

a) Validation of Measurement Models; and
b) Testing of Proposed Models.

6.1 Validation of Measurement Models

This thesis extends corporate sustainability research and IS research to validate the measurement items for the three dimensions of corporate sustainability, and the construct of ISEC. In the following, we discuss the measurement items for the three dimensions of corporate sustainability and also for the construct of ISEC.

6.1.1 Corporate Sustainability

This thesis verifies that corporate sustainability can be represented by three dimensions, and they are SOC, ECO, and ENV. Our result has parsimonious 15-items of instrument that could tap into these three dimensions of corporate sustainability. This result has captured the multiple aspects of corporate sustainability. The measurement items which are developed in this thesis has a major contribution in corporate sustainability because it is a prerequisite for any theoretical advancement (Schwab, 1980). Our results provide a better understanding of corporate sustainability, which comprises three distinguishable dimensions (i.e., SOC, ECO, and ENV). This thesis further confirms the stability of these three dimensions by using the statistical technique of structural equation modeling. With holding to a validated instrument for measuring corporate sustainability, researchers will be able to undertake further studies that link to other relevant decision variables such as organizational performance, stakeholder integration, and organizational capabilities. For practitioners, our results have provided them a better understanding about the strategic applications of corporate sustainability. Managers can make use of them to promote the development of strategic management competencies in their companies. Our results indicate that companies should be concerned about all three dimensions of sustainability than just on one dimension in particular. Companies could apply our findings to benchmark their existing policies of corporate sustainability.

In the following, we discuss these three dimensions of corporate sustainability, namely SOC, ECO, and ENV.

6.1.1.1 SOC Construct

This thesis initially proposes SOC to be measured by 6 operations items. Through a rigorous testing, we retain 5 measurement items for SOC. They are: SCO1: Improved employee or community health and safety; SOC2: Recognized and acted on the need to fund local community initiatives; SOC3: Protected claims and rights of aboriginal peoples or local community; SOC5: Communicated the firm's environmental impacts and risks to the general public, and SOC6: Considered interests of stakeholders in investment decisions by creating a formal dialogue. These 5 refined measurement items are further discussed as follows.

1) SOC1: Improved employee or community health and safety. This measurement item measures the extent to which companies have paid sufficient attention to the health and safety of employees or community. Their activities are related to: (1) health effects - which may due to local air pollution, incidental release of toxic substances and toxicity of products; and (2) safety effects – which may due to employees' and community's mental or physical illness, risk of injuries and crime occurred in the local community (Azapagic, 2004).
2) SOC2: Recognized and acted on the need to fund local community initiatives. This measurement item describes the extent to which companies should pay attention to the development of local community. Such local community initiatives include (1) physical infrastructure (e.g., water systems, electrical distribution and roadways), (2) employment opportunities across the local community, (3) wage parity, and (4) purchasing of local based products (Azapagic, 2004; Labuschagne et al., 2005)
3) SOC3: Protected claims and rights of aboriginal peoples or local community. This measurement item refers to the extent to which companies have considered and protected human rights of aboriginal peoples or local community. Such activities include (1) equally treatment to women, (2)

respect to rights of disability people, (3) avoid volatile indigenous rights, and (4) fairness of compulsory labors (Steurer et al., 2005).

4) SOC5: Communicated the firm's environmental impacts and risks to the general public. This measurement item describes the extent to which companies communicated with the public about their environmental impacts and risks. The importance of this measurement item indicates that public disclosure, especially on the disclosure of corporate environmental performance, should be exercised tp an extent that its operations are transparency to stakeholders as much as possible (Turker, 2009).
5) SOC6: Considered interests of stakeholders in investment decisions by creating a formal dialogue. This measurement item assesses the extent to which companies could allow stakeholder to involve in their business operations. This measurement item indicates that the practice of treating stakeholders in an ethically and socially responsible manner is a critical function of SOC. To consider interests of stakeholders and their participation, companies should share valuable information with their stakeholders so that stakeholders could appreciate the performance of the companies further (Labuschagne et al., 2005).

This thesis removes one SOC measurement item in the process of item purification. It is: SOC4: Showed concern for the visual aspects of the firm's facilitates operations. Even though Chinese companies have made great efforts on the above aspects of SOC, it is suggested that Chinese companies should further implement social activity that could perhaps improve the quality of life of their employees (Birkin et al., 2009).

6.1.1.2 ECO Construct

This thesis initially proposes ECO to be measured by 6 operations items. Through a rigorous testing, we retain 5 measurement items for ECO. They are: ECO1: Sold waste product for revenue; ECO2: Reduced costs of inputs for the same level of outputs; ECO3: Reduced costs for waste management for the same level of outputs; ECO4: Worked with government officials to protect the company's interest; and ECO5: Created spin-off technologies that could be profitably applied to other areas of the business. These 5 refined measurement items are further discussed as follows.

1) ECO1: Sold waste product for revenue. This measurement item describes companies could generate their revenue by selling waste products. Selling waste products for business profit is a good action for the growth of sustainable economy (Bansal, 2005).
2) ECO2: Reduced costs of inputs for the same level of outputs. This item measures the extent to which companies reduced costs of inputs to improve their profit. Costs reduction has played a critical role for the creation and distribution of an economic value. However, how to reduce the costs of inputs matters the most. It is suggested that companies could these costs including costs for operations, raw materials, and so on (Azapagic, 2004).
3) ECO3: Reduced costs for waste management for the same level of outputs. This item relates to the extent to which companies take actions to reduce costs of waste management for improving their profit value. Their activities may

include events such as the minimizing of payments for fines, liabilities, and worker compensation – which may be caused by the engagement of environmental accidents or waste treatment and disposal (Veleva and Ellenbecker, 2001). It is claimed that this item could achieve both benefits of the financial performance and environmental cleanness.

4) ECO4: Worked with government officials to protect the company's interest. This item iterates that companies should abide to the local regulations of the green practices. It is suggested that companies should actively participate in and collaborate with the local government units so that their business plans could enhance a long-term economic success (Newman, 2007).
5) ECO5: Created spin-off technologies that could be profitably applied to other areas of the business. This item highlights that companies should enhance their competitiveness and profitability through the investment on the product innovation and/or the engagement of research and development (R&D) on their products/services. By improving the innovation capabilities on processes/products/services, companies could differentiate their products/services from their counterparts so that their competitive advantage can be treated as a component of their future survive (Lopez-Gamero et al., 2009).

This thesis removes one ECO measurement item in the process of item purification. It is: ECO6: Differentiated the process/product based on the marketing efforts of the process/product's environmental performance. This item describes about companies could gain competitive advantage in the market by differentiating their processes/products/services. Chinese companies have realized the importance of environmental protection on their daily operations. However, most of these companies would only implement the environmental protection if it is government regulated (Zhang and Wen, 2008). Merging environmental protection into economic structure or strategy is still at the early phase of environmental protection in China (Zhang and Wen, 2008). To differentiate the processes/products/services, Chinese companies should continue to adjust their economic structure to include the development of an environmental management systems and eco-labeling.

6.1.1.3 ENV Construct

This thesis initially proposes ENV to be measured by 10 operations items. Through a rigorous testing, we retain 5 measurement items for ENV. They are: ENV2: Reduced wastes and emissions from operations; ENV4: Reduced the environmental impacts of its products/services; ENV5: Reduced environmental impact by establishing partnerships; ENV6: Reduced the risk of environmental accidents, spills, and releases, and ENV7: Reduced purchases of non-renewable materials, chemicals, and components. These 5 refined measurement items are further discussed as follows.

1) ENV2: Reduced wastes and emissions from operations. This item measures the extent to which companies could reduce wastes and emissions from their operations. Wastes and emissions are consequences of the activities of companies. Tracking and reducing wastes and emissions could improve the life cycle of overall performance for their products and services, and they

could also serve as a part of comprehensive design-for-environment program (Hart, 1995).

2) ENV4: Reduced the environmental impacts of its products/services. This item assesses the actions of companies that have taken to reduce the negative environmental impacts. The outcome could be served as an improvement to the design of company's products and services. The outcome benefits include (1) the increased compatibility with future environmental legislation, (2) the advancement of differentiating products/services, and (3) the enhancement of companies' reputation (Chan, 2005).

3) ENV5: Reduced environmental impact by establishing partnerships. This item measures the action of companies that have taken to reduce environmental impact through a mean of partnership. One company alone cannot achieve the goal of environmental protection for the whole society (Chan, 2005). Companies should build partnerships that could (1) improve environmental technology, (2) establish environmental standards for products/processes, and (3) reduce wastes and emissions (Zhang and Wen, 2008).

4) ENV6: Reduced the risk of environmental accidents, spills, and releases. This item assesses the extent to which companies undertake actions to reduce the risk of environmental accidents, spills, and releases. Their activities include (1) the changing design of processes/products/services, (2) the training of employees or community in emergency response procedures, (3) the investments in equipment and control/alarm systems, and so on (Sharma and Vredenburg, 1998).

5) ENV7: Reduced purchases of non-renewable materials, chemicals, and components. This item describes the extent to which companies undertake

actions to (1) reduce purchases of non-renewable materials, chemicals and components, (2) lower operational costs, and (3) conserve the natural resource. Their activities could include (1) a tracking system for the material consumption, (3) a reducing of intense use of non-renewable materials and chemicals, and (3) a monitor of recycled input materials or chemicals (Lindgreen et al., 2009).

This thesis removes 5 ENV measurement items in the process of item purification. They are: ENV1: Reduced energy consumption; ENV3: Reduced impact on animal species and natural habitats; ENV8: Reduced the use of traditional fuels by the substitution of some less polluted energy sources; ENV9: Undertook voluntary actions for environmental restoration; and ENV10: Undertook actions for environmental audit, public disclosure, employee training and immunity. We briefly explain two reasons about why these measurement items are not applied to China's companies in below.

First, ENV1 and ENV8 are referred to the consumption of energy. Even though the energy consumption in China has fallen dramatically over the last decade, the record has revealed that the primary energy consumption (e.g., coal, iron, steel, and cement) has doubled in size (Zhang and Wen, 2008). China is still considered as a country with a high intensity in consuming energy. The primary energy consumption in China is still much higher than that of developed countries (Zhang and Wen, 2008). Zhang and Wen (2008) reveal that China is still facing many problems (such as shortage of resources and poor rate of utilization) in governing how to consume energy effectively that made their practices have clearly contradicted to their belief in exercising sustainability. To ensure that there is enough energy to meet their future needs, Chinese companies should dedicate their emphases on the efficiency of energy consumption, the development of renewable energy, and the investment of R&D in energy re-use and supply (Chen and Robin, 2000).

Second, ENV3, ENV9, and ENV10 are about environmental protection of Chinese companies. In China, the current practice of environmental protection is straightly rested on the shoulder of the local government instead of an ethical responsibility from individual Chinese companies (Ni and Johansson, 2004). There is evidence to show that Chinese companies would have engaged in the practice of environmental protection voluntarily (Zhang and Wen, 2008). This phenomenon may be due to the fact that China is a developing country and the practice of environmental protection is still in a preliminary stage across all Chinese companies (Chan, 2005). Undertaking a large scale of actions - such as environmental audit and employee training - for environmental protection does not seem to be an economical and viable option for most Chinese companies. Sharma (2000) suggests that companies could benefit from the adoption of environmental protection if they could develop a proactive environmental strategy. Therefore, it is recommended that Chinese companies should take voluntary actions to proactively engage in environmental protection – such as the protection on animal species and natural habitats, and environmental restorations – as part of their business strategy in near future.

6.1.2 ISEC Construct

This thesis also contributes to the refinement of measurement items for the ISEC. Similar to findings of Sharma and Vredenburg (1998) and Chan (2005), this thesis concludes that ISEC can be decomposed and represented by two newly constructs: ISEIL and ISESC. Each of these two constructs is measured by 3 measurement items and they are discussed below.

6.1.2.1 ISEIL Construct

The construct of ISEIL is referred to the enhancement of innovation and learning that IS can integrate their organizational capabilities for companies. The ISEIL can also be interpreted as the specific capabilities that IS can be rendered for companies to achieve the practice of corporate sustainability (Chan, 2005; Sharma and Vredenburg, 1998). The 3 measurement items for ISEIL are: 1) ISEC2: Facilitate or trigger innovation within the firm; 2) ISEC3: Facilitate or trigger collective learning within the firm; and 3) ISEC4: Help develop a shared or long-range vision within the firm. We discuss these 3 measurement items as follows.

1) ISEC2: Facilitate or trigger innovation within the firm. This item measures the extent to which the ISEIL of a company has facilitated or triggered innovation within this company. ISEIL has always been considered as one of the most powerful tools to achieve competitive advantage through an innovative improvement on their daily operations for businesses (Davenport, 1993). Companies are thus recommended to integrate their IS with key processes that

could form a knowledge-based system, which could further enhance their relationships with customers. These operations could be considered to nurture innovation capabilities in customer relationship, manufacturing, procurement, supply chains and other key activities (Davis, 2003; Ward and Peppard, 2002).

2) ISEC3: Facilitate or trigger collective learning within the firm. This measurement item measures the extent to which the ISEC of a company has facilitated or triggered collective learning within this company. ISEIL could improve organizational learning within a company (Sambamurthy et al., 2003). Companies with appropriate IS could improve knowledge sharing and collective learning so that the outcome could improve the social trust and collaboration in companies (Sambamurthy et al., 2003).

3) ISEC4: Help develop a shared or long-range vision within the firm. This measurement item assesses the extent to which the ISEC of a company has helped companies to develop a shared or long-range vision within the companies. With ISEIL, companies could achieve a good performance by sharing information and business goals (Konsynski and McFarlan, 1990). Advanced IS communication technologies enable a rich communication among managers and facilitate the long-term emergence of share structures of interactions and cognition (Huber, 1990).

6.1.2.2 ISESC Construct

In contrast, ISESC describes the competitiveness and uniqueness of operations that brought by IS in companies. ISESC can be interpreted as generic capabilities of the entire company's operations that are enabled by IS (Chan, 2005; Sharma and Vredenburg, 1998). Two examples of these generic capabilities are quality management (Ravichandran and Rai, 2000) and supply-chain systems enabled by IS (Wu et al., 2006). In this thesis, we identify and confirm 3 measurement items to operate ISESC. They are: 1) ISEC6: Cannot be taken away these capabilities with employees when leaving the firm; 2) ISEC7: Cannot be easily be identified or imitated by competitors; and 3) ISEC8: Cannot be built up faster by competitors through a greater application of resources. We discuss these 3 measurement items as follows.

1) ISEC6: Cannot be taken away these capabilities with employees when leaving the firm. This measurement item assesses the extent to which the ISESC of a company is not transferable by employees when they leave for a company. The importance of ISEC6 indicates that ISESC is not freely transferable between companies; hence, competitors are unable to acquire ISESC to replicate the companies' competitive advantage (Barney, 1991). Companies with appropriate IS could improve the collaboration with other operational systems (e.g., supply chain systems) and could also achieve sustained competitive advantage. Such a competitive advantage cannot be transferred with employees' leaving.
2) ISEC7: Cannot be easily be identified or imitated by competitors. This measurement item measures the extent to which the ISESC of a company is hard to imitate. The main characteristics of ISESC is that it enables companies to integrate people, process, and information technologies together to form a competitive system so that it is hard to imitate and valuable. Such an example is referred to a Chinese company who developed a system called "Neway".

They have gone through a complex process of integration of enterprise resource planning (ERP) and supply chain systems (Bose et al., 2008). The success of this system lies on the integration of their operations such as the efficient procurement and management of hardware, software and human resources. This integrated system is hard to imitate.

3) ISEC8: Cannot be built up faster by competitors through a greater application of resources. This measurement item assesses the extent to which the ISESC of a company is of causal ambiguity (Barney, 1991). Causal ambiguity exists when the linkage between a company's IS resources and their company's competitive advantage is not understood by its competitors (Barney, 1991). IS enables a greater collaboration across different departments through a platform - such as portals, supply chain systems, and so on – that their competitors cannot duplicate the same system easily by simply obtaining IT hardware and software (Wade and Hulland, 2004).

6.2 Testing of Proposed Models

This thesis also contributes to the understanding on how ISEC affects corporate sustainability. In this section, we discuss the result findings of our proposed models. We initially propose 7 hypotheses. They are H1a, H1b, H1c, H2, H3, H4, and H5 as shown in Figure 3.4. Through data analysis on ISEC, ISEC is decomposed and represented by two newly constructs: ISEIL and ISESC. Therefore, our initial 7 hypotheses are revised accordingly. Figure 5.1 reveals these 7 revised hypotheses. Among them, hypotheses H1a to H1c are used to confirm whether ISEIL and ISESC have direct effects on with each construct of

SOC, ECO, and ENV. Hypotheses H2, H3, and H4 are related to the study of mediating relationships between constructs (ISEIL and ISESC) and a combination pair of constructs (SOC, ECO, and ENV). Altogether, we have three pairs of combination: (SOC and ECO), (SOC and ENV), and (ECO and ENV). By combining the result findings of hypotheses H2, H3, and H4, hypothesis H5 is formed and it is used to verify the relationships between (ISEIL and ISESC) and (SOC, ECO, and ENV). In this section, we only discuss the results of hypotheses H1a, H1b, H1c and H5. The reasons are that: (1) Hypotheses H1a, H1b, and H1c are prerequisites of condition for carrying out further study of hypotheses H2 to H5; and (2) Hypothesis H5 is the final and integrated model which combining result findings of hypotheses H2, H3, and H4. The result findings of hypothesis H5 have already considered the result findings of hypotheses H2, H3, and H4. In the following, we discuss the result findings of hypotheses H1a, H1b, and H1c with the help of Figure 5.2. After which, we will discuss the result findings of hypothesis H5 with the help of information that presented in Table 5.27 and Figure 5.7.

6.2.1 Direct Relationships between (ISEIL and ISESC) and SOC

Figure 5.2 reveals that both ISEIL and ISESC have direct effects on SOC. This result implies that ISEC has played an important role in SOC in China. In the following, we discuss the effects of ISEIL and ISESC on SOC:

1) ISEIL has a direct effect on SOC ($\beta = 0.27$). This result finding suggests that companies should give the reign to the role of IS in innovation, learning, and shared vision so that the smooth progress of SOC is guaranteed. One example

is referred to organizational capabilities on the vision sharing that enabled by IS that can promote companies with a better understanding on the needs of society at large by (1) communicating with the publics, and (2) considering the interests of stakeholders. Such IS-enabled vision-sharing capabilities could ensure SOC improves social equity and also to enhance the quality of life (Hilty et al., 2005).

2) ISESC has a direct effect on SOC ($\beta = 0.48$). This result indicates the importance of system competitiveness enabled by IS in SOC. It refers that the achievement of SOC as an organizational strategy is easy to realize if organizations could combine different operations systems together with their IS efficiently and effectively. One example is the integration of IS and customer-oriented service system together so that this newly formed system could improve their customers' satisfaction on the companies' products and/or services (Park and Kim, 2003).

3) Our results reveal that path coefficient of ISEIL on SOC ($\beta = 0.27$) is smaller than that of ISESC ($\beta = 0.48$). This result implies that ISEIL has played a lesser influencing role on SOC when comparing to ISESC in the Chinese business environment. One possible explanation is that ISEIL concentrates more on the operational efficiency of environmental strategy and economic structure (Melville, 2010). On the other hand, ISESC could emphasize more on employees' cooperation and stakeholders' benefits. For example, customer relationship management (CRM) could improve companies' communication capabilities on the interaction between companies and their stakeholders. Practicing CRM could affect SOC by (1) improving customers' comfort and satisfaction and (2) satisfying the needs of local community to create

shareholder value (Payne and Frow, 2005). This result suggests that Chinese companies are focusing more on the coordination among the use of systems, such as the skill development through IS personnel involvement, and so on (Bharadwaj, 2000; Waage et al., 2003).

6.2.2 Direct Relationships between (ISEIL and ISESC) and ECO

Figure 5.2 reveals that both ISEIL and ISESC have direct effects on ECO. This result implies that ISEC plays an important role in ECO in China. In the following, we discuss the effects of ISEIL and ISESC on ECO:

1) ISEIL has a direct effect on ECO ($\beta = 0.31$). This result indicates the importance of IS enabled organizational capabilities in innovation, learning and shared vision for ECO. This result re-iterates the findings of many studies that ISEIL could improve a company's ECO practices (e.g., Melville, 2010). This result also suggests that companies should pay more attention on the role of IS which involves in innovation, learning and shared vision because they could ensure their economic success. One example is that the innovative capabilities enabled by IS could increase the utilization of raw materials through R&D processes. Companies should thus improve their ECO practices on aspects of the cost reduction and creation of revenue (Melville, 2010).
2) ISESC has a direct effect on ECO ($\beta = 0.25$). This result highlights the importance of ISESC on ECO practices. Companies should consider more on the integration of their IS with other systems (e.g. quality-based system and supply chain system) in organizations so that the overall performance could be enriched. Such an action of the integration could also be improved the

efficiency of overall operational processes within the companies, and could also be achieved the value creation in their processes (Ravichandran and Rai, 2000).

3) Our results reveal that path coefficient of ISEIL on ECO ($\beta = 0.31$) is higher than that of ISESC ($\beta = 0.25$). This result implies that ISESC has played a lesser influencing role on ECO when comparing with ISEIL in the Chinese business environment. This result manifests ISEIL has played a more influencing role on ECO when comparing to the effect of ISESC in the Chinese business environment. Companies should improve their performance through the use of ISEC in the area of operations/product/service innovation, collective learning and shared vision within the companies. On the other hand, the effectiveness of system integration requires companies to commit strongly in coordinating events such as IS personnel, operations process, and technologies together. China as a new comer in using IS (e.g., CRM and ERP) still at a preliminary stage that Chinese organizations have not achieved this objective efficiently (Martinsons, 2002). This phenomenon has suggested that Chinese companies should pay more attention to the efficiency for coordinating and involving with system integration that require their personnel participation.

6.2.3 Direct Relationships between (ISEIL and ISESC) and ENV

Figure 5.2 reveals that both ISEIL and ISESC have direct effects on ENV. This result implies that ISEC has played an important role in ENV in China. In the following, we discuss the effects of ISEIL and ISESC on ENV:

1) ISEIL has a direct effect on ENV ($\beta = 0.31$). This result implies that ISEC, which constitutes the advantages of service innovation and shared vision, could help Chinese companies to improve ENV practices. In the practice of ENV, it is expected that companies could produce environmental - friendly products through the development of their environmental technologies. Employees should share their companies' environmental vision with each other, so that the whole company could work together towards ENV practices. To implement the ENV, it is suggested that managers should highlight the important role of IS plays on organizational innovation, learning and shared vision (Melville, 2010).
2) ISESC has a direct effect on ENV ($\beta = 0.28$). This result suggests that organizations should also pay attention on how an organization could effectively integrate their systems together. One practical example is referred to that an integrated system of the quality-based inventory control system could help an organization to improve their environmental processes competitively (Hart, 1995).
3) Our results reveal that path coefficient of ISEIL on ENV ($\beta = 0.31$) is higher than that of ISESC ($\beta = 0.28$). This result implies that ISESC has played a lesser influencing role on ENV when comparing to ISEIL in the Chinese business environment. Our result has echoed the similar finding of Chan (2005). In ENV, ISEC has a higher significant value than ISEIL. This phenomenon may reflect to the fact that ISEIL could help Chinese companies easily to accomplish the goals in which their actions are (1) to produce environmental products with advanced technology, (2) to optimize operational lines that would improve energy efficiency, and (3) to share about

environmental vision within organizations. ISESC is also important in ENV. Managers should consider to invest more resources in IS so that the new services could include the improvement of collaboration within and between organizations (e.g., suppliers and customers) so that a common goal of ENV can be realized (Melville, 2010).

6.2.4 Integrated Relationships between (ISEIL and ISESC) and (SOC, ECO, and ENV)

In this section, we discuss the result findings of integrated model that examines the relationships between (ISEIL and ISESC) and (SOC, ECO, and ENV). Table 5.27 and Figure 5.7 reveal our findings. In the following, we discuss these results in three separate parts. They are: 1) effects of ISEIL on SOC, ECO, and ENV; 2) effects of ISESC on SOC, ECO, and ENV; and 3) relationships between SOC, ECO, and ECO.

1) Effects of ISEIL on each of SOC, ECO, and ENV. Table 5.27 reveals that ISEIL has a direct effect on (a) SOC (direct effect = 0.27), (b) ECO (direct effect = 0.13), and (c) ENV (direct effect = 0.16). In comparison, ISEIL has a higher influence on SOC, followed by ENV and ECO. In Figure 5.7, our results also reveal that ISEIL has also played not only the direct but also the indirect influence to (a) ENV through the mean from the effect of SOC (indirect effect = 0.15), and (b) ECO through the mean from each of the effects of SOC (indirect effect = 0.04) and ENV (indirect effect = 0.17). All these indirect effects are mainly initiated from the SOC. This result shows

that Chinese enterprises are paying a higher and direct attention on how ISEIL could help their stakeholders (i.e., SOC) to realize the mission of corporate sustainability (i.e., SOC) in prior to apply the ISEIL to achieve their sustainable goals from ENV and ECO. One example is that ISEIL could help companies to restructure and redesign their operational processes that could contribute to the improvement of environmental pollution. The reduction of environmental pollution has now been considered as an important agenda by their stakeholders and that this agenda could in turns optimal structure of ECO (Esty, 2004). This strategic approach of human comes first has becomes fashionable from the SOC literature. The reason is being that it is people who make the success of corporate sustainability. The end result would readily achieve corporate sustainability. It is therefore not a surprise to see that the total effect of ISEIL has the higher influence on ECO (total effect = 0.34), followed by ENV (total effect = 0.31), and the SOC (total effect = 0.27). Toward the end, ISEIL contributes more on the ECO for companies that exercising sustainability.

The above results also manifest how ISEIL affects corporate sustainability. The processes are: (1) ISEIL has a direct effect on SOC, ECO, and ENV; (2) ISEIL has indirect effect on ENV through SOC, and (3) ISEIL has an indirect effect on ECO through both SOC and ENV. One observation which could achieve these results is through the development of environmental and recycling plans that could involve the awareness of stakeholders' demand to these products that involving the adoption of R&D processes. ISEIL could help to design simulation tools that would (1) reduce waste and costs, and (2) generate products or values that are beneficial for ENV and SOC. These results have shown the significant values of ISEIL in corporate sustainability in China. Companies should make fully use of IS by which it could strengthen the outcome of collective learning, communication channels that enrich social ties to better share a vision, and improve innovative capability (Waage et al., 2003).

2) Effects of ISESC on SOC, ECO, and ENV. Figure 5.7 reveals that ISESC has the direct effect on SOC only (β = 0.49). In Table 5.27, it reveals that this direct effect of SOC to ISESC has a role in other two remaining dimensions, that is ISESC has an indirectly influence to (a) ENV (indirect effect = 0.27), and (b) ECO (indirect effect = 0.15). This result highlights the mediating role of SOC for companies practicing corporate sustainability through the use of ISEC. This result manifests that SOC – on aspect of social equity and justice – has played a fundamental role in corporate sustainability for Chinese companies. Even though the indirect effects of ISESC on SOC, ENV and ECO are having quite a similar fashion to that of ISEIL, their total effects on SOC, ENV, and ECO is not the same. The total effects of ISESC on SOC, ENV, and ECO are reported to have a total value of 0.49, 0.27, and 0.15, respectively. ISEIL has played the highest influence on SOC, followed by ENV and ECO. This result has revealed a similar conclusive remark for ISEIC. It manifests that companies should realize the collaboration feature should be integrated with other business applications together because the end result could affect the outcome of SOC, ECO, and ENV differently. These results reveal the facts that: (1) ISESC directly affects SOC, and (2) ISESC

only affects ECO and ENV indirectly. Companies should invest more resources on IS and pay more attention to the integration of IS with other systems together so that the end product could achieve SOC practices for the companies. Companies should also pay attention to the impacts of ISESC on ECO and ENV when integrating IS with other systems together. This integration may require to refine, redesign and restructure the mechanism of value creation economically and environmentally so that the companies could achieve the “win-win” goals towards the adoption of corporate sustainability (Chen et al., 2008).

The above results also indicate how ISESC affects corporate sustainability. The processes are: (1) ISESC firstly affects SOC; and (2) the impact of ISESC is then passed to ECO and ENV through the effect of SOC. Companies may witness to a fact that it takes a longer time to realize the effect of having ISESC on ECO and ENV than to the SOC. Such an example is that the installation of sensors with a computerized control system could provide a better control and monitor the consumption of energy and material usage. This indirectly outcome helps organizations to improve their ENV by not only trimming operations costs but also advance them in competitive edge (Melville, 2010). These results also manifest that ISESC is critical component for corporate sustainability in China. Companies should implement their IS efficiently with the integration of all operational systems together.

3) Relationships between SOC, ECO, and ECO. In Figure 5.7, it shows that SOC has a direct effect on ENV (direct effect = 0.56) and ECO (direct effect = 0.14). As reveals in Table 5.27, SOC has also played a role to have an indirect effect on ECO (indirect effect = 0.30). The total effects of SOC on ENV and ECO are 0.56 and 0.44, respectively. These results represent that SOC is the most fundamental and critical component for Chinese companies whose trying to attain their practices of the sustainable development in the information age. Our findings here are quite aligned to the report of Birkin et al.'s (2009) that the success of implementing corporate sustainability is dependent on how people interface with their ISs in Chinese companies. These results also echo to the remark made by Starik and Rands (1995) that what humans (or stakeholders) want and do would dominate on how organizations would be success in corporate sustainability.

In Figure 5.7, it also reveals that that ENV has a direct effect on ECO (direct effect = 0.54). This result implies that the outcome of ECO is directly dictated on how a company practicing their ENV in China. It is suggested that Chinese organizations should adopt a proactive approach to address their environmental issues in which it could provide an alternative way to sustain their economic growth (Chan, 2005; Hart, 1995). Chinese companies should also continue to transform their conventional economic structure to a newly business footprint that would include the adoption of environmental management systems and/or the eco-labeling (Zhang and Wen, 2008). It is hoped that the future adjustment of ECO structure in China could provide a long-life living condition of environment that has a lesser pollution.

To conclude, this thesis shows that both ISEIL and ISESC have effects on SOC, ECO, and ENV. ISESC has a higher influence on SOC than ISEIL, but not on the ENV and ECO. These results manifest that companies should implement IS from comprehensive aspects of applications that are not only including innovation, learning and share vision, but also on the collaboration with other application systems together. The reason is being that ISEC has provided different imperative features for implementing of corporate sustainability in Chinese companies.

CHAPTER 7 CONCLUSION

This chapter draws a conclusion on the overall findings, contributions, limitations, and future research directions of this thesis. The chapter comprises of the following four sections:

a) Overview of Findings;

b) Contributions of this Thesis; and

c) Limitations and Future Research Directions.

7.1 Overview of Findings

This thesis proposes an integrated model to examine the effects of IS-enabled capabilities (ISEC) on corporate sustainability. Based on the RBV, our ISEC is referred to the extent of IS could enable organizational capabilities. In particular, this thesis precedes our study by firstly proposing, developing, and validating the measurement items for ISEC and the three dimensions of corporate sustainability, namely, SOC, ECO, and ENV. This thesis then validates these measurement items by collecting a survey data from Chinese managers in China. In our finding, the construct of ISEC can be decomposed into two newly constructs: IS-enabled innovative learning (ISEIL) and IS-enabled system competitiveness (ISESC). Each of these two constructs has three measurement items. Our data analysis has also confirmed that corporate sustainability is also represented by three different dimensions: SOC, ECO, and ENV. Each of these three dimensions has five measurement items. Therefore, this thesis provides a useful tool for researchers and practitioners to gain a better understanding how to measure and develop their corporate sustainability, ISEIL and ISESC.

Through the analysis of the relationships between ISEC (i.e. ISEIL and ISESC) and the three dimensions of corporate sustainability (i.e., SOC, ECO, and ENV), this thesis reveals that both ISEIL and ISESC have direct effects on each of the three dimensions of corporate sustainability (i.e. SOC, ECO, and ENV). This result verifies our first research objective that ISEC has played an important role to the success of corporate sustainability practices. In the second part of our research, our integrated model reveals the findings how ISEC could effect on SOC, ECO, and ENV together. Our findings demonstrate quantitatively that ISEIL has direct effects on SOC, ECO, and ENV, but ISESC has only direct effect on SOC and ENV and an indirect effect on ECO.

Further, this thesis has also compared the total effect of ISEIL and ISESC on SOC, ENV, and ECO. It reveals that ISEIL has a lesser impact on SOC, and a higher impact on both ENV and ECO. This observation reveals that both ISEIL and ISESC have played a different role in corporate sustainability in Chinese companies. Lastly, this thesis also verifies the relationships between the three dimensions of corporate sustainability when ISEC is used as an influence factor. Our results show that SOC has a direct effect on both ENV and ECO, and that ENV has a direct effect on ECO.

7.2 Contributions of this Thesis

This thesis has made two major research contributions:

a) Verification of measurement items for ISEC and corporate sustainability; and
b) Empirical evidence regarding ISEC and corporate sustainability.

7.2.1 Verification of Measurement Items of ISEC and Corporate Sustainability

This thesis is perhaps the first of its kind to verify measurement items for SEC and corporate sustainability empirically. First, this thesis proposes and confirms that corporate sustainability can be measured by three dimensions: SOC, EOC, and ENV. After data analysis on these proposed measurement items for SOC, ECO, and ENV, each dimension have 5 measurement items, and the final version of these measurement items can be rendered as a measurement tool for future corporate sustainability research. Second, this thesis contributes to the verification of measurement items for ISEC. Our findings show that ISEC can be further decomposed and represented by two newly constructs: ISEIL and ISESC. Each of these two constructs has 3 measurement items. Therefore, these measurement items can also be rendered as a measurement tool for future ISEC research.

7.2.2 Empirical Evidence Regarding ISEC and Corporate Sustainability

This thesis is perhaps the first of its kind to provide empirical evidence on the study of the influence of ISEC on corporate sustainability practices in China. This thesis empirically confirms the direct relationships between (ISEIL and ISESC) and each of the three dimensions (SOC, ECO, and ENV). This thesis can be treated as a supplement literature which provides empirical evidence for the theoretical arguments in past literature on the relationship between IS and corporate sustainability. On the other hand, this thesis also proposes and empirically confirms the relationship between (ISEIL and ISESC) and (SOC, ECO and ENV) together. Our results show that ISEIL has a direct effect on SOC, ENV, and ECO; and ISESC has a direct effect on SOC and ENV, and an indirect effect on ECO. This thesis proposes and empirical confirms the relationships between SOC, ECO, and ENV. By not treating the relationships between SOC, ECO, and ENV equally, this thesis concludes that: SOC has impacts on ENV and SOC, and ENV has an impact on SOC. To conclude, this thesis offers important insights to researchers and practitioners about the value of IS and how a firm should arrange to implement IS to leverage the success of corporate sustainability practices.

7.3 Limitations and Future Research Directions

This thesis has inherent the following limitations, which can be used to expand as future research.

a) Conceptual Views of Corporate Sustainability Practices;

b) Conceptual Views of ISEC Construct;

c) Data Sampling Source;

d) Culture Differences; and

e) Exogenous Variables.

7.3.1 Conceptual Views of Corporate Sustainability Practices

This thesis hypothesizes that corporate sustainability is only represented by SOC, ECO, and ENV. Literature suggests many other dimensions of corporate sustainability, such as technology (Hill and Bowen, 1997) and institution (Labuschagne et al., 2005), may also play critical roles in corporate sustainability practices. Thus, it is suggested that future researches should also be considered these factors together.

7.3.2 Conceptual Views of ISEC Construct

This thesis develops the factor of ISEC by considering how IS could serve as an enabler for organizational capabilities. Other literature also suggests that ISEC could also be based on the functional capabilities. It is suggested that future studies of ISEC should consider IS capabilities that include measures of IS functions, IS infrastructure, IS management, and so on.

7.3.3 Data Sampling Source

It is recognized that the significance value of the chi-square index is subject to, and sensitive to, sample size (Hair et al., 2010). Practitioners should be aware that a good-fitting model could be rejected merely because of small differences between the observed and predicted covariance matrixes in a large sample. In contrast, ill-fitting models may be accepted as having adequate fit if the sample is small (Bentler and Bonett, 1980). Future work should test our instrument by using different sample sizes so that the generalizability of the findings can be observed.

This thesis collects data from Chinese managers attending part-time MBA programs. Our results may subject to the limitation of the generation. A variance in profiles of responding companies in this research to some degree helps to reduce the potential bias from this limitation. Considering the available resource and effort, it seems that the present approach is a most efficient and economical way to collect the data. Ideally, future research can attempt to avoid this methodological pitfall by collecting data from a random sample of companies in various contexts. Furthermore, this study framework tests primarily with a single informant. This approach may render a common method bias for simultaneous measurements between independent and dependent variables. It is suggested that a dataset with multiple informants from each organization could enhance the validity of the findings.

7.3.4 Culture Differences

This thesis tests measurements and constructs by using data from in China. But given the perceptual nature of the data used to describe the theoretical construct, it is imperative to recognize that the problems may associate with cross-cultural and/or cross-regional issues (Bhalla and Lin, 1987; Chow et al., 2008). Further research should be connected to the contexts of China and western countries together so that we could understand the effect of cultural differences better in corporate sustainability.

7.3.5 Exogenous Variables

This thesis limits our study by only considering the roles of endogenous variables in corporate sustainability (i.e., ISEC). Recently, RBV literature has called upon the study that the exogenous variables be treated as moderating effects (e.g., Aragon-Correa and Sharma, 2003; Chan, 2005). For example, Aragon-Correa and Sharma (2003) posit that environmental factors including complexity, uncertainty and munificence could be treated as moderators to impact on the relationship between organizational capabilities and environmental management. Chan (2005) analyzes that firm size and operational mode could moderate relationship between organizational capabilities and ENV. Future studies could also include exogenous variables by applying theories such as stakeholder theory (e.g., government pressure), contingent theory (e.g., environmental factors), and so on, to influence corporate sustainability.

APPENDIX A

Questionnaire

This research project is to study the effects of IS-enabled capability on corporate sustainability in China. Your participation is the vital key success to this project, and I sincerely hope that you could spend a few minutes of your valuable time to complete the following questions. All responses are strictly confidential and no information which could reveal your firm's or your own identity will be used in any data reporting nor will it be shared in its individual form with any outside party without your expressed permission to do so.

Thank you for taking the time to participate in the study.

Section 1:

Please indicate the extent to which your firm's IS-enabled capability has the following characteristics.

Under use of IS, The capabilities in our firm enabled by IS:	much smaller			Neutral			Much larger
1. Take a long period of time to build up.	1	2	3	4	5	6	7
2. Can facilitate or trigger innovation within the firm.	1	2	3	4	5	6	7
3. Can facilitate collective learning within the company.	1	2	3	4	5	6	7
4. Can help develop a shared or long-range vision within the firm.	1	2	3	4	5	6	7
5. Can help establish trust-based collaborative relationships among a wide variety of stakeholders for solving problems.	1	2	3	4	5	6	7
6. Cannot be taken away these capabilities with employees when leaving the firm.	1	2	3	4	5	6	7
7. Cannot be easily be identified or imitated by competitors.	1	2	3	4	5	6	7
8. Cannot be built up faster by competitors through a greater application of resources.	1	2	3	4	5	6	7
9. Provide benefits to several functional areas/departments of the firm.	1	2	3	4	5	6	7
10. Provide benefits to different levels within the firm.	1	2	3	4	5	6	7
11. Combine with other assets to generate benefits for the firm, (e.g. improved reputation combines with an established retail network).	1	2	3	4	5	6	7

Section 2:

Please indicate the extent to which your firm has adopted the following actions.

Our firm:	much smaller		Neutral			Much larger	
12. Improved employee or community health and safety.	1	2	3	4	5	6	7
13. Recognized and acted on the need to fund local community initiatives.	1	2	3	4	5	6	7
14. Protected claims and rights of aboriginal peoples or local community.	1	2	3	4	5	6	7
15. Showed concern for the visual aspects of the firm's facilities and operations.	1	2	3	4	5	6	7
16. Communicated the firm's environmental impacts and risks to the general public.	1	2	3	4	5	6	7
17. Considered interests of stakeholders in investment decisions by creating a formal dialogue.	1	2	3	4	5	6	7
18. Sold waste product for revenue.	1	2	3	4	5	6	7
19. Reduced costs of inputs for same level of outputs.	1	2	3	4	5	6	7
20. Reduced costs for waste management for same level of outputs.	1	2	3	4	5	6	7
21. Worked with government officials to protect the company's interest.	1	2	3	4	5	6	7
22. Created spin-off technologies that could be profitably applied to other areas of the business.	1	2	3	4	5	6	7
23. Differentiated the process/product based on the marketing efforts of the process/product's environmental performance.	1	2	3	4	5	6	7
24. Reduced energy consumption.	1	2	3	4	5	6	7
25. Reduced wastes and emissions from operations.	1	2	3	4	5	6	7

26. Reduced impact on animal species and natural habitats.	1	2	3	4	5	6	7
27. Reduced the environmental impacts of its products/service.	1	2	3	4	5	6	7
28. Reduced environmental impact by establishing partnerships.	1	2	3	4	5	6	7
29. Reduced the risk of environmental accidents, spills, and releases.	1	2	3	4	5	6	7
30. Reduced purchases of non-renewable materials, chemicals, and components.	1	2	3	4	5	6	7
31. Reduced the use of traditional fuels by the substitution of some less polluted energy sources.	1	2	3	4	5	6	7
32. Undertook voluntary actions (e.g. actions that are not required by regulations) for environmental restorations.	1	2	3	4	5	6	7
33. Undertook actions for environmental audit, public disclosure, employee training and immunity.	1	2	3	4	5	6	7

Section 3:

Please answer the following questions by putting "√" into the appropriate boxes

Type of Industry	☐ Academic/Education	☐ Banking/Finance/Insurance
	☐ Computers/ Telecommunications/Networking	☐ Electrics/Electronics
		☐ Engineering/Architecture
	☐ Manufacturing	☐ Mass Media/Publishing
	☐ Medicine/Health	☐ Real Estate
	☐ Restaurant/Hotel	☐ Retailing/Wholesaling
	☐ Textile/Garment	☐ Transport/ Logistics
	☐ Utilities	☐ Others (Please specify): ____________

Average Annual Sales/ Income *(RMB in million)*	☐ < 10 ☐ 10-49.9 ☐ 50-99.9 ☐ 100-499.9 ☐ 500-999.9 ☐ ≥ 1000	**Operational Period *(in years)***	☐ < 1 ☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ > 20
Ownership Structure	☐ Stately owned ☐ Privately owned ☐ Foreign owned	**No. of Employees**	☐ ≤ 10 ☐ 11-50 ☐ 51-100 ☐ > 100

~END~ Thank you very much!

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