Corporate sustainability development in China: review and analysis

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Abstract

Purpose – The purpose of this paper is to threefold. The first purpose is to review and critically analyze corporate sustainability development (CSD) research in China. Second, the paper extracts a unified theoretical framework among CSD drivers, CSD practices, and corporate performance in China. Finally, it seeks to identify links between CSD and industrial management and data systems (IMDS) topics.

Design/methodology/approach – A comprehensive and structured review of the research literature investigating CSD in China was completed. Categorizations and classifications of the literature were summarized. A critical analysis of the literature resulted in a generic theoretical framework that can be used for evaluation of the literature and further investigation.

Findings – The literature review found over 189 papers on CSD in China published from 1997 to 2013. The framework developed focussed on relationships among drivers, practices, and performance within a CSD in China context. The framework provides useful insights into the implementation of CSD practices. The integration of the three dimensions of sustainability and decision-making methodology are still rare. Specific features of CSD are also reviewed with a linkage to IMDS research around information technology, business process modeling, and supply chain management.

Originality/value – This is one of the first works to provide a comprehensive focus on CSD in China. The theoretical framework was developed for CSD in China to clarify the relationships between the drivers, the corporation's characteristics, CSD practices, and corporation performance and will prove useful for future research development and investigation. The linkage to IMDS topics is novel and will help further research related to CSD in China for this journal.

Keywords China, Social responsibility, Corporate sustainability, Environmental, Theoretical framework

Paper type Literature review

1. Introduction

Over the past 30 years China has gone through extraordinarily rapid economic growth to become the second largest economy in the world. It has become the world's global manufacturing center since its economic reform and openness to the outside world in

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1978. China's increased economic growth has been accompanied by high environmental and social costs. The litany includes environmental pollution, resource scarcities, smog, and social responsibility concerns. These negative environmental and social impacts have been recognized as major challenges for China's future and have attracted global attention (Zhu *et al.*, 2013b; Tsoi, 2010; Geng and Doberstein, 2008).

In response to these concerns, China has sought out regulatory policies to implement such as the innovative circular economy (CE) and low-carbon economy policies. The focus has occurred at multiple levels including eco-regions at the macro-level, eco-industrial parks (EIPs) at the meso-level, and eco-enterprises at the micro-level (Geng *et al.*, 2013; Liu *et al.*, 2013; Zhu *et al.*, 2007a; Yuan *et al.*, 2006).

Due largely to pressures from governments, non-governmental organizations (NGOs), customers, competitors, and various other shareholders, many corporations have adopted sustainability practices (Lu and Abeysekera, 2014; Zhang *et al.*, 2008; Zhu *et al.*, 2005). The topic of corporate sustainability development (CSD) in China's corporations has been of great interest for the last decade both in academia and practice. At present, some understandings through research investigation have been achieved, such as what motivates corporations to implement environmental protection activities and how to integrate the natural environment into business strategy and activities. But there is still a long journey for China before improvements in environmental and social performance can be fully realized. These realizations need to occur while still improving economic development within China and corporations doing business there.

A need for more research on developing an appropriate framework for understanding and managing corporate sustainability or CSD in China still exists. It is our goal in this paper to survey the literature and extract a theoretical framework for corporate sustainable development driver, practices, and performance. This review also seek to link this framework and literature to industrial management and data systems (IMDS) research concerns such as management information systems, business process management, and supply chain management, which can prove to be powerful enabling mechanisms for CSD adoption in China.

Meanwhile, literature reviews in related fields are available: first, the history and concept of sustainability (Mebratu, 1998; Lele, 1991); second, sustainable supply chain management (Seuring, 2013; Gold *et al.*, 2010; Seuring and Müller, 2008); third, sustainability in a specific industry (Jenck *et al.*, 2004); and fourth, clean development mechanism's contribution to sustainability (Olsen, 2007). From the Chinese perspective, a general policies review of environmental protection and sustainability in China has been published (Zhang and Wen, 2008). Three additional reviews focus on corporate social responsibility (CSR) literature or reporting in China (Guan and Noronha, 2013; Noronha *et al.*, 2013; Moon and Shen, 2010). Yet, this literature has rarely focussed on CSD issues in China.

Given the increasing significance of promoting corporate responsibility in China (Kolk *et al.*, 2010) and the ambiguity of inter-relationships among CSD drivers, CSD practices, and corporate performance in China, this paper attempts to fill this gap of a lack of literature and framework for understanding. Overall, the purpose of this study is to: first, review sustainable development research for corporations in China and critically analyze this literature from different perspectives; second, extract a unified theoretical framework for CSD in the Chinese context; third, link these topics to IMDS; and fourth, provide insights into future research directions that need further exploration.

The paper is structured as follows. In Section 2, background information on China and sustainability is initially presented. The research methodology and a descriptive

analysis of publications, including years of publication and major journals, are presented in Section 3. Next, publication classification analyses, including research methods, industry sector, dimensions of CSD, are presented in Section 4. Further, a theoretical framework of corporate sustainable development for the research field will be offered and discussed in Section 5. Section 6 ties some of the major issues to IMDS topics. In the last section of this paper the research findings and conclusions, limitations and future research directions are summarized.

2. Background

Sustainable development and sustainability attracted attention after it was used by the Brundtland Commission in its report "Our Common Future," and was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Sustainable Development, 1987). It seeks to pursue current development while preserving the environment and natural resources for long-term growth (Kuhn and Deetz, 2008). More recently, it has been extended to incorporate economic, environmental, and social sustainability which includes equitable development (Bai and Sarkis, 2014; Fergus and Rowney, 2005).

CSD can be an effective business strategy that attempts to meet the needs of organizational stakeholders without compromising the resources and interests of the local community (Dyllick and Hockerts, 2002). CSD has multiple dimensions with the most popular being environmental, economic, and social (Chow and Chen, 2012; Hubbard, 2009). These three dimensions have been termed the triple bottom line (TBL) principle (Elkington, 1998).

The CSD literature in China has embraced the TBL framework (Chow and Chen, 2012). However, most papers of CSD research focus on the environmental impact dimension or social dimension, and lack consideration of the integration of the three dimensions of economic growth, environmental sustainability, and social equity. Whether this is true for overall Chinese research studies in corporate sustainability will be part of the investigation in this paper.

To help complete some initial background of CSD in China, this review provide an overview of the Chinese focus on some of the sustainability dimensions. Since the government in China plays a large role in every aspect of community and economic life, the following will initially provide the governmental context for CSD.

2.1 China and sustainability: setting the regulatory and public context

In order to promote coordinated development between the environment, society, and the economy, China has implemented a series of sustainability- (especially environmental sustainability) oriented policies since the 1980s. As the largest developing country, China's policies for fostering sustainability has been evolutionary and become more sophisticated in terms of making an integrated policy to realize long-term development and growth (Zhang and Wen, 2008). It will be of importance not only for China, but also for the world. China's policies on environmental development have experienced three time periods which are summarized in the next three sections. A timeline diagram with sustainability-oriented important events in China is shown in Figure 1.

2.1.1 "End-of-pipe control" stage (1973-1992). In 1973, China held its first national conference on environmental protection in Beijing (Zhang and Wen, 2008). In 1983, the

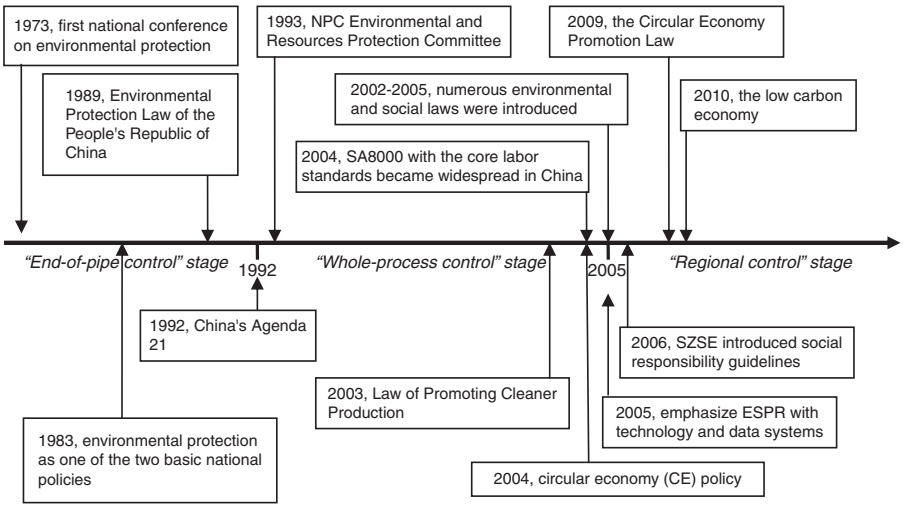

Figure 1.
Timeline of corporate environmental sustainability-oriented policies in China

State Council of China regarded environmental protection as one of the two basic national policies in China (Beyer, 2006). The regulation for environmental protection named "the 1989 Environmental Protection Law of the People's Republic of China" provided the legal basis for achieving environmental sustainability. After China's participation in the United Nation's Conference on Environment and Development in 1992, the Chinese government put forward Ten Strategic Policies on Environment and Development which were to enhance the intersection of its environment and development (National Environmental Protection Agency, 1994a). In August, 1992, the Chinese government published China's Agenda 21 (White Paper on China's Population, Environment, and Development in the twenty-first century) as the action blueprint to achieve sustainable development (National Environmental Protection Agency, 1994b). At this stage, environmental management focussed on end-of-pipe processes, technology, and data management controlling for air, water, and solid waste pollution from major industries.

In March 1993, the National People's Congress (NPC) Environmental and Resources Protection Committee was established and "China Environmental and Resources Protection legal framework" was proposed. From this point onward China's environmental resources legislation entered a new stage.

2.1.2 "Whole-process control" stage (1993-2005). Since 1993, regulators in China have attempted to encourage the "Shift from end-of-pipe treatment to whole-process control strategy of environmental prevention." In this stage the cleaner production strategy was adopted and applied throughout China. China then determined sustainability as one of the two basic national strategies together with the strategy of "rejuvenating the country through science and technology" (State Development Planning Commission (SDPC) *et al.*, 1996). In 1997 the National Environmental Protection Agency released "the opinions on the implementation of cleaner production." The Law of Promoting Cleaner Production was issued and put into effect in 2003. This indicated that China was paying more attention onto environmental prevention rather than the end-of-pipe treatment and control of the waste from major industries.

From 2002 to 2005, numerous environmental and social laws were introduced. These laws included: the Law on the Safety Production, the Law on Desert Prevention and Transformation, the Law on Environmental Impact Assessment, the Law on Radioactive Pollution Prevention and Control in 2003, the Law on Administrative Permission in 2004, and Law on the Promotion of Renewable Energy in 2005.

2.1.3 "Regional control" stage (2005-the present). Since 2006, the Chinese government has developed region-oriented regulations and policies. One key strategy was to establish various forms of EIPs (Shi *et al.*, 2010). Responding to the increasingly severe shortage of natural resources, China has expanded its EIPs initiatives to a CE policy since 2004 (Geng *et al.*, 2010). This policy focusses on balancing economic development and environmental protection and the shift from "fast and well" development to "well and fast" development.

In 2005, China ecological policy strategies have shifted to emphasize energy savings and pollution reduction with technology and data systems as one of the core aspects of managing in this environment (Wang and Chen, 2010). Much of this regulatory policy is based on ecological modernization theory (Park *et al.*, 2010; Sarkis and Zhu, 2008; Zhu *et al.*, 2012). Ecological modernization theory posits that simultaneous improvements in both economic and environmental dimensions can be completed with the help of modernization techniques including technology, processes, and systems.

These flexible and largely voluntary regulatory policies include providing subsidies to leading companies with an aim to motivate them for implementing innovative environmental management practices. On August 2008, the Circular Economy Promotion Law was approved and has been put into enforcement since January 1, 2009 (Geng *et al.*, 2009). In 2009, the State Council announced goals of setting up a country-wide target to reduce the intensity of carbon dioxide emissions, a major greenhouse gas, per unit of GDP in 2020 by 40-45 percent relative to the emission levels in 2005. Subsequently, the development of a low-carbon economy was put forward in the third session of the China's NPC in March 2010 (Jiang *et al.*, 2010). Part of these efforts will include various mechanisms such as carbon trading requiring industrial and data systems in place.

2.1.4 Social responsibility in China. CSR in China may have a different meaning than in other countries (Sarkis *et al.*, 2011). Currently, China has not specified CSR regulations. Many of these types of regulations are scattered in labor law, consumer protection law, environmental law, women's rights protection law, and corporate laws (Li, 2012; Tang and Li, 2009). Although most definitions of CSR are that these practices are meant to go beyond regulatory compliance.

Since 2004, CSR standards SA8000 with the core labor standards became widespread in China (Miao *et al.*, 2012). These systems are similar to ISO standards. In 2006, amendments of Company Law of the People's Republic of China first proposed CSR terminology or concepts in the Article 5 of the General. In that same year, the Chinese Communist Party Sixth Plenary Session proposed building a harmonious society with a focus on improving the social responsibility of businesses and organizations.

In response to the Chinese government's efforts in this arena, both the Shenzhen Stock Exchange and the Shanghai Stock Exchange introduced social responsibility guidelines for listed firms in 2006 and 2008, respectively. These guidelines encouraged listed companies to publicly disclose social and environmental information in their CSR reports along with their annual report (Gao, 2011; Lin, 2010). The use of CSR reports requires the appropriate data systems, which many organizations in China still require.

In 2008, the State-Owned Assets Supervision and Administration Commission (SASAC) of the State Council released the "Guiding Advice on Fulfilling Social Responsibility by Central Enterprises" document urging enterprises to enhance awareness of social responsibility, and actively fulfill their social responsibilities. This guideline stressed the exemplary role that central corporations should play in carrying out social responsibility, and included principles and implementation measures of CSR development (SASAC, 2008; Belyaeva and Kazakov, 2014; Guan and Noronha, 2013; Gao, 2011).

Despite these governmental policies, many environmental and social challenges still exist in China. China is still criticized as the worst polluter in the world (Wang *et al.*, 2008; Economy, 2007). Dangerous working conditions and occupational diseases and injuries in Chinese mining and labor-intensive manufacturing industries have often been reported in both domestic and foreign media (UNESCAP, 2010; World Bank, 2004). A critical way to turn the deteriorating trend in China is to motivate or require Chinese corporations to incorporate CSD. Evidence on some of these practices are now presented and discussed.

3. Research methodology and descriptive statistics

This paper builds on a method of literature review adopted by previous review papers in the field of sustainable supply chain management (e.g. Seuring and Müller, 2008). The structured review methodology is introduced so that replication of the results may be more effectively completed. The methodology contains five stages, collection and filtering, descriptive analysis, classifications analysis, material evaluation, and discussion. Each of these stages can be defined as:

(1) collection and filtering: material collection (major databases and keywords), delimitation of the research (excluding non-related papers), and rationality of the research is described in detail;

(2) descriptive analysis: basic contents of the material are analyzed from three aspects: sustainability in China, the concept of corporate sustainable development, analysis of related journals and the number of publications per year;

(3) classifications analysis: the materials are classified into six perspectives, e.g. research methods, industry sector, ownership status, corporation size, country location, dimensions of CSD;

(4) material evaluation: the material is systematically analyzed according to the major topics and a theoretical framework for the research field will be developed and discussed; and

(5) discussion: the research findings and conclusions, limitations and future research directions will be discussed and identified.

3.1 Material collection and delimitation

Published papers in CSD for China were collected by searching major databases and publishers with a structured keyword in English language journals[1]. The structured keywords, which were used to search title and keyword, combine "China" or "Chinese" with sustainability related ones, including "sustainable/sustainability," "SD (sustainable development)," "ecology/ecological," "environment(al)," "green," "social," and "CSR

(corporate social responsibility)." Major databases and publishers included Elsevier (www.sciencedirect.com), Emerald (www.emeraldinsight.com), Springer (www.springerlink.com), Taylor & Francis (www.taylorandfrancis.com), and Wiley (www.wiley.com).

Numerous articles were not directly link to CSD. Four types of articles were excluded from further analysis through a quick content check: unrelated to businesses or corporations; consumer behaviors for sustainability, such as sustainable consumption or consumer responses to CSD; regional sustainable development; and sustainable energy.

3.2 Validation

To increase findings' validity, all steps of the basic contents analysis were conducted by two researchers. Any differing judgments were resolved after further discussion. Second, citations within the collected papers were used as a secondary source, and several additional papers were found and incorporated into the study database. Through this process, missing keywords from the first step were found. For instance, the paper "Extended producer responsibility and eco-design changes: perspectives from China" (Yu *et al.*, 2008) did not appear in the first process round. This caused the research team to include the missing keywords "eco-" with "China" or "Chinese" once again going through the search engines of the major publisher databases.

In order to restrict the number of sources, other keywords (e.g. "industrial symbiosis (IS)," "cleaner production," and some other specific CSD practices) were not considered. Second, the most cited papers which did not appear in the above database and publishers were also collected and evaluated. Only two papers (Christmann and Taylor, 2001; Zhu and Geng, 2001) fit this description and were added to the final study database.

Initially, 2,029 unique (after removal of papers that appeared more than once) were found. These were narrowed down to 187 articles from the content check (Section 3.1) and additional discussion by the research team. Finally, two additional papers were added, leaving a total of 189 papers to be used in this study.

3.3 Statistical descriptive analysis

The total sample of works for this study contains 189 papers (research papers published up to the end of 2013). Figure 2 shows the number of reviewed papers by

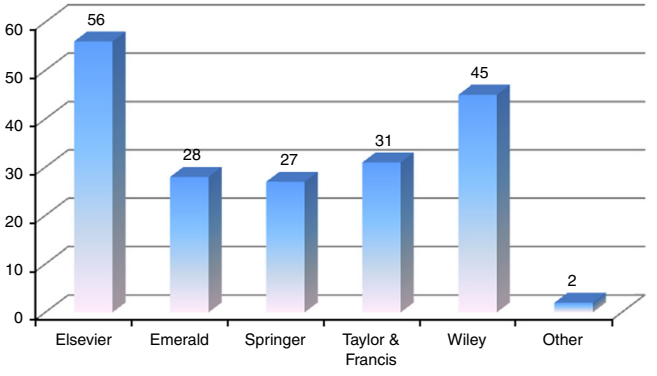

Figure 2.
Distribution of reviewed literature papers by publisher

publisher. "Elsevier" published the largest amount and is about twice that of "Emerald" and "Springer" databases. The reviewed papers show an upward trend for the period (1997-2013), as shown in Figure 3. The highest numbers occur most recently during the period between 2009 and 2013, which shows a geometric growth on China's corporate sustainability research. Much of this recent growth is consistent with other Chinese business research (Peng, 2012; Wang, 2011). This growth can be due to an opening of China's universities to foreign scholars, collaborative research between Chinese and international scholars (Adams *et al.*, 2009), and greater encouragement to publish in higher quality journal publications within China (Tang *et al.*, 2014).

Table I shows the distribution of reviewed literature papers by journal. The *Journal of Cleaner Production* is the leading journal with 19 papers (approximately 10 percent). The top five journals, including the *Journal of Cleaner Production*, the *Journal of Business Ethics*, *Corporate Social Responsibility and Environmental Management*, *Business Strategy and the Environment*, and *Journal of Environmental Management*, represent 34.4 percent of all found publications. The rest of the papers are distributed across a range of other journals as shown in the Table I. A total of 103 journals published at least one article on CSD in China. This dispersion of journals indicates that Chinese CSD has attracted widespread attention in a variety of outlets with multiple perspectives, whether it is basic science, environmental science and policy, business, and economics research.

4. Classifications analysis

A further classification analysis of the papers, based on paper content, is now completed. Research methods, cross-country comparisons, industry sector, organization size, and ownership type are the classifications that will be evaluated in this section.

4.1 Classification by research methods

Research method characterizations included five categories: theoretical and conceptual; case study; survey; analytical methodologies; and literature reviews. Figure 4 shows the assignments of the papers according to the research methods.

Empirical surveys have been the most popular approach. This result is similar to the trends in sustainable supply chains research where empirical research has been well established (Seuring and Müller, 2008). This result is likely due to the relative

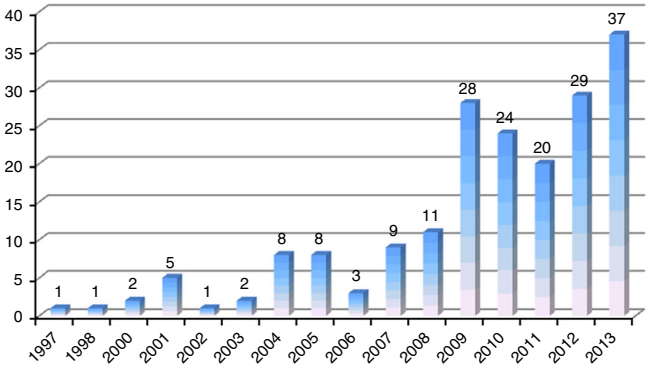

Figure 3.
Distribution of reviewed literature papers by year

No.	Journal
19	*Journal of Cleaner Production*
15	*Journal of Business Ethics*
13	*Corporate Social Responsibility and Environmental Management*
11	*Business Strategy and the Environment*
7	*Journal of Environmental Management*
3	*Chinese Management Studies*; *Journal of Industrial Ecology*; *Journal of Technology Management in China*; *Management Research Review*; *Public Relations Review*; *Social Responsibility Journal*
2	*Asia Pacific Business Review*; *Asian Economic Journal*; *Chinese Journal of Population Resources and Environment*; *Corporate Governance*; *Food Control*; *Innovation and Development*; *International Journal of Sustainable Development & World Ecology*; *Journal of Chinese Economic and Business Studies*; *Mathematical and Computer Modelling*; *Omega*; *Strategic Management Journal*; *Sustainable Development*; *Technological Forecasting and Social Change*; *Transportation Research Part E: Logistics and Transportation Review*
1	*Annals of Operations Research*; *Applied Economics, Business and Development*; *Architectural Science Review*; *Asia Pacific Journal of Management*; *Asia Pacific Journal of Marketing and Logistics*; *Asia Pacific Journal of Tourism Research*; *Asia-Pacific Journal of Accounting & Economics*; *Benchmarking: An International Journal*; *Biomedical and Environmental Sciences*; *Building Research & Information*; *Business and Society Review*; *Business, Economics, Financial Sciences*; *Business Ethics: A European Review*; *Business, Economics, Financial Sciences*; *China & World Economy*; *China Economic Review*; *China Journal of Social Work*; *Corporate Governance: An International Review*; *E-Business Technology and Strategy*; *Ecological Complexity*; *Ecological Economics*; *Ecological Engineering*; *Energy Policy*; *Energy Procedia*; *Environment, Development and Sustainability*; *Environmental and Resource Economics*; *Environmental Politics*; *European Journal of Innovation Management*; *Frontiers of Economics in China*; *Global Business and Organizational Excellence*; *Greener Management International*; *In Design for Innovative Value Towards a Sustainable Society*; *International Journal of Bank Marketing*; *International Journal of Emerging Markets*; *International Journal of Hospitality Management*; *International Journal of Mining, Reclamation and Environment*; *International Journal of Operations & Production Management*; *International Journal of Production Economics*; *International Marketing Review*; *Journal of Agricultural and Environmental Ethics*; *Journal of Asia-Pacific Business*; *Journal of Business Ethics*; *Journal of Business Venturing*; *Journal of China Tourism Research*; *Journal of Comparative Asian Development*; *Journal of Consumer Marketing*; *Journal of Contemporary China*; *Journal of Engineering and Technology Management*; *Journal of Environmental Planning and Management*; *Journal of International Business Studies*; *Journal of Law and Management*; *Journal of Management Studies*; *Journal of Multi-Criteria Decision Analysis*; *Journal of Operations Management*; *Journal of Purchasing and Supply Management*; *Journal of Science and Technology Policy in China*; *Journal of Sustainable Development & World Ecology*; *Journal of Systems and Information Technology*; *Journal of the Minerals Metals and Materials Society*; *Journal of the Textile Institute*; *Local Environment*; *Management and Organization Review*; *Management Research News*; *Organization Management Journal*; *Oxford Bulletin Journal of Science and Technology Policy in China*; *Production and Operations Management*; *Production Planning & Control*; *Public Management Review*; *Research in the Sociology of Organizations*; *Resource and Energy Economics*; *Resources Policy*; *Resources, Conservation and Recycling*; *Review of Development Economics*; *Scottish Journal of Political Economy*; *Social and Environmental Accountability Journal*; *Society and Business Review*; *Technology Analysis & Strategic Management*; *World Development*

Table I.
Distribution of reviewed literature papers by journal

novelty of CSD in China, where researchers are utilizing empirical surveys as descriptive research in order understand real world issues and problems.

Out of this sample only 20 papers apply formal quantitative, analytical, methodologies. These papers only account for little more than 10 percent of the

total number of publications. Except for several works such as rough set (Bai and Sarkis, 2010a; Bai and Sarkis, 2010b), DEMATEL (Bai and Sarkis, 2013a), Fuzzy C-Means (Bai *et al.*, 2014), TOPSIS (Bai and Sarkis, 2013b), Grey System Analysis (Bai and Sarkis, 2011), formal decision-making modeling approaches to address CSD decision making were rarely applied. Those approaches can effectively link the three pillars of economic growth and environmental sustainability and social equity together, and provide useful insights into the sustainability decision making for the corporate managers. Chinese scholars have shown their advantages in the formal modeling of CSD issues, but the lack of real world data for China CSD is a key limitation (Bai *et al.*, 2012) for making progress in this area.

4.2 Cross-country comparisons and CSD

Some papers have conducted a comparative analyses of CSD differences between China and other countries including the USA (Lo *et al.*, 2008; Shafer *et al.*, 2007), France, Germany (Altenburg *et al.*, 2012), Japan (Mei *et al.*, 2012), Brazil (Abreu *et al.*, 2012), Russia (Belyaeva and Kazakov, 2014), India (Fu and Zhang, 2011), and Indonesia (Cummings, 2008). Overall, research in this area, particularly comparative studies with western developed countries is still rare. The existing literature focussing on CSR practices has generally neglected the study of the relationship between environmental practices and the country location.

4.3 Industry sector and CSD

An industrial sectors classification of the reviewed papers is summarized in Table II. The sectors classification is based on the GICS[2] Standards. Such a classification is important since sustainable practices that work for one industry may not work for other industries (Hassini *et al.*, 2012). The existing research papers have covered almost all industries.

The three most cited industries are chemical/petrochemical industry, electrical/electronic industry, and machinery/equipment industry. These Chinese industries have a long history of integration with global supply chains and could be considered more environmentally sensitive than other industries (Zhu and Sarkis, 2006). Thus, these industries, due to their environmental sensitivity, seem to have adopted more CSD practices (Zhu *et al.*, 2008a). In recent years, the food/beverage/tobacco industries have attracted widespread concern

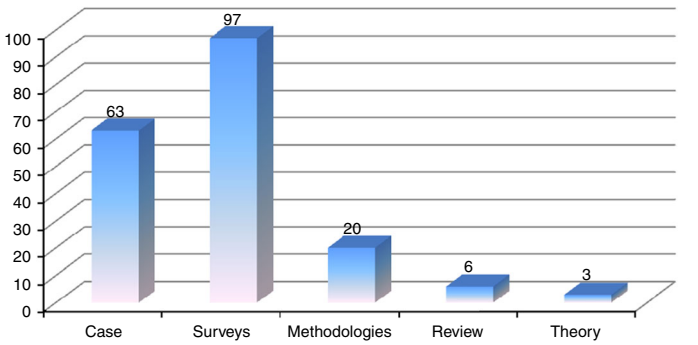

Figure 4.
Distribution of reviewed literature papers by method

Industry sector	Publications
Agriculture, wine, horticulture	Chen (2009); Kuo *et al.* (2012); Guoyou *et al.* (2013)
Articles for culture, education	Chen (2009)
Automotive	Cao (2007); Zhu *et al.* (2011a); Liu *et al.* (2012); Tan (2009); Zu and Song (2009); Zhu *et al.* (2005); Zhu and Sarkis (2004); Zhu and Sarkis (2006); Zhu *et al.* (2007c); Zhu *et al.* (2008a); Wang and Chaudhri (2009); Tang and Li (2009); Zhu *et al.* (2010); Zhu *et al.* (2011c); Zhu *et al.* (2011b); Liu *et al.* (2011); Lema and Lema (2012); Altenburg *et al.* (2012)
Banking, finance, and insurance	Chan and Welford (2005); Lattemann *et al.* (2009); Wang and Chaudhri (2009); Tang and Li (2009)
Chemicals, petroleum	Cao (2007); Lattemann *et al.* (2009); Zhu *et al.* (2011a); Liu *et al.* (2012); Yang and Yao (2012); Guoyou *et al.* (2013); Lin *et al.* (2011); Wang and Jin (2007); Tan (2009); Zu and Song (2009); Zhu *et al.* (2005); Cole *et al.* (2008); Dasgupta *et al.* (2001); Zhu and Sarkis (2004); Zeng *et al.* (2005); Zhu *et al.* (2007c, 2008a); Liu and Anbumozhi (2009); Liu *et al.* (2010c); Zeng *et al.* (2010); Zhu *et al.* (2010); Liu *et al.* (2010a); Zeng *et al.* (2011); Zhu *et al.* (2011c, 2011b); Miao *et al.* (2012); Lai and Wong (2012); Jiufang *et al.* (2009)
Electrical, electronics	Cao (2007); Birkin *et al.* (2009); Zhu *et al.* (2011a); Liu *et al.* (2012); Yang and Yao (2012); Guoyou *et al.* (2013); Tan (2009); Zu and Song (2009); Zhu *et al.* (2005a); Cole *et al.* (2008); Zhu and Sarkis (2004); Zeng *et al.* (2005); Zhu and Sarkis (2006); Zhu *et al.* (2007c); Zhu *et al.* (2008a); Liu and Anbumozhi (2009); Tang and Li (2009); Zeng *et al.* (2010); Zhu *et al.* (2010, 2011b, 2011c); Miao *et al.* (2012); Lai and Wong (2012); Lema and Lema (2012)
Energy	Chan and Welford (2005); Cao (2007); Yang and Yao (2012); Guoyou *et al.* (2013); Wang and Jin (2007); Chen (2009); Zu and Song (2009); Zhu *et al.* (2005a); Zhu and Sarkis (2004), Zhu and Sarkis (2006); Zhu *et al.* (2007c, 2008a); Liu and Anbumozhi (2009); Wang and Chaudhri (2009); Tang and Li (2009); Liu *et al.* (2010a, 2010c); Zeng *et al.* (2011); Miao *et al.* (2012); Fu and Zhang (2011); Lema and Lema (2012)
Fashion, retail, grocery	Chan and Welford (2005); Lattemann *et al.* (2009); Tan (2009); Wang and Chaudhri (2009); Tang and Li (2009); Miao *et al.* (2012); Cao and Dupuis (2010)
Food, beverage, and cigarette	Cao (2007); Yang and Yao (2012); Lin *et al.* (2011); Wang and Jin (2007); Tan (2009); Chen (2009); Zhu *et al.* (2005); Cole *et al.* (2008); Dasgupta *et al.* (2001); Zeng *et al.* (2005); Liu and Anbumozhi (2009); Zeng *et al.* (2010); Zhu *et al.* (2011b); Kong (2012); Miao *et al.* (2012); Lai and Wong (2012); Jiang and Zhu (2013)
Furniture	Cao (2007); Yang and Yao (2012); Guoyou *et al.* (2013); Lin *et al.* (2011); Chen (2009); Zhu *et al.* (2011b)
Healthcare, pharmaceuticals	Zhu *et al.* (2005); Liu and Anbumozhi (2009); Wang and Chaudhri (2009); Zeng *et al.* (2010, 2011)
Hospitality, catering, tourism	Wang and Chaudhri (2009); Gu *et al.* (2009)
Housing, construction, realestate	Chan and Welford (2005); Cao (2007); Birkin *et al.* (2009); Liu *et al.* (2012); Zu and Song (2009); Zeng *et al.* (2005); Wang and Chaudhri (2009); Zhu *et al.* (2011b); Miao *et al.* (2012); Zeng *et al.* (2004); Tam *et al.* (2004); Zhou (2010)

(*continued*)

Table II.
Distribution of reviewed papers by industry sector

Industry sector	Publications
Machinery and equipment	Cao (2007); Birkin *et al.* (2009); Zhu *et al.* (2011a); Liu *et al.* (2012); Yang and Yao (2012); Guoyou *et al.* (2013); Lin *et al.* (2011); Wang and Jin (2007); Tan (2009); Zu and Song (2009); Cole *et al.* (2008); Zeng *et al.* (2005); Liu and Anbumozhi (2009); Zeng *et al.* (2010); Zhu *et al.* (2010); Liu *et al.* (2010a); Zhu *et al.* (2011b, 2011c); Miao *et al.* (2012); Lai and Wong (2012)
Materials	Cao (2007); Liu *et al.* (2012); Yang and Yao (2012); Lin *et al.* (2011); Wang and Jin (2007); Chen (2009); Zu and Song (2009); Zhu *et al.* (2005); Cole *et al.* (2008); Zhu and Sarkis (2004); Liu and Anbumozhi (2009); Liu *et al.* (2010c); Zeng *et al.* (2010); Liu *et al.* (2010a); Zeng *et al.* (2011); Lai and Wong (2012)
Mining	Cao (2007); Kuo *et al.* (2012); Guoyou *et al.* (2013); Chen (2009); Liu and Anbumozhi (2009); Tang and Li (2009); Zeng *et al.* (2011); Zhongxue and Qing (2004); Li *et al.* (2012)
Paper, printing, publishing	Cao (2007); Liu *et al.* (2012); Yang and Yao (2012); Lin *et al.* (2011); Wang and Jin (2007); Chen (2009); Cole *et al.* (2008); Dasgupta *et al.* (2001); Liu and Anbumozhi (2009); Liu *et al.* (2010a); Zeng *et al.* (2010); Liu *et al.* (2010c); Zeng *et al.* (2011); Lai and Wong (2012)
Telecommunication, media, information services	Chan and Welford (2005); Cao (2007); Kuo *et al.* (2012); Yang and Yao (2012); Guoyou *et al.* (2013); Wang and Chaudhri (2009); Tang and Li (2009); Zhu and Liu (2010)
Textile, clothing, and dyeing	Cao (2007); Liu *et al.* (2012); Yang and Yao (2012); Lin *et al.* (2011); Wang and Jin (2007); Tan (2009); Chen (2009); Zhu *et al.* (2005); Cole *et al.* (2008); Dasgupta *et al.* (2001); Liu and Anbumozhi (2009); Liu *et al.* (2010a); Zeng *et al.* (2010); Liu *et al.* (2010c); Zeng *et al.* (2011); Lai and Wong (2012); Cooke and He (2010); Chi (2011)
Transportation, logistics, warehousing	Chan and Welford (2005); Cao (2007); Birkin *et al.* (2009); Zu and Song (2009); Wang and Chaudhri (2009); Miao *et al.* (2012)
Utility	Chan and Welford (2005); Cao (2007); Liu *et al.* (2010c)

Table II.

due to food safety issues. It has become an important Chinese domestic issue since 2003 after a string of serious food safety scandals such as the melamine contaminated milk powder. The CSR performance of a food company has an apparent link with the effectiveness of its food safety management (Zhang *et al.*, 2013a).

Overall, most studies concentrated on the manufacturing sector, which is consistent with the investigation of sustainable supply chain management literature (Seuring and Müller, 2008). The possible reason behind this result is that manufacturing enterprises are facing the greatest pressures to implement socially and environmentally conscious organizational practices. The least studied industries are the telecommunication industry and financial services industry, which may have a more "clean" industry perception among various stakeholders.

A number of the publications provide detail on why the adoption of CSD practices across different industries is heterogeneous. Reasons include Chinese corporations in different industries have differing drivers and pressures (Zhu and Sarkis, 2006). Zeng *et al.* (2010) also confirm that the environmentally sensitive sectors have high levels of CSD practices, especially with respect to environmental

information disclosure. This important finding has implications for data systems that need to be adopted by organizations. Certain industries should introduce systems for capturing environmental and social responsibility information to share with various stakeholders. Further discussion of implications appears in Section 6.

4.4 Organizational size and CSD

According to various empirical studies in China, organization size is a differentiator of CSD practices adoption. Most scholars identified that the implementation of CSD practices is closely associated with organizational size in China. Large-sized organizations are more likely to adopt CSD practices than small-sized and medium-sized corporations (Luethge and Han, 2012; Zeng *et al.*, 2010; Zhu *et al.*, 2008c; Zhu and Geng, 2001). A reason for this result is that larger sized corporations can more easily get access to resources and external support. A second reason is that larger firms face more environmental problems and pressures because of their size (Christmann, 2004). Third, larger firms are more likely to be under public scrutiny and are expected to have higher propensities for environmental and social disclosure. This result is interesting since small- and medium-sized enterprises accounted for more than 90 percent of the total number of manufacturing establishments in China in 2010, and they have created significant negative environmental impacts (Zeng *et al.*, 2011).

In the more general CSR-related literature, very few studies have looked at the relationship between corporation size and the respective social dimension practices. Much of the literature on this topic in China has been relegated to environmental management practices adoption (Zhu *et al.*, 2008a).

4.5 Corporation ownership type and CSD

Corporation ownership in China has been classified into at least six categories by the reviewed literature. State-owned enterprises (SOEs), private-owned enterprise (POEs), foreign-owned enterprises (FOEs), collectively owned enterprises (COEs), joint ventures (JVs), township-and-village industrial enterprises (TVIEs), were all defined as ownership types. Corporation ownership type has been found to influence the implementation of CSD practices in most of the studies examined.

The different ownership background, during China's transition toward a market economy, has influenced CSD activities and adoption. In China, SOEs normally are required to take various social responsibilities and play critical roles in both political and economic fields (Zu and Song, 2009). SOEs are more likely to have managers who reject CSR when compared to POEs. Managers in SOEs and COEs appear to possess stronger environmental ethical values than their counterparts in the POEs and JVs. State ownership brings more attention to the stakeholders of SOEs and hence influences the CSD behavior of these corporations (Li *et al.*, 2013).

After China's entry into the World Trade Organization (WTO), more foreign companies have initiated operations within China, particularly increasing the opportunity for Chinese manufacturing exporters to serve as foreign company suppliers by international trade. Those early FOEs caused many Chinese manufacturers to rethink the role of environmental management practices in their organizational strategies and operations (Zhang *et al.*, 2008). For example, Bristol Myers Squibb, IBM, and Xerox have encouraged their Chinese suppliers to develop environmental management systems consistent with ISO 14001 (Zhu *et al.*, 2008a). The FOEs and SOEs have higher levels of CSD practices implementation than other corporations with no international linkage (Weber, 2014; Lin *et al.*, 2011; Zeng *et al.*, 2010).

Thus, evaluation of CSD in China needs to explicitly consider ownership type in empirical surveys, whether as a variable or control. Also, there are many types of ownership and further clarity on definition will be needed as some of the literature was not clear on the differences and overlaps that might occur.

4.6 Dimensions of CSD

Elkington (1998) is credited with popularizing the TBL principle (also known as the three pillars: profit, planet, and people) of sustainability. In the existing literature, a stream of studies addresses CSD from economic, environmental, and social dimensions in China. Relatedly, a major finding in the literature is that a "win-win" strategy to balance economic development and environmental protection or social responsibility is necessary for greater acceptance of the non-economic dimensions of the TBL (Zhu and Geng, 2013). Overall, though, much of the literature on sustainability downplays the economic dimension since that is viewed as the traditional dimension of most management and business studies.

Totally, 98 papers focussed on investigating environmentally related issues shown in Figure 5. Transferring environmental technologies and systems has seen some of the greatest initial efforts for the environmental dimension practices in China (Guerin, 2001). Hence, green supply chain management (GSCM), environmental information disclosure and ISO 14001 are among the frequently mentioned topics. Each of these areas has strong data management aspects that are required for improvement along environmental dimensions.

Overall, a wide range of environmental aspects are taken into account. GSCM is the most common issue investigated for CSD, and 21 papers devoted to GSCM research from various perspectives (e.g. Zhu *et al.*, 2013b; Liu *et al.*, 2012; Cheung *et al.*, 2009; Kortelainen, 2008).

Totally, 62 papers explore the social aspect of sustainability through CSR. There is a lack of consideration on specific social issues, e.g. human rights abuses, child labor, and irresponsible investment. Some of the findings include that Chinese companies normally do not adopt the typical western CSR concept, which treats their employees, customers, community, and government as equally important stakeholders (Idemudia, 2011; Moon and Shen, 2010; Lockett *et al.*, 2006). Instead, existing studies on CSR in China have focussed on how government and consumers affect companies' attitudes toward CSR, without paying much attention to other

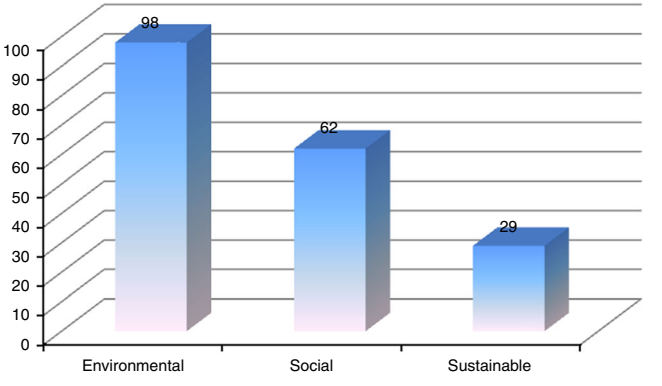

Figure 5.
Distribution of reviewed literature papers by dimension

stakeholders like local community and NGOs. In practice, Chinese domestic and foreign retailers have different dimensions for reporting their CSR (Kolk *et al.*, 2010). In China, the CSR evaluating systems are still in their nascent period. Various standards and guidelines covering a range of CSR issues such as GRI, SA8000, ISO 26000, and AA1000 have already been widely promoted at a global level (Kong, 2012).

The integration of all three sustainability dimensions has not been explicitly addressed in the China CSD literature. Previous findings have confirmed that the social dimension requires better integration with the economic and environmental aspects. This finding also points to a clear research gap regarding the overall integration of the three dimensions, while this will not be an easy or simple task. Data systems can be a useful integration enabler, but it will also require appropriate and acceptable performance measures for Chinese organizations are developed.

5. Toward a theoretical framework

In order to understand the interrelationship among CSD elements in China, this paper aims to develop a theoretical framework. The framework will be presented in three aspects:

(1) drivers of CSD in China;

(2) practices of CSD in China; and

(3) performance measurement and management of CSD in China.

5.1 Drivers of CSD in China

Previous studies have examined the driving mechanisms for CSD in China although researchers have not reached consensus on these drivers (Liu *et al.*, 2010a). Most studies are based on two related organizational theories institutional theory (DiMaggio and Powell, 1983) and stakeholder theory (Freeman, 1994).

According to institutional theory, the alignment of sustainability and business operations may be influenced by three forms of isomorphic drivers: normative, coercive, and mimetic (DiMaggio and Powell, 1983). Institutional theory emphasizes the influence of pressures outside of the targeted organization (DiMaggio and Powell, 1983). It has been found that the driving factors which are most likely to influence environmental practices at a plant level are coercive pressure from organizations holding mandatory oversight power, normative pressures from industrial associations and the public, and mimetic pressures from competitors in the same sector (Liu *et al.*, 2010a).

International environmentally oriented institutional drivers are also positively associated with the adoption of various environmental and CSD practices by Chinese manufacturers (Dong *et al.*, 2014; Zhu *et al.*, 2007b, 2011c). For example, globalization plays a predominant role in encouraging ISO 14001 diffusion among China corporations (Qi *et al.*, 2011), which is based on processes and data management systems. International customer pressure also plays a role in these global external drivers (Lai and Wong, 2012).

Related to some institutional pressures, stakeholder theory states that CSD strategy is influenced by various stakeholders (Liu and Anbumozhi, 2009; Frooman, 1999; Donaldson and Preston, 1995). Much of the existing literature has included studies

from this perspective. Research results show that Chinese corporations are "pulled" to be environmentally friendly by these external stakeholders and "pushed" into compliance by internal stakeholders. External stakeholders may include the government, consumers, NGOs, investors, lenders, surrounding communities, industrial associations, competitors, and suppliers. The internal stakeholders may include corporate top managers, middle managers, and employees. Investors, surrounding community, industrial associations, and mass media, all appear to have some role as well (Dong *et al.*, 2014; Lin *et al.*, 2014; Liu and Anbumozhi, 2009; Qi *et al.*, 2011; Zeng *et al.*, 2010; Liu *et al.*, 2010a; Lu and Abeysekera, 2014). A summary breakdown on the quantity of papers investigating these various drivers is shown in Table III.

A consensus among researchers is that government and international customers are two of the most important factors for promoting CSD (Lin *et al.*, 2014; Zhu *et al.*, 2007b, 2008b, 2013b). Government legislation has been found to be a main enabler of CSD practices in China (Zhu *et al.*, 2011b). Government-led initiatives in China consequently take on a more influential role than in many other countries worldwide due to the government's overwhelming role (Schroeder, 2014; Lin, 2009, 2010).

Literature relating to internal stakeholders is relatively less than external stakeholders. Much of the published literature recognizes that top managers have strong relationships with CSD practices while employees having a weaker relationship (Zhang *et al.*, 2014; Dong *et al.*, 2014)

Besides external and internal driving factors, CSD was found to be also influenced by organizational characteristics like size, ownership, location, learning capacity, position in the value chain, and financial status. These characteristics provide a better understanding of corporate decisions on CSD and implementation of CSD practices. Chinese research has focussed on many of these dimensions. The implementation of CSD practices is closely associated with organizational size in China according the findings in Section 4.4. Larger organizations will be more visible and have greater pressures, as institutional theory posits, to adopt these practices.

Programmatic organizational learning is strongly related to the extent of use of all the GSCM practices (Zhu *et al.*, 2008b). Learning and continuous improvement programs were valuable complementary activities for GSCM practices. This observation necessitates future research of the relationship between a corporation's characteristics and proactive sustainable practices in the Chinese context (Liu *et al.*, 2010a).

Globalization is an important environmental factor that drives Chinese CSD practices. Internationalization has led to a connection between the Chinese CSD and the rest of the world. Especially after China's entry into the WTO, more foreign companies have initiated their manufacturing bases within China, increasing the opportunity for Chinese corporations to serve as foreign company suppliers (Long *et al.*, 2013). This internationalization has resulted in higher opportunities and drivers for Chinese corporations to improve their sustainable performance through CSD practices. Simultaneously, Chinese corporations are forced to directly compete with their foreign competitors and have to address sustainable concerns more positively with the aim to increase their international reputation and competitiveness (Zhu and Geng, 2013; Kolk *et al.*, 2010; Gugler and Shi, 2009). Another finding, based on results from Section 4.5, found that the different ownership types will influence CSD activities and adoption and much of this is related to globalization. Corporations with

Driver factors	Main issue	Cited by	Number
External factors			
Government	Increase the frequency of monitoring and enforcement	Liu *et al.* (2010c)	29
Consumers	Consumers are increasingly concerned about the quality of the natural environment, which is reflected from their purchasing decisions	Qi *et al.* (2011)	23
Competitors	A firm devoted to developing green innovation not only meets the environmental regulations, but also gains competitive advantages over its peer competitors	Zhu *et al.* (2011c)	12
Surrounding community	Raise complaints to increase government's enforcement or direct against	Liu *et al.* (2010c)	10
Suppliers	Decreased trust and opportunity reduction on business cooperation	Liu *et al.* (2010c)	8
NGOs	Mainly refers to environmental non-governmental organizations, raise campaign to fight against the bad performers	Tsoi (2010)	7
Media	As a platform for various social forces to express their own opinions on CSD	Liu *et al.* (2011)	7
Investors	Depreciate the bad performers and reduce the investment to the firms	Liu *et al.* (2010c)	6
Industrial associations	May determine the legitimate set of actions taken by the corporation	Liu *et al.* (2010b)	4
Lenders (banks)	Depreciate the bad performers and cut or suspend the credits to them	Liu *et al.* (2010c)	3
Internal factors			
Top managers	Top manager is a critical element of adoption and implementation of CSD practices in an organization	Zhu *et al.* (2008b)	6
Employees	The implementers of CSD practices	Liu and Anbumozhi (2009)	3
Corporate own characteristics			
Size	Is defined as the natural log value of the firm's net asset	Liu and Anbumozhi (2009)	29
Industrial sector belongings	Understanding the source of the drivers for environmental improvements and determining if those drivers vary in industrial sectors will be useful references for policy makers who may wish to guide the industry/environment relationship within China	Zhu *et al.* (2011b)	23
Ownership type	Including: SOEs, POEs, FOEs, COEs, JVs, TVIEs		21
Financial status	Economic performance can influence corporate financial capability to undertake costly programs related to social demands	Lu and Abeysekera (2014)	9

(*continued*)

Table III.
Drivers of CSD in China

Driver factors	Main issue	Cited by	Number
Learning capacity	Be viewed as an especially important capability within this resource-based framework since, especially when coupled with an organizational emphasis on continuous improvement, they can help organizations build from more basic "complementary capabilities" such as those associated with ISO 9000 and TQM systems experience	Zhu *et al.* (2008b)	4
Location	Countries where the company	Abreu *et al.* (2012)	4
Age as listed company	Is the number of years since the company was listed in the Chinese Stock Market	Liu and Anbumozhi (2009)	3
Environmental factors			
Globalization/ internationalization	Increased market internationalization with more and stricter environmental regulations in different countries has caused manufacturers to extend their environmental management practices to cover their supply chain partners	Zhu *et al.* (2011b)	4
Culture	Chinese traditional culture and philosophy	Wang and Juslin (2009)	2

Table III.

international linkage, such as FOEs and SOEs, have higher levels of CSD practices implementation shown in the Section 4.5, and thus further supports the reasoning that globalizations is an important antecedent.

Culture can be viewed as an operating system that guides how people think, act, and feel in an organization (Liu *et al.*, 2014; Tang *et al.*, 2014; Raynard *et al.*, 2013; Chang and Lin, 2007). Most of the existing studies on CSR in China focus on how the Chinese culture, such as "People First" affects companies' CSR practices (Phoon-Lee, 2006). Demands of stakeholders on CSR issues would depend on the cultural setting in a country (Ramasamy and Yeung, 2009). Different cultures focus on different practices. In corporate communications of social responsibility, for example Brazilian firms emphasize volunteerism and health, while Chinese firms' emphasis was on sponsorships of arts and culture (Alon *et al.*, 2010).

5.2 CSD practices in China

To improve their sustainable performance, Chinese enterprises have initiated various CSD practices such as ISO 14001 certification and cleaner production. Early on, CSD management strategies mainly include adopting environmental technologies. Recently, Chinese organizations' primary CSD practices include environmental/CSR information disclosure, ISO 14001 certification, cleaner production, and eco-design. An essential message is that environmental/CSR information disclosure may effectively increase the resident's readiness of public participation (Liu *et al.*, 2010c). China has witnessed a rapid increase in the number of ISO 14001 certifications, which is ranked first in the list of top ten countries by the end of 2008.

GSCM has emerged as an important new CSD strategy for organizations (Zhu *et al.*, 2008a). GSCM requires the participation of both upstream and downstream supply chain partners. These practices may include green purchasing on the input side and

customer environmental cooperation on the output side, reflecting the importance of cooperation in greening the supply chain.

Overall, Chinese corporations' practices are still in the early stages, lagging behind practices in developed countries (Zhu and Sarkis, 2006).

This paper identifies four main components of CSD practices: production-based practices, evaluation-based practices, partner-based practices, and general environmental management practices (Lai and Wong, 2012). Production-based practices are defined as the design, production, recycling activities throughout the product lifecycle in manufacturing corporations. They may include cleaner production, eco-design, eco-innovation, and recycle of by-product. Evaluation-based practices are defined as the organizational ability to evaluate, monitor, and improve performance on a continuous basis, which includes: strategic environmental assessment (SEA), ISO 14001 certification, and SA8000. Partner-based practices are to reflect organizational ability of coordinating with external partners during the implementation of CSD, including: technology transfer, green purchasing, socially responsible investment, communication strategy on CSR, GSCM, customer cooperation with environmental concerns, and green logistics management. The general sustainability practices are the sustainable development behaviors that are not included into the production process and the legal responsibility of manufacturing corporations. The examples are environmental/CSR information disclosure. One note about these practices is that most practices are supported of environmentally focussed concerns. As mentioned in Section 4.6 on the dimensions of CSD, the social issues are not as well defined in terms of practices that are to be adopted.

5.3 CSD performance in China

The relationship between corporate environmental, social, and economic performance has always been the core issue of corporate sustainable development management research (Menguc *et al.*, 2010). Studies give mixed results. Thus, there is a need to further clarify the relationship between CSD practices and performance.

5.3.1 The relationship between CSD practices and performance. For CSD practices, the GSCM and performance relationship has received the greatest attention (e.g. Zhu and Sarkis, 2004). GSCM practices tended to have win-win relationships in terms of environmental and economic performance (Bai and Sarkis, 2014; Zhu *et al.*, 2005, 2010, 2011c, 2013b; Bai and Sarkis, 2010a). But, some of these win-wins were not direct, but related indirectly (Zhu *et al.*, 2013b).

For other CSD practices, Chen and Zhang (2009) found that the company can implement strategy on two-way communication on CSR information between company and stakeholders that benefits a company's CSR performance and stakeholders' decision. Yuan and Shi (2009) argued that decreasing production cost and improving environmental performance can effectively enhance the competitive advantage. Lai and Wong (2012) showed that green logistics management positively relates to environmental and operational performance in a developing country context. Lai *et al.* (2012) provided empirical evidence that Chinese export manufacturers that implement green logistics management are positively associated with their environmental, financial, and operational performance. Lan and Munro (2013) investigated the external and internal effects of human capital on firms' environmental performance. The study of Dong *et al.* (2013b) showed that IS generated both environmental and economic gains for the company.

Those CSD practices are helpful for economizing environmental efforts by reducing energy and other resources consumption as well as saving costs and gaining profit. Better coordination and cooperation among supply chain members can also aid the eco-design of products and finally result in the market competitive edge.

5.3.2 Performance antecedents to CSD practices. Corporate performance also maintains some relationships with CSD practices. The commonly held view is that economic benefit motivates the adoption of CSD. Yet, economic performance is also an antecedent (driver) of CSD efforts. Indirectly if there are reasons inhibiting economic performance improvements, convincing manufacturers to adopt CSD is a difficult Chinese policy maker to overcome (Zhu *et al.*, 2011a). Zhang *et al.* (2015) indicate that the CSR performance of a company affects the effectiveness of its food risk management measures. But, it has also been found that economic performance is not significantly related to some CSD practices (e.g. environmental disclosure, Liu and Anbumozhi, 2009).

5.3.3 The relationship between CSD drivers and performance. The relationship review also found that the CSD drivers have caused Chinese manufacturers to strive to improve the environmental aspects of their operations and attain subsequent performance improvements. Governments-, competitors-, and the media-firm stakeholder drivers were found to significantly affect Chinese corporation's environmental performance (Zhu *et al.*, 2011c). Chinese manufacturing organizations can gain value from their responses to the international drivers for environmental protection (Zhu *et al.*, 2011c). Market driving forces plays an important role in improving performance of contamination control and prevention (Zeng *et al.*, 2011). Supply chain partners, customers, and communities all have played positive roles in encouraging firms to improve environmental management performance (Tang and Tang, 2012). Also Chinese firms' eco-innovation types and environmental regulations have significant effect on ecological performance (Dong *et al.*, 2013a).

5.4 A proposed framework for CSD in China

Bringing all these factors together this paper introduces a systematic framework for CSD using institutional, stakeholder, and legitimacy theory and legitimacy theory. It is possible and helpful to jointly consider these dimensions and theories to provide more insightful explanations for adoption of CSD practices and performance outcomes. Drivers may be clustered into two groups of external shareholders and internal shareholders, who may be interested in the firm's social and environmental activities. The main drivers are government regulation and international customers which affect firm's CSD practices.

While stakeholder theory focussing upon the expectations of particular interest groups in general, legitimacy theory reveals the expectations of society. Legitimacy theory argues that a firm is legitimized when its value system matches that of the social system of which it forms a part (Lindblom, 1994). According to legitimacy theory, firms that are more likely to be subject to public scrutiny, such as larger firms and firms in high-profile industries, intend to disclose more social and environmental information to meet the expectations of the public. Using legitimacy theory, this various corporate characteristics can be grouped using this driver mechanism. Furthermore, internationalization and Chinese culture are two important

environmental factors and need consideration together with the environmental variables. The various CSD practices identified in the literature can each be influenced by these drivers. The various types of performance are possible outcomes (both negative and positive) that can occur. Various controls, identified in the literature may also play a role, such as moderators or mediators, in the broader relationships among these various factors and dimensions. Yet, the roles and interactions of social and environmental performance outcomes, due to a lack of social dimensions investigations, as described in Section 4, needs further relationship development.

A summary of these relationships and framework are shown in Figure 6. The solid lines represent strong relationships within China CSD findings, and the dotted lines represent either weak or indirect relationships, based on the overviews from the literature.

6. Relationships to IMDS

This concluding section will identify within the CSD in China context some of the more discernible findings of this research and relationships to IMDS. IMDS are meant to provide the necessary information to enable managers to exploit the potential of new technology knowledgeably and improve understanding of management activity such as management information systems, business process management, and supply chain management. This section will identify the relationship of CSD in Chinese enterprises means to these three major managerial activities. In many cases scholars have alluded to or explicitly mentioned some of these linkages. Here a summary and additional discussion and insight is presented.

6.1 Information systems and CSD in China

One of the findings in this review is the weak relationships between many stakeholders and CSD practices in China. One way to help build this relationship is through sharing of information on CSD and gathering information to help

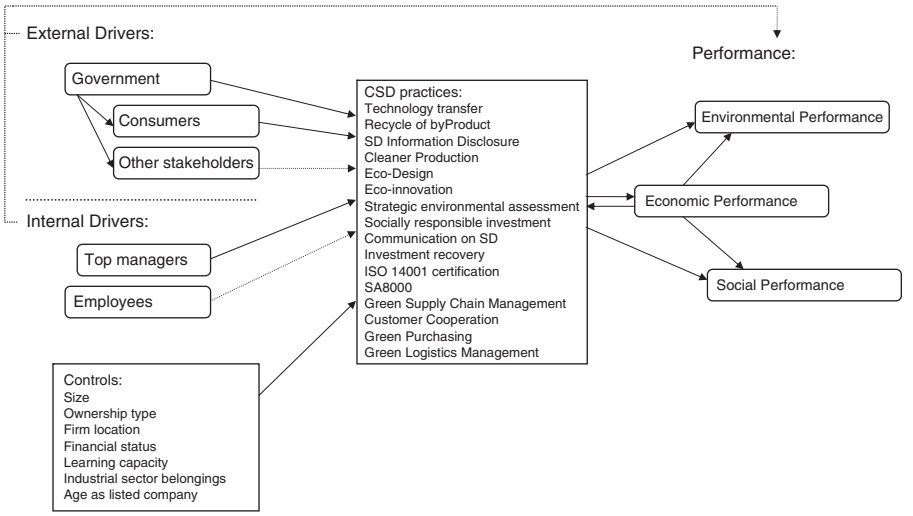

Figure 6. Analytical framework for CSD in China

companies achieve CSD. Developing the appropriate information systems may also require gathering data from the organization, customers, government agencies, that show how well organizations are doing in adopting various CSD practices and performance outcomes. These systems can range from internal database development, new information policies, to social media and inter-organizational systems.

Information systems management is needed to manage large amounts of information that exists for Chinese government sponsored CSD programs and practices, especially for new policies such as the CE (Sarkis and Zhu, 2008). The inability of information diffusion for many of these voluntary governmental programs has caused problems in CSD adoption (e.g. Geng *et al.*, 2014). Other stakeholders, such as industrial associations, although not as prevalent, need to take advantage of these new information channels (Cramer, 2002).

There is a need for and development of internal, to the organization, information systems to support efforts ranging from ISO 14000 certification, eco-design, health and safety, environmental management, efforts require significant research. How information systems can be used to further understand and develop CSD in Chinese organizations is major gap in the literature. Although, allusion to environmental information systems has been made the actual study, empirical or quantitative on the systems and characteristics of successful and unsuccessful information systems integration is missing.

6.2 Business process management and CSD in China

Organizational change to help in adopting CSD, especially in Chinese organizations, is important. Without a long-term history of CSD practices in China, as evidenced in the background section, the need for organizations to change is necessary. Change needs to occur to fit with an emerging market economy, especially one that is under a severe and strained ecological and social situation. Business process management can be used to help in that change, but it can also be used to help improve the CSD systems in place (Sarkis *et al.*, 2006; Zhu *et al.*, 2008a). Given that many overseas customers consider CSD factors as important selection criterion in assessing and selecting suppliers from China, having the processes in place and documented are necessary. It has been found that companies adopting business process systems like IS0 9000 can more easily adopt environmental management systems such as ISO 14000 (Zhu *et al.*, 2013a). This finding was especially true in China. The extension of these systems to incorporate CSR process standards such as ISO 26000 also seems like an opportune area for further investigation.

As part of business process management, the motivation of workers and management as well as organizational learning all play a role. Research on each of these areas was identified above, but additional investigation with respect to business process improvements of general CSD in China is clearly needed. The role of internal information systems with business process management to advance CSD is a multiple dimensional perspective for investigation that is quite fertile.

Poor and limited performance evaluation research on this topic in China may limit business process management practices. Given that few tools and techniques exist in the CSD literature in China to help develop key performance indicators and evaluate sustainability performance of corporations is an example of where research can greatly benefit the diffusion of business process management practices and adoption for CSD purposes.

6.3 Supply chain management and CSD in China

Of the three major industrial data and systems management topics introduced in this section supply chain management and CSD is the most extensively covered within the literature. This coverage was evident in our review from above. Concerns still do exist on technological, innovation, and information systems aspects in the supply chain and CSD. Most of the topics were focussed on the appropriate theory related to pressures, practices, and performance.

The implications of the findings are pretty clear with respect to the supply chain issues. CSD diffusion and adoption, in China, is heavily dependent on the international supply chain and markets. It may take a while for domestic supply chains and relationships to become more CSD oriented. The only real pressure that exists domestically in China for CSD through the supply chain is primarily through governmental effort, such as green government procurement. Developing industrial management systems to further support CSD in the supply chain are still needed.

Analytical decision and modeling efforts focussing on China's unique situation have not been as developed, and applied. This may be an area for significantly more research to be developed with respect to supply chain CSD. Another significant concern and research topic that should be pursued and has not been in the literature is the beyond-dyadic supply chain focus. This study has found that CSD within multi-tier supply chains have not been investigated within the literature and represents a fertile area for additional research.

In each of these industrial management and systems areas the full holistic CSD (including all dimensions of sustainability) investigation is still required and investigators can contribute in any of the areas with this expanded focus.

7. Conclusion

The major contribution of this paper is to provide a comprehensive review on CSD in China. A set of descriptive statistics, classifications, and analysis were all presented. It is evident that focussed environmental and CSR dimensions dominate the literature, with the integration of three dimensions being widely ignored. Results show that the main pressure originates from the government, international customers, top managers, and is related to organizational characteristics. The CSD practices were also grouped into four categories and an analysis of the relationship between CSD practices and performance was performed. Based on these results a theoretical framework was developed for CSD in China to clarify the relationships between the drivers, the corporation's characteristics, CSD practices, and corporation performance. The findings of the paper summarize the status of research on CSD in China with respect to IMDS topics, while offering insights into directions for future research.

The study provides greater insight into CSD in China and future research needs and directions. There are limitations to this study. For example, although the review was comprehensive only major publishers were used. In the CSR fields there are some articles that may have been overlooked in the analysis because the publishers were not in our list, although this study tried to minimize this occurrence with additional investigation into other highly cited articles. This review is one of the first studies to focus on this topic, one that will be of critical concern for one the largest, by population, country on earth. It sets the stage for greater investigation, in general to CSD in China, but also topics related to IMDS (Table IV)

Practices of CSD	Main issue	Cited by
Production-based practices		
Cleaner production	A strategy for reducing negative environmental impacts throughout the production processes avoids and decreases pollution at its source and increases the competitiveness of enterprises	Hicks and Dietmar (2007)
Eco-design	Design for the environment (DFE) is a helpful, emerging tool to improve companies' environmental performance by addressing product functionality while simultaneously minimizing life-cycle environmental impacts	Zhu and Sarkis (2006)
Eco-innovation	Eco-innovation is defined as "the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its lifecycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives"	Dong *et al.* (2013)
Investment recovery	IR refers to an organization's strategic use of recycling, redeployment, reselling, and similar techniques to derive greater value from materials and products	Zhu *et al.* (2008b)
Recycle of product	Products for reuse, recycle, recovery of material, component parts	Liu *et al.* (2010a)
Evaluation-based practices		
Strategic environmental assessment	SEA was defined as a systematic process in which environmental, economic, and social consequences of proposed policies, plans, and programs are evaluated at the earliest appropriate stage of decision making	Ren *et al.* (2010)
ISO 14001 certification	A process standard aimed at ensuring that facilities have a workable environmental management system (EMS) in place and does not actually mandate improvements in a facility's environmental performance	Fryxell *et al.* (2004)
SA8000	A global social accountability standard, as a national standard of labor protection	Tang and Li (2009)
Partner-based practices		
Technology transfer	TT is the process of moving innovations from their origin (or other location) to where they can be put into operation	Guerin (2001)
Green purchasing	Is an emerging approach in Chinese enterprises, which focusses on the inbound or upstream segment of a product's and organization's supply chain	Zhu *et al.* (2008a)
Customer cooperation with environmental concerns	CC have an increased focus on customers' needs and the development of value-added products and services	Zhu and Sarkis (2006)

Table IV.
Practices of CSD

(*continued*)

Practices of CSD	Main issue	Cited by
Communication strategy on CSR	Means the information on CSR can be transferred between company and its stakeholder in a bidirectional manner	Chen and Zhang (2009)
Socially responsible investment	Responsible investment (RI) or ethical investment (EI) have become part of mainstream investment practices in many financial markets	Ho (2013)
Green supply chain management	As a more systematic and integrated strategy, green supply chain management (GSCM) has emerged as an important new innovation that helps organizations develop "win-win" strategies that achieve profit and market share objectives by lowering their environmental risks and impacts, while raising their ecological efficiency	Zhu *et al.* (2007b)
Green logistics management	GLM aims to deploy processes that produce and distribute goods in a sustainable way, with a view to reducing waste and conserving resources in performing logistics activities	Lai *et al.* (2012)
Industrial symbiosis (IS)	As a key subbranch of industrial ecology (IE), IS is a system innovation to share services, utility, and by-product resources among diverse industrial processes or actors so as to add value, reduce cost and improve the environment	Dong *et al.* (2013)
The general sustainable management practices		
Environmental/CSR information disclosure	As a dialog between firms and their stakeholders who are interested in corporate social and environmental activities, demonstrates the fulfillment of corporate social responsibility to their stakeholders	Lu and Abeysekera (2014)

Table IV.

Notes

1. There is a substantial amount of Chinese language journal literature that covers this topic. Significant insights and potentially different developments can be accrued from this other literature. This is a limitation of this research study. But, English language journals are more broadly disseminated, not subject to interpretation, and are more easily accessible to the broader research community. Although it is recommended that completing a survey of Chinese language journals on this topic would be a valuable direction for future research.
2. www.mscibarra.com/products/indices/gics/

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