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1 Inside Out: The Interrelationships of Sustainable  
2 Performance Metrics and Its Effect on Business

3 Decision Making: Theory and Practice

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17  
18  
19 **Abstract**

20 There has been an increasing interest in the use of decision-making models to achieve  
21 sustainability goal in recent decades. However, a systematic review of performance  
22 metrics, which are an important element of decision-making models to evaluate the  
23 outcomes regarding firm's economic, environmental and social performance, is  
24 lacking. This study provides critical reflections on the current state of literature and  
25 industry development regarding sustainable performance metrics and offers concrete  
26 suggestions to guide future research. This study contributes to existing studies by (1)  
27 exploring the interrelationship between sustainable triple-bottom performance in the  
28 decision making process; (2) integrating corporate governance mechanism into  
29 decision making process for sustainable consideration; and (3) conducting a  
30 comparison between academic theory and industry practice regarding the performance  
31 metrics proposed and employed.

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34  
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36 **Keywords:** Business Decision Making; Corporate Governance Mechanism;  
37 Performance Metrics; Sustainable Supply Chain Management

## 1. Introduction

Business decision-making and sustainable supply chain management (SSCM) are both relatively established research fields. The former conceptualizing as “a locus of innovation, planning tools, heuristic logic, or market device” (Hacklin and Wallnofer, 2012, pp. 166). The latter exploring “the management of material, information and capital flows as well as cooperation among companies along the supply chain, taking goals from the three perspectives of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements” (Seuring and Muller, 2008). With customers’ expectations and demands rapidly changing, companies targeting a customer base with high awareness of all three perspectives of sustainability need careful consideration of these in their business decision-making. Unfortunately, one of the most challenging aspects of decision-making to achieve sustainability, is that elements of the process are beyond the reach of companies’ control (Gimenez and Tachizawa, 2012). A high level of environmental performance achieved by one firm can be brought to nothing by its supply chain partners’ poor environmental/social performance (Faruk et al., 2001). For example, Apple, Samsung and Sony who has invested heavily in its Corporate Social Responsibility (CSR) development face child labour claims due to the poor performance of its supply chain partners (Wakefield, 2016). The problem arises where the two parties have different interests and asymmetric information, such that the one player cannot directly ensure that the other player is always acting in mutual best interests, particularly when activities that are useful to the one player are costly to the other, and where elements of what the other player does are costly to observe. This asymmetric information problem exists between the companies and its partners in the value chain. The extant literature has documented the important role of governance mechanisms, which are defined as a set of arrangements “that coordinate all stakeholder interests to ensure that the decision-making is more scientific and safeguards all corporate interests” (Li et al., 2014), see also Gillan, 2006; Jensen, 2002; Zingales, 1998, in reducing asymmetric information problems. Therefore, to meet with the newly developed sustainability requirements, firms have recognized the need to not only guide their business decision internally through governance mechanisms but also extend their traditional business making decision process beyond the firms’ boundary to involve their supply chain partners through external governance mechanisms. This prompts questions about how sustainability should be measured into different levels of management decision-making through the value chain and supply network to achieve sustainable production from upstream relationships to sustainable consumption from downstream relationships.

To operationalize the triple bottom line (economic, social and environmental perspectives) (Elkington, 1997; Seuring and Müller, 2008) and to interpret the interrelationships between these perspectives and to guide decision-making processes,

80 clear metrics of “performance are needed in order to judge the efficacy of any  
81 decision on the resulting sustainability performance” (Hutchins and Sutherland, 2008).  
82 Against this backdrop, the authors hereby extend the existing literature by  
83 investigating how the academic literature address the decision-making process in the  
84 context of sustainable supply chain management and identifying the gap between the  
85 academic literature and industrial practices regarding sustainability related factors that  
86 influence decision makers aiming to fulfil strategic sustainability goals. Current  
87 research has been conduct regarding the performance indicators applied for  
88 decision-making regarding sustainability (Seuring and Müller, 2008; Hutchins and  
89 Sutherland, 2008; Hervani et al., 2005, Bai et al., 2012). However, this study  
90 identifies little existing research that examines the interrelationship between the triple  
91 perspectives, especially from the lens of triangulation between theoretical and  
92 practical viewpoints. Thus, the authors contribute to the extant literature by  
93 comparing the performance metrics proposed by scholarly research and employed by  
94 industry. More specifically, the authors aim to answer three questions: what are the  
95 metrics of performance suggested by the academic literature and what is the  
96 interrelationship between these? Has industry used these metrics? What is the impact  
97 of governance mechanisms on decision-making models that focus on corporate  
98 sustainability performance?  
99

100 In doing so, this study attempts to follow a systematic review method to identify the  
101 performance metrics across a broad range literature of business decision-making  
102 processes and their use within industry. Although some previous reviews (Koh et al,  
103 2016) can be found, this systematic review distinguish itself from previous reviews by  
104 demonstrating its in-depth rigour of the methodology adopted and also the new  
105 research directions proposed as a result of the triangulation between theory and  
106 practice to comprehensively understand the interrelationship between the triple  
107 perspectives. A major debate of this study is that a significant proportion of current  
108 business model building research assume there is an implicit or explicit win-win  
109 situation between three sustainable perspectives: economic, social and environmental,  
110 however this may not exist. More specifically, current literature argues that by  
111 investing in social and environmental perspectives, the company can realise better  
112 economic performance. Even if there might be short-term conflict, a long-run win-win  
113 situation exists. However, this study suggests that instead of turning a blind eye on the  
114 interrelationship between the three sustainable perspectives by assuming a win-win  
115 situation for all cases, it is practical to go inside the box and test the interrelationship  
116 among these perspectives before building business decision models; a reverse  
117 causality from improved economic performance to improved environmental and  
118 social performance or a negative relationship between economic performance and  
119 environmental and social performance might exist, which have significant  
120 implications in the building of decision-making models. As such, the authors urge the  
121 examination of this interrelationship under different governance mechanisms and

122 conditions and call attention to the contingency perspective in future study.

123  
124 The unique points of this study also involve a content analysis of annual reports,  
125 sustainability reports and corporate reasonability reports of the top 50 listed  
126 manufactures selected from FTSE 250 companies. Consequently, this study  
127 contributes to both the academic and professional communities. For researchers, the  
128 authors summarize current knowledge and suggest some directions for future research.  
129 For professionals, this study can be used to guide what performance metrics can be  
130 implemented by businesses.

131  
132 The structure of this study is as follows. The next section provides a summary of the  
133 methodology and outlines the research protocol adopted to identify the systematic  
134 review sample papers. The results of the search and initial analysis are presented,  
135 followed by a discussion of the findings. Finally, conclusions are drawn, with  
136 implications for management practice and further academic research.

## 137 138 **2. Methodology**

139  
140 This study applies a systematic review approach to provide a comprehensive literature  
141 review. Systematic review is a rigorous review methodology originally developed  
142 mainly within medical research and first outlined for the field of management and  
143 organization studies by Tranfield et al (2003). By adopting a scientific, transparent  
144 and replicable process, systematic reviews differ from more traditional approaches to  
145 literature reviews. Through exhaustive searches of published work, with a clear audit  
146 trail of the decisions and actions taken, the aim is to reduce bias and error (Tranfield  
147 et al., 2003). The principle aim is to draw a balanced understanding of research in a  
148 specific field without selecting for publication field or location, and to obtain a  
149 reliable overview of a subject that cannot be achieved by a single non-longitudinal  
150 study (Tranfield et al., 2003). As outlined by Thorpe (2005), a systematic literature  
151 review should provide: transparency - each search of the available research studies is  
152 recorded (Denyer and Neely, 2004), clarity - a clear, stepped series of searches is  
153 presented (Tranfield et al., 2003), focus, - unify research and practitioner communities  
154 (Leseure et al., 2005), equality - studies are reviewed on their own merits with no  
155 distinction between the nature of journals (Pittaway et al., 2004), accessibility – the  
156 reviews are made available outside of the specialist in the forms of searchable  
157 database with broad coverage (Pittaway et al., 2004).

158  
159 Following the procedures laid out by recent systematic review (Dekkers et al., 2013;  
160 Fogliatto et al., 2012; Keupp et al., 2012), the authors applied two stages of search  
161 strings. Step one involved identifying potential relevant papers, the authors selected  
162 keywords related to the topic of sustainability. Sustainability is a broad concept  
163 (Hubbard, 2009). The triple bottom line, of environmental, social, economic

164 sustainability is a central concept to help operationalize sustainability (Elkington,  
 165 1997, Seuring and Müller, 2008). As such, three search strings (“environmental  
 166 sustainability” AND “management”, “economic sustainability” AND “management”,  
 167 and “social sustainability” AND “management”) are searched using 2 databases:  
 168 Scopus and Web of Science, using key word search of [“Environmental sustainability  
 169 AND management”], [“Economic sustainability AND management”] and [“Social  
 170 sustainability AND management”] within title, abstract and keyword fields (Table 1).  
 171 The sample period covers from January 2007 to March 2016, to ensure this study  
 172 reflect the recent development in this field.

173

174 The choice for Scopus and Web of Science is due to the fact that each of the two  
 175 databases are documented to have extensive coverage for peer review journals (Meho  
 176 and Yang, 2007). As of 5<sup>th</sup> May 2016, Thomson Reuters Web of Science had covered  
 177 more than 12,000 of the high impact research journals and contains over 90 million  
 178 records. By January 2016, Elsevier’s Scopus has covered over 21,500 peer-reviewed  
 179 journals and over 60 million records.

180

181

Table 1: Search String

Stage 1	Stage 2 (based on the Stage 1 database)
Search String 1: Environmental sustainability AND management	Search string 4: Supply chain
Search String 2: Economic sustainability AND management	
Search String 3: Social sustainability AND management	

182

183 Both databases are searched individually with the selected keywords. Only published  
 184 peer-reviewed journal articles were considered. Equally, As argued by Newbert,  
 185 (2007), David and Han (2004) and Gosling and Naim, (2009), the authors considered  
 186 that by restricting the search to peer-reviewed journals, the quality control of search  
 187 results was enhanced due to the peer review process to which articles published in  
 188 such journals are subject to prior to publication. This step generated a total 34,442  
 189 articles in English (16, 564 articles in Scopus and 17, 878 articles in Web of Science).  
 190 After deleting duplicates, the total number of unique articles in is 17, 416. The  
 191 process of is illustrated in Figure 1.

192

193 Following the previous step, the authors further searched the papers identified for  
 194 reference to Supply Chains as indicated in Table 1 in order to broadly capture the  
 195 potential list of studies that might be related to the authors’ research questions. This  
 196 resulted in 1074 unique articles. To further improve the quality of papers being  
 197 reviewed the authors excluded journals where the 5-year impact factor was less than

198 3.0 for science journals and 1.0 for social science journals. As noted by Moed (2010)  
199 impact factors vary between disciplines, with science journals often having higher  
200 impact factors than those in the social sciences, by setting these levels the authors  
201 intend to capture only research published in highly rated journals. After excluding all  
202 articles with 5-year impact factor less than the journal's exclusion criteria, 546 unique  
203 articles remained.

204

205 The penultimate step of the review consisted of reading the titles, abstracts and key  
206 words of all unique citations with one criteria: remove papers with abstracts that  
207 describe content not relevant to the research topic. The process of initial review by  
208 title, abstract and key words, follows the two-tier methodology proposed by Keupp et  
209 al. (2012) and Denyer and Neely (2004) to reduce subjective bias, encourage  
210 transparency and enhance validity. To achieve this, the authors organized themselves  
211 into two groups that undertook the review independently of each other. The use of a  
212 two-phase review process is identical in purpose to the expert panel used by Tranfield  
213 (2003) and Leseure et al. (2005). The review began with a general agreement on the  
214 inclusion/exclusion criteria for the purpose of excluding non-relevant papers  
215 according to the authors' views of supply chain sustainability and decision-making  
216 performance metrics. This resulted in 132 articles remaining.

217

218

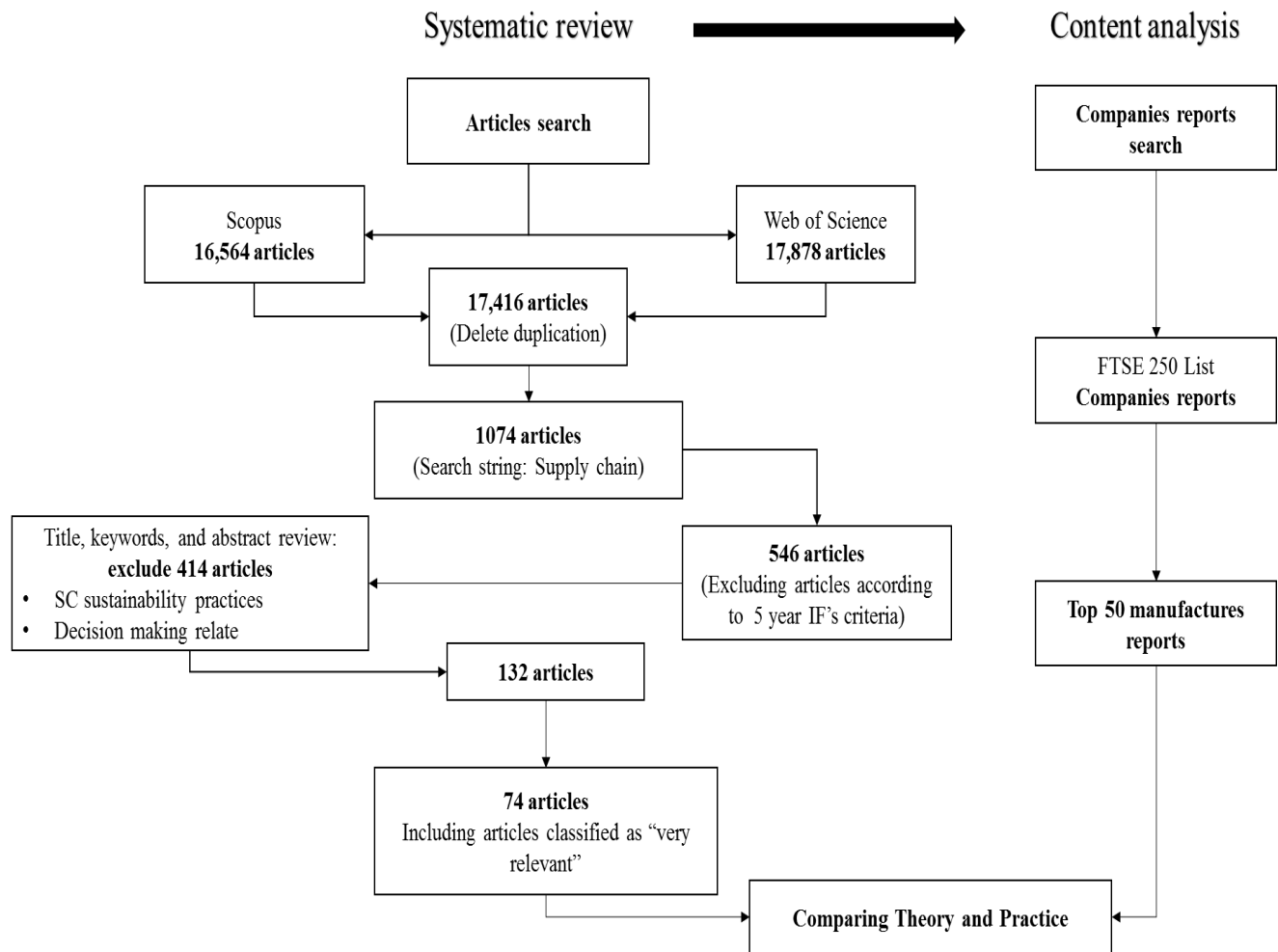


Figure 1: The Methodology Overview

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220

221

222

223 These 132 articles were read in full by the authors to grade as “limited relevance”,  
 224 “somewhat relevant” and “very relevant” as such to identify their direct relevance to  
 225 the research questions. This resulted in 74 articles been classified as “very relevant”  
 226 to the authors’ research.

227

228 By applying these systematic principles, this review has sought to gather all relevant  
 229 research in the field, so as to make sense of it, encourage openness and enable validity  
 230 in research repetition (Tranfield et al., 2003). Collection of all relevant research at a  
 231 point in time also provides the foundations for new research questions to be posed.  
 232 However, this method is not without its limitations. Challenges encountered in this  
 233 study were similar to the limitations highlighted by Pittaway et al (2004) and Leseure  
 234 (2005). The key word search of “sustainability” is ambiguous, resulting in  
 235 publications from journals from multiple disciplines as well as topics outside the  
 236 scope of this study. Synthesizing a broad range of topics, industry and outcomes was  
 237 challenging. Action oriented discussions on precise definitions of the search terms,



238 inclusion and exclusion criteria, contributed to the authors' efforts in finalizing the list  
 239 of papers relevant to this study. In addition, there were risks associated with filtering  
 240 papers based on their abstracts. As highlighted by Pittaway et al (2004), much  
 241 depends on the quality of the written abstract, and consequently some relevant papers  
 242 may have been mislabelled and excluded for the final list. To mitigate part of this risk,  
 243 papers whose abstracts indicated that it may fall into category either "somewhat  
 244 relevant" or "very relevant" were read in detail to determine whether or not they  
 245 belong to the later.

246  
 247

### 248 **3. Findings and Discussion from the Systematic Literature** 249 **Review**

250

251 The authors' analysis found 74 papers clearly focused on supply chain  
 252 practices/mechanism to facilitate the decision-making process in the context of  
 253 sustainability. The distribution by journal is shown in Table 2. The Journal of Cleaner  
 254 Production is clearly the leading journal in this context as evidenced in our results.  
 255 This finding is noteworthy due to the fact that this journal is not listed in the  
 256 Academic Journal Guide 2015, which is widely used as a reference for UK business  
 257 school researchers, whilst its impact factor is respectfully high in its own right. One  
 258 can argue that the interdisciplinary nature of sustainability triadic complexity, has led  
 259 to journal(s) that appreciate this lens.

260

261 Figure 2 presents the distribution of publications in this domain over time, indicating  
 262 a research field that has grown rapidly in the last decade.

263

264

Table 2 Ranking of journals by number of publications

Journal title	Number
Journal of Cleaner Production	16
International Journal of Production Research	6
International Journal of Production Economics	5
International Journal of Physical Distribution and Logistics Management	4
Supply Chain Management-an International Journal	4
Ecological Economics	2
International Journal of Logistics Management	2
International Journal of Operations & Production Management	2
Journal of Business Ethics	2
Journal of Environmental Management	2
Journal of Supply Chain Management	2
Resources Conservation and Recycling	2
Resources Policy	2
Technological and Economic Development of Economy	2

Transportation Research Part E-Logistics and Transportation Review	2
Bioresource Technology	1
Business Strategy and the Environment	1
Corporate Social Responsibility and Environmental Management	1
Decision Sciences	1
Energy Conversion and Management	1
Energy Policy	1
Environmental Science and Technology	1
European Management Journal	1
Food Policy	1
IEEE Transactions on Engineering Management	1
Industrial Marketing Management	1
International Journal of Life Cycle Assessment	1
International Journal of Sustainable Transportation	1
Journal of Operations Management	1
Journal of Purchasing and Supply Management	1
Omega (United Kingdom)	1
Production Planning & Control	1
Renewable and Sustainable Energy Reviews	1
Transportation Research Part D: Transport and Environment	1

265  
266  
267

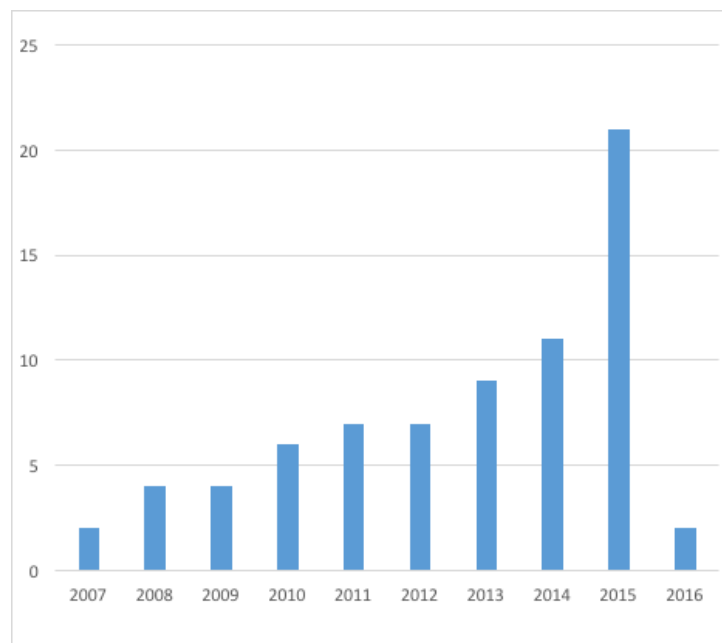


Figure 2: Time distribution of sample publications

268  
269  
270  
271  
272

The authors then categorized these papers into a number of key themes based on the

273 fundamental nexus of the debate on the interrelationship between sustainable  
274 performance metrics in business decision-making models. These are discussed below:  
275

### 276 **3.1 Triple-bottom line perspective:**

277 The number of papers regarding sustainability within the supply chain management  
278 discipline has grown significantly during the last decade. The economic perspective,  
279 within the subject, is the most documented performance metric, which almost all of  
280 the sample papers mention. However, most consider traditional accounting  
281 measurements of focal companies such as cost, revenue, and profitability to guide the  
282 economic business decision (Taticchi et al., 2015). Only a few consider profit-sharing  
283 indicators for the supply chain partners. As suggested by Taticchi et al., (2015) a  
284 future economic sustainability performance indicator should emphasize the  
285 importance of a cooperative relationship, instead of a competitive relationship with  
286 separate units measuring using traditional accounting methods, between the value  
287 chain partners to facilitate information share in their efforts to improve their overall  
288 sustainability performance. Due to the comparative nature of the study and the limited  
289 information disclosure of the sample companies, the triple-bottom line perspective the  
290 authors focused on is at the operational level (company level) performance metrics  
291 instead of the country-level macroeconomic sustainable performance metrics, though  
292 the authors have seen a sound progress towards this path (Vahabzadeh 2015; Vachon  
293 and Mao 2008).

294  
295 It is worthwhile to note that most papers in the authors' sample have made a  
296 concerted effort to advance environmental measurements. Measurements include, but  
297 not limited to carbon emission (Koh et al., 2013; Lake et al., 2015; Gadema and  
298 Oglethorpe, 2011; Fichtinger), natural and material resources usage (Liu et al., 2012;  
299 Pimentel et al., 2016; Wu and Pagell, 2011) and waste generated from products and  
300 materials (Nagurney et al., 2015; Verghese, 2010; Bai and Sarkis, 2014). Hassini et al.,  
301 (2012) suggested that although there is no obvious shortage of environmental metrics,  
302 it is still challenging to know when to use which one and how to decide between these.  
303 A more fine-grained industry-oriented performance metrics should be studied and  
304 developed to answer this call. Over the sample period, the authors saw a diversified  
305 sample of industries across different institutional background including: the  
306 construction minerals industry in China (Chen et al., (2015); US hospital industry  
307 (Kumar et al., 2008), U.S. Diaper production case (Adhitya et al., 2011); Brazilian  
308 energy sector (Matos and Silvestre, 2013); automotive suppliers (Subramoniam,  
309 2009); Food industry (Gadema and Oglethorpe, 2011) and fashion industry (Li,  
310 2014).

311  
312 A comprehensive list of indicators to measure social performance is proposed by the  
313 UN in "Indicators of Sustainable Development: Guidelines and Methodologies (2007)"  
314 and a growing number of authors has started to use it as a guide to conduct their work.

315 However, there exist a gap between theory and implementation to operationalize the  
316 social performance metrics in decision-making related to supply chains. A more  
317 detailed comparison with social measurements currently employed by UK top  
318 companies is presented in the next section. Among the sample literature, the authors  
319 observe an increasing application using a more holistic concept of corporate social  
320 responsibility (CSR) to acknowledge the importance of social aspect to guide business  
321 decisions, see Hutchins and Sutherland (2008); Morali and Searcy (2013); Li et al.  
322 (2014). Hutchins and Sutherland (2008) made a significant advance by including  
323 measures of social sustainability into business decision-making practice by proposing  
324 several measures such as labour equity, healthcare, safety, and philanthropy, which are  
325 discussed in their social Life Cycle Assessment (LCA) model that not only provide  
326 insight into the mapping of corporate inputs and outputs into measures of social  
327 performance but also demonstrate corporate actions can be used to effect positive  
328 social change. Vachon and Mao (2008) attempt to link supply chain strength to  
329 sustainable social welfare in a country-level analysis and conclude that the number  
330 and quality of the suppliers and customers in a country (supply chain strength) is  
331 positively linked to a country's sustainable development.

332

333 Table 3 outlines the performance measures of the three perspectives of the triple  
334 bottom line as identified within the selected literature.

Table 3: Sustainable measurements discussed in the literature

Sustainability perspective	Code	Measurements
Economic	E1	Costs (Metta and Badurdeen, 2013, Chaabane et al., 2012, Wang and Hsu, 2010, Adhitya et al., 2011)
	E2	Revenues (Metta and Badurdeen, 2013, Chaabane et al., 2012, Choudhary et al., 2015, Adhitya et al., 2011, Awudu and Zhang, 2012)
	E3	Profit sharing (Chaabane et al., 2012, Wang and Hsu, 2010, Adhitya et al., 2011)
	E4	Creating sustainability value (relates environmental and social) (Pimentel et al., 2016, Zhang and Awasthi, 2014, Huq et al., 2014, Awudu and Zhang, 2012)
Environmental	EN1	Emission reduction/ climate change (Tseng and Hung, 2014; Koh, et al., 2013; Lake et al., 2015; Gadema and Oglethorpe, 2011; Elghali, et al., 2007)
	EN2	Natural sources' usage (energy efficiency) (Elghali, et al., 2007; Cucchiella and D'Adamo, 2013, van Hoek and Johnson, 2010)
	EN3	Waste reduction (Nagurney et al., 2015; Harms et al., 2013, Erol et al., 2011)
	EN4	Used product or material 's disposal (Erol et al., 2011, Subramoniam et al., 2009)
	EN5	Use of recycle materials (Harms et al., 2013, Erol et al., 2011, Rostamzadeh et al., 2015)
	EN6	Choice of suppliers by considering the environmental criteria (Shen et al., 2013, Rostamzadeh et al., 2015, Sarkis and Dhavale, 2015)
Social	S1	Degree of job localisation (Koh et al., 2013; Harms et al., 2013)
	S2	Human rights (Harms et al., 2013, Muduli et al., 2013)
	S3	Employee CSR training (Koh et al., 2013; Muduli et al., 2013)
	S4	Health care and safety (Hutchins and Sutherland, 2008; Muduli et al., 2013)
	S5	Degree of purchasing localisation (Koh et al., 2013; Subramoniam et al., 2009)
	S6	Labour equity (Hutchins and Sutherland, 2008)
	S7	Community (compliance, volunteer, charity, and ethic) (Koh et al., 2013; Hutchins and Sutherland, 2008)

337 Conceptually sustainability considers the interrelationships between environmental,  
338 social, and economic objectives. Increasingly, research tries to integrate all the three  
339 perspectives. It must be emphasised that interrelationship and integration of the triple  
340 perspectives are two very different concepts. The former, which is the focus of the  
341 study, emphasises on the complex interactions amongst the perspectives, whilst the  
342 later focuses on the combinatorial effects. The combinatorial effects of the integration  
343 of the triple perspectives have already been theorised and demonstrated (e.g. See Koh  
344 et al, 2016).

345

346 Little is understood about the interrelationship of the triple perspectives. Among the  
347 selected papers examining the issue, they tend to follow a win-win paradigm, which  
348 means economic, environmental and social perspectives can be achieved  
349 simultaneously. This key assumption often serves as a foundation to build the  
350 proposed business model. More specifically, they tend to assume that there is causal  
351 relationship in that improved environmental and social performance lead to sound  
352 economic performance. Only a few recognise there might be a short term negative  
353 relationship among the trade-off of the three perspectives. Such a win-win paradigm  
354 also assumes a long term positive relationship could be achieved.

355

356 Interestingly, the results from a boarder range of sustainability literature reviewed in  
357 the study seem to be less supportive of such win-win assumption. Therefore, the  
358 authors call for further research to examine this key assumption underpinning the  
359 sustainable business model building.

360

361 Generally, there are two strands of research supporting this win-win paradigm. One  
362 suggests that the managerial skills of a company with improved social and  
363 environmental performance is transferable to the company's economic activities  
364 (Waddock and Graves, 1997, Frooman, 1997, Schuler and Cording, 2006). As a result,  
365 the stakeholders reward companies with such 'good management skills' through  
366 activities such as investment, consumption and higher productivity from employees.  
367 Hence, the economic performance is realised. Similarly, another set of research based  
368 on the stakeholder theory suggests that the mutual trust and cooperation with  
369 stakeholders reduces the negotiation and contracting costs, both implicit and explicit,  
370 and serve as control mechanisms that significantly reduces the likelihood of managers'  
371 opportunistic behaviour and pushing them to adopt a long-term orientation (Jones,  
372 1995; Choi and Wang, 2009; Eccles, Ioannou and Serafeim, 2014). The stakeholder  
373 theory thus implies that a company with improved environmental and social practices  
374 should realize lower costs of managing stakeholder relationships and therefore, should  
375 earn better economic performance than firms with bad social and environmental  
376 practices, vis-à-vis poorly managed stakeholder relationship (Jones, 1995).  
377 Furthermore, by addressing the claims of stakeholders, managers can increase the  
378 efficiency of their organization's adaptation to external demands and hence increase

379 economic performance.

380

381 On the contrary, two strands of theories and empirical studies suggest a negative  
382 relationship between environmental and social performance and economic  
383 performance. One theory suggests that managers who practice environmental and  
384 social activities neglect to take opportunity cost of such actions into account and  
385 consequently, sacrifice more profitable activities for the company (Schuler and  
386 Cording, 2006). Over time, such activities result in poor economic performance. The  
387 other theory is based on agency cost theory state that managers engage in  
388 environmental and social practices for their own personal interests because it is  
389 difficult for owners to monitor the behaviour of managers (Schuler and Cording,  
390 2006). As such, this theory implies that managers, who direct resources toward social  
391 and environmental projects, fail to put resources to their highest productive use and,  
392 over time, fail to maximize the company's economic performance.

393

394 Unlike the previous findings of either a positive or a negative causal relationship from  
395 environmental and social practice to economic performance, affordability theory,  
396 suggests a totally reverse causality. This theory claims that only firms with adequate  
397 economic performance can afford to pursue the costly social and economic activities.  
398 As a result, the causality of affordability model is that improved economic  
399 performance leads to environmental and social practice. Carroll (1979) argue that by  
400 managing wisely for economic, then legal, then ethical domains, managers can then  
401 disperse resources to philanthropic activities to be a good corporate citizen. Schuler  
402 and Cording (2006) suggest that companies such as Anheuser-Busch, Coca-Cola, Eli  
403 Lilly, Philip Morris, and Target etc., devoting a portion of their pre-tax income to fund  
404 various philanthropic projects, is a group of companies fitting this category.

405

406 Therefore, the debateable win-win or trade-off assumption underpinning the business  
407 model building must be examined before a robust model could be proposed. To be  
408 more specific, whether environmental and social activities for a particular company or  
409 industry really lead to improved economic performance need to be carefully  
410 interpreted. More interestingly, it is not simply a question of whether considering  
411 social and environmental perspectives in business decision making lead to improved  
412 economic performance; the literature has already shown that this can be achieved and  
413 have already been demonstrated by (Koh, et al, 2016), it is a matter of how, why and  
414 what types of interrelationships exist to support such business decision making  
415 leading to a win-win paradigm, vis a vis to avoid failure. In another word, what makes  
416 those assumption work and those leading organisations successful in achieving  
417 improved performance considering all triple perspective.

418

419 One opposition for such radical thinking may go as follows: if the authors succeed in  
420 understanding a reverse causality from better economic performance to social and

421 environmental performance, does this to justify sacrificing environmental and social  
422 welfare to economic benefits and therefore is it futile to concentrate on the social and  
423 environmental aspects. This objection rests on a common tendency to confuse an  
424 explanation of causes with a justification or acceptance of results (Diamond, 1998).  
425 Understanding is more often used to try to alter an outcome than to repeat or  
426 perpetuate it. “This is why psychologists try to understand the minds of murders and  
427 rapists, why physicians try to understand the cause of human disease. Investigators do  
428 not seek to justify murder, rape and illness. Instead, they seek to use their  
429 understanding of a chain of cause to interrupt the chain” (Diamond, 1998, pp. 28).  
430 With this critical lens in mind, the authors attempt to advance prior research by  
431 extending not only the conditions in which the win-win assumptions can be  
432 understood which test repeatability, but also the behavioural discourse in terms of  
433 potential pitfalls and sacrifices in the trade-off in order to achieve a balanced and just  
434 outcome for sustainable business decision making.

435

436 The authors interpret this equivocal results of these theories and empirical studies by  
437 recognising that not all groups of stakeholders have similar reaction to company  
438 environmental and social activities: one groups positive reaction may cause a negative  
439 response from another group, confounding these activities and impact on economic  
440 performance. For instance, a firm's practice to donate local communities in which its  
441 stores operate may be praised by their local employee but criticized by distant  
442 shareholders. Thus, a more fine-grained analysis of a particular group is required so as  
443 to fully understand this relationship. More generally, a contingency perspective of  
444 business model building that states that the economic performance required conforms  
445 to levels of environmental and social activities for certain firms at points in time  
446 should be called for. That is to say, more research into any causal relationship with  
447 moderator effect (under what circumstance) and mediating effect (in what ways) is  
448 necessary to understand this relationship and integrate into business decision-making  
449 models.

450

451 Such moderating and mediating effects in business decision-making processes are  
452 related to a board literature of corporate governance mechanisms. Though there are  
453 various definition for this concept, it generally includes a set of arrangements that  
454 “coordinate all stakeholder interests to ensure that the decision-making is more  
455 scientific and safeguards all corporate interests” (Li et al., 2014), (see also Gillan,  
456 2006; Jensen, 2002; Zingales, 1998). These sets of arrangements can be at formal  
457 institutional level such as legal and political system (Campbell, 2007) or informal  
458 institutional level such as cultural beliefs and norms (Joyner and Payne, 2002), at firm  
459 level, such as ownership structure (Johnson and Greening, 1999), at group level such  
460 as board structure (Sanders and Carpenter, 1998), board demography (Daily et al.,  
461 2003), board social capital (Hillman and Dalziel, 2003), and at individual level, such  
462 as CEO age (Godos-Díez et al., 2011), gender (Bear et al., 2010), qualification (Abdul



463 and Ibrahim, 2002), experience (Bear et al., 2010) and political ideology (Chin et al.,  
464 2013). As such, the authors recommend that greater scholarly attention needs to be  
465 accorded to incorporating the multi-level corporate governance mechanism into  
466 model building and how multiple configurations of the corporate governance  
467 mechanism interact and combine to impact firm decision-making processes regarding  
468 sustainable supply chain management from the perspective of moderating and  
469 mediating effects. More generally, the authors suggest that business decision-making  
470 and corporate governance mechanism in the context of sustainable supply chain  
471 management research should employ multi-theoretical lens as reviewed above and  
472 apply sophisticated qualitative and quantitative methods such as instrumental  
473 variables and the Heckman (1979) two-stage estimation approach to enable a deeper  
474 and finer-grained analysis of the casual relationship.

475

### 476 **3.2 The difference between academic theory and industrial practice**

477

478 To answer the question, whether industry uses the performance metrics suggested by  
479 academia, the top 50 manufactures from FTSE 250 were selected for analysis. The  
480 UK has a mature policy environment towards sustainability and extensive reporting  
481 requirements that do not exist in less mature economies. Firms listed on the London  
482 Stock Exchange represent a broad spectrum of industries that function in multiple  
483 markets. By comparing the difference between the theory and practice of such a  
484 market, the authors seek to identify where gaps exist and where efforts need to be  
485 focussed from both a theoretical and practitioner perspective. The results of this study  
486 can serve as an indicator for other emerging or less developed markets of the impact  
487 of these differences on sustainability, decision-making and supply chain management  
488 across different sectors. Such differences can also provide the foundation for further  
489 academic research and the groundwork for managerial practice for both developed  
490 and developing economies.

491

492 To collect this data, multiple data sources are used, including Annual Reports (AR),  
493 Corporate Responsibility Report (CRR), and Sustainability Report (SR). This study  
494 focuses on the financial year 2015 because this provided the most up to date  
495 information for each company. The reports were download directly from the  
496 companies' website and the sample companies are presented in Table 4. The  
497 companies have been anonymized in the table and subsequent analysis.

Table 4: Sustainability Report Disclosure for Sample Companies

	Companies	Industry	Sustainability Report (SR)	Corporate Responsibility Report (CRR)
Aerospace, Building Materials, Automotive, Technology, Plastic, Engineering	A1	Military		Individual CRR
	A2	Aerospace, defence	SR in AR	CRR in AR
	A3	Building materials	Individual SR	CRR in AR
	A4	Technical products and services		CRR in AR
	A5	Plastic products		CRR in AR
	A6	Automotive Aerospace	SR in AR	
	A7	Building materials		CRR in AR
	A8	Technology		CRR in AR
	A9	Building materials	Mentioned in AR	
	A10	Manufacturing		CRR in AR
	A11	Packaging and Paper	Individual SR	
	A12	Aerospace, Defence, Energy, Marine		Individual CRR
	A13	Engineering		Individual CRR
	A14	Building materials	SR in AR	
Food, Beverage, Tobacco	F1	Beverages		CRR in AR
	F2	Food		Individual CRR
	F3	Tobacco	Individual SR	
	F4	Soft drink	Individual SR	
	F5	Food	Individual SR	
	F6	Food		CRR in AR
	F7	Food		CRR in AR
	F8	Tobacco		Individual CRR
	F9	Beverages	Individual SR	
	F10	Dairy Products		CRR in AR
Chemical, Medicine, Pharmacy	CH1	Pharmaceuticals	SR in AR	
	CH2	Chemicals	Individual SR	
	CH3	Pharmaceuticals		CRR in AR
	CH4	Biotechnology		CRR in AR
	CH5	Pharmaceuticals	SR in AR	
	CH6	Pharmaceuticals		Individual CRR
	CH7	pharmaceuticals		CRR in AR
	CH8	Pharmaceuticals	SR mentioned in AR	
	CH9	Medical	Individual SR	

Table 4 Continued

Cluster	Companies	Industry	Sustainability Report (SR)	Corporate Responsibility Report (CRR)
Mining, Oil, Gas, Natural Stone	M1	Mining	Individual SR	
	M2	Mining	Individual SR (2014)	
	M3	Mining	Individual SR	
	M4	Oil and gas	Individual SR	
	M5	Chemicals		CRR in AR
	M6	Steel, Mining		CRR in AR
	M7	Mining	SR in AR	
	M8	Mining	Individual SR	
	M9	Chemicals	SR in AR	
	M10	Mining		CRR in AR
	M11	Natural stone and concrete hard landscaping	SR in AR	
	M12	Mining	SR in AR	
	M13	Oil and gas	Individual SR	
Consumer Goods	C1	Fashion	SR in AR	
	C2	Consumer	Individual SR	
	C3	Consumer goods	Individual SR	
	C4	Consumer goods	Online	CRR in AR

501

502 In the authors' sample, almost all of companies disclose the sustainability issues with  
503 around 32% of companies having separate sustainability reports and 12% having  
504 separate corporate responsibility reports. The remaining companies disclose  
505 sustainability issues in annual reports. Comparing companies disclosing sustainability  
506 issue in the annual reports, companies with individual CRR or SR reports tend to be  
507 more concerned with sustainability practice since they can reveal the sustainability  
508 issue in more details within separate reports while the companies reporting  
509 sustainability in annual reports merely put sustainability issues in strategic section  
510 with limited actionable practices. It is noteworthy that the industry with greater  
511 proportions of sustainability disclosed practices is Consumer Goods Industry with 4  
512 out of 4 has separate sustainability reports, following by Mining, Oil and Gas, Nature  
513 Stone Industry with 7 out of 10, which is justified by heavy marketing schemes  
514 regarding sustainability from Consumer Goods industry and the resource consumption  
515 nature of Mining and Oil and Gas industries.

516

517

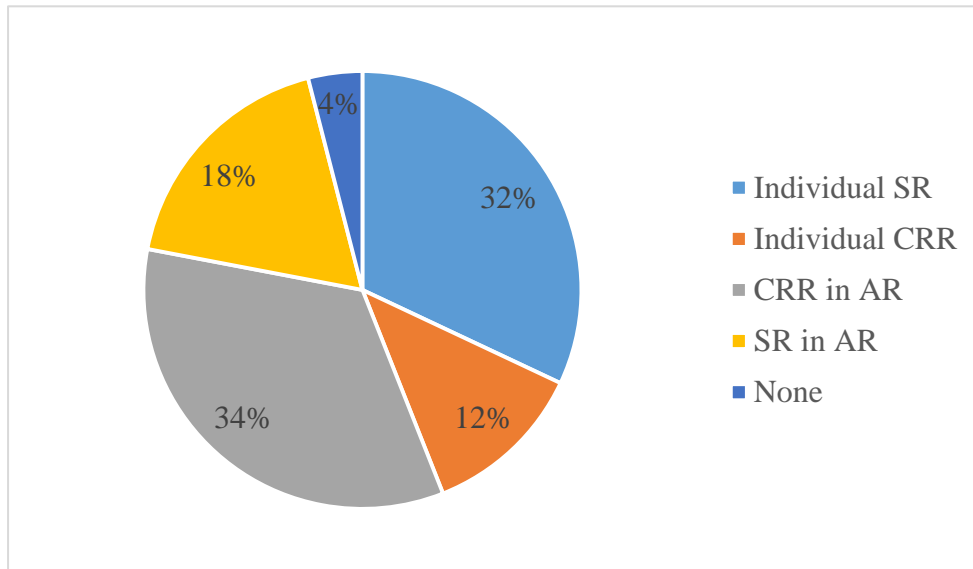


Figure 3: Distribution of companies' SR and CRR disclosure

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519

520

521 The authors categorized the measures identified from the systematic review, Table 3,  
 522 to examine, which performance metrics have been used in the company's report  
 523 sustainability performance. All the companies receive a score of 0 or 1 on each of  
 524 corresponding economic, environmental and social measures, 1 means the company  
 525 did disclose the information otherwise it is 0.

526

527 The results presented in Table 5 show that all the metrics identified in the literature  
 528 are used by at least company. Only three metrics are reported by all the firms  
 529 researched, EN1, emissions reduction/climate change; S4 Health and Safety; S7,  
 530 community. This prevalence is almost certainly due to statutory reporting  
 531 requirements. The majority of all the metrics identified in the literature were reported  
 532 on by the majority of the selected companies. It is interesting to note that three of the  
 533 metrics were reported by less than half the companies. S1, Degree of job localisation  
 534 was reported by only 10 firms, this perhaps reflects the multinational nature of these  
 535 companies. S6, labour equity was reported by only 16 companies and E4, creating  
 536 sustainability value was reported by only 20 companies. These represent the largest  
 537 gaps between theory and practice within the companies researched.

538

539 In order to visualise the level of reporting against each of the perspectives of  
 540 sustainability the results from Table 5 were graphed as presented in Figure 4. The  
 541 x-axis and y-axis are the aggregated scores against the disclosed perspectives. The  
 542 environmental and social metrics have been combined into a single scale to allow for  
 543 clear comparison with the more traditional economic metrics. Each quartile of these  
 544 figures represents a different profile of reporting against the three perspectives. The  
 545 High-High quartile represents companies that report the majority of all three

546 perspectives' performance metrics. The Low – Low quartile identifies companies that  
547 report a minority of both economic, social and environmental metrics potentially  
548 identifying companies that report only to comply with statutory requirements. The  
549 High – Low quartile represents companies that reported against more than half of the  
550 environmental and social metrics but a half or less of the economic metrics,  
551 suggesting firms that are interested in demonstrating a wider commitment to  
552 sustainability. The Low – High quartile represents firms that used the majority of  
553 economic metrics but a minority of social and environmental metrics.

554

555 All four firms in the Consumer Goods industry are in the High – High quartile,  
556 reporting against the majority of both economic and social and environmental metrics,  
557 this perhaps reflects consumer pressure to demonstrate strong sustainability  
558 credentials in this sector. In the Mining, Oil and Gas and Natural Stone sector all  
559 companies report a high number of social and environmental metrics, however three  
560 slip into the High – Low quartile by reporting on only two economic metrics. In the  
561 Food, Beverage, and Tobacco industry sector companies paid attention on the social  
562 and environmental aspects, probably due to the nature of business, but nearly half of  
563 the companies disclose fewer economic measurements from the perspective of the  
564 academic literature. The picture is more mixed in both the Chemical, Medical and  
565 Pharmaceutical sector and the Aerospace, Building Materials, Automotive,  
566 Technology, Plastics and Engineering sector. This probably reflects the highly diverse  
567 nature of the companies within these two sectors.

568

569 It is heartening to note that majority of metrics identified in the academic literature  
570 are used by at least some companies within the authors' sample. In all sectors the  
571 majority of companies report against a wide range of social and environmental  
572 metrics suggesting that companies see the benefit of reporting on these or are obliged  
573 to do so for regulatory reasons. The Consumer Goods sector with all companies in the  
574 High – High quartile could be said to be most closely following the triple bottom line  
575 approach reporting extensively on all three perspectives.

576

577 The classification into the quartiles outlined above presents to both practitioners and  
578 academics a simple method for identifying the balance struck by firms in reconciling  
579 the trade offs between economic and social and environmental aspects of their  
580 decision-making.

581

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Table 5: A Comparison of Measurements Employed Industry Reports and in Academic Literature

Industry	Code of companies	Economic				Environmental						Social						
		E1	E2	E3	E4	E N 1	E N 2	E N 3	E N 4	E N 5	E N 6	S1	S2	S3	S4	S5	S6	S7
Aerospace, Building materials, Automotive, Technology, Plastic, Engineering	A1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1
	A2	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	0	1
	A3	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	1
	A4	1	1	0	0	1	1	0	1	0	1	0	0	1	1	1	0	1
	A5	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	1
	A6	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	1
	A7	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	0	1
	A8	1	1	0	0	1	0	1	0	0	0	0	1	1	1	1	0	1
	A9	1	1	0	0	1	1	1	1	1	0	0	1	0	1	0	0	1
	A10	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	0	1
	A11	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	A12	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	1
	A13	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1
	A14	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	0	1
Food, Beverage, Tobacco	F1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	0	1
	F2	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1
	F3	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1
	F4	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1
	F5	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	0	1
	F6	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1
	F7	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	0	1
	F8	1	1	0	1	1	1	1	0	0	1	0	1	1	1	1	0	1
	F9	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
	F10	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1
Chemical, Medicine, Pharmacy	CH1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1
	CH2	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1
	CH3	1	1	1	1	1	0	1	0	1	0	0	1	1	1	1	0	1
	CH4	1	1	0	0	1	0	1	0	0	1	1	1	1	1	0	1	1
	CH5	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	0	1
	CH6	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	0	1
	CH7	1	1	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0
	CH8	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1
	CH9	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	1
Mining, Oil, Gas, Nature Stone	M1	1	1	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1
	M2	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
	M3	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	0	1
	M4	1	1	0	0	1	1	1	1	1	0	0	1	1	1	0	0	1
	M5	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	0	1
	M6	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	0	1
	M7	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
	M8	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1
	M9	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	1
	M10	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	0	1
	M11	1	1	0	1	1	1	1	0	0	0	0	1	1	1	1	0	1
	M12	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
	M13	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
Consumer Goods	C1	1	1	1		1	1	1	0	1	1	1	1	1	1	1	1	1
	C2	1	1	1	0	1	1	1	0	1	1	0	1	1	1	0	0	1
	C3	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1
	C4	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1

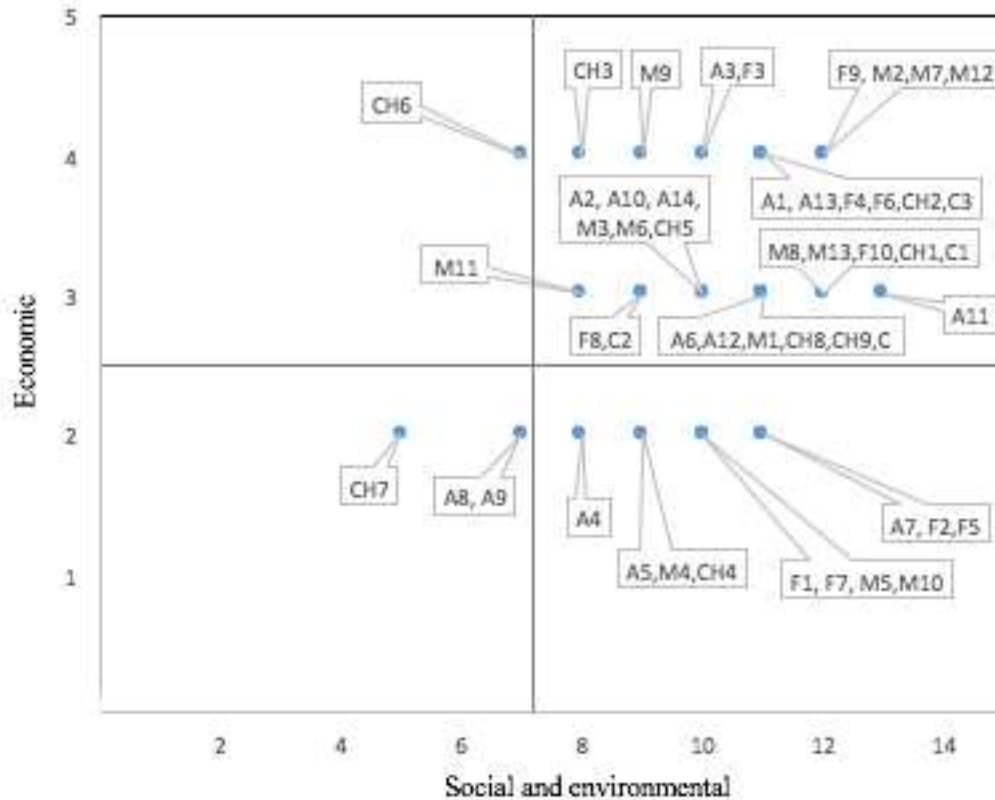


Figure 4 Distribution of performance metrics employed by industries

#### 4. Conclusion and Future Research

To conclude, this study has provided a critical review of the status of performance metrics employed in business decision-making for sustainable supply chain management.

Adopting a rigorous systematic review methodology (Pittaway et al., 2004), this study started with 17416 articles as the baseline and they were filtered down to 1074 articles within the supply chain literature. The 1074 articles were reviewed and further filtered down to 74 articles that were analysed in depth. The review of these scientific papers were triangulated with the annual reports of the Top 50 companies in the FTSE250. This combined approach of theoretical and practical lens forms the basis of this in-depth review.

The authors found, that notwithstanding the fact that many researchers have examined social and environmental perspectives in supply chains, a gap still exist between the desirability of sustainability results and its implementation in reality for improved business decision making. This often occurs when the sustainable performance metrics in theory and practice are unclear and lack applicable governance mechanism to guide the business decision-making process. This study has tried to fill this gap by

615 providing a review of the existing knowledge to highlight the need for further  
616 research in these areas.

617

618 In addition, the win-win paradigm assuming positive outcome as a result of adopting  
619 sustainability practices was questioned. Consistent with the views of many  
620 researchers, work has been done to understand the integration of the triple  
621 perspectives, but little research can be found examining the interrelationship between  
622 the triple perspectives. The authors propose future research to develop innovative  
623 metrics that encourage cooperative relationships, instead of competitive relationships,  
624 and to rethink traditional accounting methods and thus improve the sustainability over  
625 the whole value chain.

626

627 Future research should not only consider the three perspectives in isolation, but  
628 consider the interrelationship between the perspectives to provide a better  
629 understanding of a balanced decision-making process in order to achieve a win-win  
630 outcome or optimised trade-off choice between Triple Bottom Line (TBL)  
631 sustainability factors, particularly under different corporate governance mechanism.  
632 Given varied formal institutional level governance mechanisms such as legal and  
633 political system and ownership structures, and informal institutional level governance  
634 mechanisms, such as cultural beliefs and norms, board structure, board demography,  
635 board social capital, and individual factors, such as CEO age, gender, qualification,  
636 experience, and political ideology the modelling of these will be complex but if  
637 successful will contribute to the development of more sustainable supply chains.



638 **References**

639

640 Abdul, Z. and Ibrahim, S., 2002. Executive and management attitudes towards  
641 corporate social responsibility in Malaysia. *Corporate Governance: The*  
642 *International Journal of Business in Society*, 2(4), pp.10-16.  
643 <http://dx.doi.org/10.1108/14720700210447641>.

644 Adhitya, A., Halim, I. and Srinivasan, R. 2011. Decision support for green supply  
645 chain operations by integrating dynamic simulation and LCA indicators:  
646 Diaper case study". *Environmental Science and Technology*, 45 (23),  
647 pp.10178-10185. <http://dx.doi.org/10.1021/es201763q>.

648 Awudu, I. and Zhang, J.2012. Uncertainties and sustainability concepts in biofuel  
649 supply chain management: A review. *Renewable and Sustainable Energy*  
650 *Reviews*, 16 (2), pp.1359-1368. <http://dx.doi.org/10.1016/j.rser.2011.10.016>.

651 Bai, C. G. and Sarkis, J. 2014. Determining and applying sustainable supplier key  
652 performance indicators. *Supply Chain Management-an International Journal*,  
653 19 (3), pp.275-291. <http://dx.doi.org/10.1108/Scm-12-2013-0441>.

654 Bai, C., Sarkis, J., Wei, X. and Koh, L. 2012. Evaluating ecological sustainable  
655 performance measures for supply chain management. *Supply Chain*  
656 *Management: An International Journal*, 17 (1), pp.78-92.  
657 <http://dx.doi.org/10.1108/13598541211212221>.

658 Bear, S., Rahman, N. and Post, C., 2010. The impact of board diversity and gender  
659 composition on corporate social responsibility and firm reputation. *Journal of*  
660 *Business Ethics*, 97(2), pp.207-221.  
661 <http://dx.doi.org/10.1007/s10551-010-0505-2>.

662 Campbell, J.L., 2007. Why would corporations behave in socially responsible ways?  
663 An institutional theory of corporate social responsibility. *Academy of*  
664 *Management Review*, 32(3), pp.946-967.  
665 <http://dx.doi.org/10.5465/AMR.2007.25275684>.

666 Carroll, A. B. 1979. A three-dimensional conceptual model of corporate performance.  
667 *Academy of Management Review*, 4(4), pp. 497-505. <http://dx.doi.org/10.5465/AMR.1979.4498296>.

669 Chaabane, A., Ramudhin, A. and Paquet, M. 2012. Design of sustainable supply  
670 chains under the emission trading scheme. *International Journal of Production*  
671 *Economics*, 135(1), pp.37-49. <http://dx.doi.org/10.1016/j.ijpe.2010.10.025>.

672 Chen, R. H., Lin, Y. H. and Tseng, M. L. 2015. Multicriteria analysis of sustainable  
673 development indicators in the construction minerals industry in China.  
674 *Resources Policy*, 46, pp.123-133.  
675 <http://dx.doi.org/10.1016/j.resourpol.2014.10.012>.

676 Chin, M.K., Hambrick, D.C. and Treviño, L.K., 2013. Political ideologies of CEOs  
677 the influence of executives' values on corporate social responsibility.  
678 *Administrative Science Quarterly*, 58(2), pp.197-232.  
679 <http://dx.doi.org/10.1177/0001839213486984>.

680 Choi, J., and Wang, H. 2009. Stakeholder relations and the persistence of corporate  
681 financial performance. *Strategic Management Journal*, 30(8), pp. 895-907.  
682 <http://dx.doi.org/10.1002/smj.759>.

683 Choudhary, A., Sarkar, S., Settur, S. and Tiwari, M. K. 2015. A carbon market  
684 sensitive optimization model for integrated forward-reverse logistics.  
685 *International Journal of Production Economics*, 164, pp.433-444.  
686 <http://dx.doi.org/10.1016/j.ijpe.2014.08.015>.

687 Cucchiella, F. and D'Adamo, I. 2013. Issue on supply chain of renewable energy".  
688 *Energy Conversion and Management*, 76, pp.774-780.  
689 <http://dx.doi.org/10.1016/j.enconman.2013.07.081>.

690 Daily, C.M., Dalton, D.R. and Cannella, A.A., 2003. Corporate governance: Decades  
691 of dialogue and data. *Academy of management review*, 28(3), pp.371-382.  
692 <http://dx.doi.org/10.5465/AMR.2003.10196703>.

693 David, R.J. and Han, S.K., 2004. A systematic assessment of the empirical support for  
694 transaction cost economics. *Strategic management journal*, 25(1), pp.39-58.  
695 <http://dx.doi.org/10.1002/smj.359>.

696 Dekkers, R., Chang, C.M., and Kreutzfeldt, J., 2013. The interface between product  
697 design and engineering and manufacturing: A review of the literature and  
698 empirical evidence. *International Journal of Production Economics*, 144, pp.  
699 316-333. <http://dx.doi.org/10.1016/j.ijpe.2013.02.020>.

700 Denyer, D. and Neely, A. 2004. Introduction to special issue: Innovation and  
701 productivity performance in the UK. *International Journal of Management*  
702 *Reviews*, 5, pp.131-135. <http://dx.doi.org/10.1111/j.1460-8545.2004.00100.x>.

703 Diamond, J.M., 1998. *Guns, germs, and steel: A short history of everybody for the last*  
704 *13,000 years*. Random House.

705 Eccles, R. G., Ioannou, I., and Serafeim, G. 2014. The impact of corporate  
706 sustainability on organizational processes and performance. *Management*  
707 *Science*, 60(11), pp. 2835-2857. <http://dx.doi.org/10.1287/mnsc.2014.1984>.

708 Elghali, L., Clift, R., Sinclair, P., Panoutsou, C. and Bauen, A. 2007. Developing a  
709 sustainability framework for the assessment of bioenergy systems. *Energy*  
710 *Policy*, 35(12), pp.6075-6083. <http://dx.doi.org/10.1016/j.enpol.2007.08.036>.

711 Elkington, J., 1997. *Cannibals with forks. The triple bottom line of 21st century*.

712 Erol, I., Sencer, S. and Sari, R. 2011. A new fuzzy multi-criteria framework for  
713 measuring sustainability performance of a supply chain". *Ecological*  
714 *Economics*, 70(6), pp.1088-1100.  
715 <http://dx.doi.org/10.1016/j.ecolecon.2011.01.001>.

716 Faruk, A. C., Lamming, R. C., Cousins, P. D. and Bowen, F. E. 2001. Analyzing,  
717 Mapping, and Managing Environmental Impacts along Supply Chains. *Journal*  
718 *of Industrial Ecology*, 5(2), pp.13-36,  
719 <http://dx.doi.org/10.1162/10881980152830114>

720 Fichtinger, J., Ries, J. M., Grosse, E. H. and Baker, P. 2015. Assessing the  
721 environmental impact of integrated inventory and warehouse management.

722 International Journal of Production Economics, 170, pp.717-729.  
723 <http://dx.doi.org/10.1016/j.ijpe.2015.06.025>.

724 Fogliatto, F.S., Da Silveira, G.J.C., and Borenstein, D., 2012. The mass customization  
725 decade: an updated review of the literature. *International Journal of Production*  
726 *Economics* 138, pp. 14-25. <http://dx.doi.org/10.1016/j.ijpe.2012.03.002>.

727 Frooman, J. (1997). Socially irresponsible and illegal behavior and shareholder wealth  
728 a meta-analysis of event studies. *Business & Society*, 36(3), pp. 221-249.  
729 <http://dx.doi.org/10.1177/000765039703600302>.

730 Gadema, Z. and Oglethorpe, D. 2011. The use and usefulness of carbon labelling food:  
731 A policy perspective from a survey of UK supermarket shoppers. *Food Policy*,  
732 36, pp.815-822. <http://dx.doi.org/10.1016/j.foodpol.2011.08.001>.

733 Gillan, S. L. 2006. Recent Developments in Corporate Governance: An Overview.  
734 *Journal of Corporate Finance*, 12, pp.381-402.  
735 <http://dx.doi.org/10.1016/j.jcorpfin.2005.11.002>

736 Gimenez, C. and Tachizawa, E. M. 2012. Extending sustainability to suppliers: A  
737 systematic literature review. *Supply Chain Management-An International*  
738 *Journal*, 17, pp.531-543. <http://dx.doi.org/10.1108/13598541211258591>.

739 Godos-Díez, J.L., Fernández-Gago, R. and Martínez-Campillo, A., 2011. How  
740 important are CEOs to CSR practices? An analysis of the mediating effect of  
741 the perceived role of ethics and social responsibility. *Journal of Business*  
742 *Ethics*, 98(4), pp.531-548. <http://dx.doi.org/10.1007/s10551-010-0609-8>.

743 Gosling, J. and Naim, M.M., (2009). "Engineer-to-order supply chain management: A  
744 literature review and research agenda". *International Journal of Production*  
745 *Economics*, No. 122(2), pp.741-754.  
746 <http://dx.doi.org/10.1016/j.ijpe.2009.07.002>

747 Hacklin, F. and Wallnöfer, M. 2012. The business model in the practice of strategic  
748 decision making: insights from a case study. *Management Decision*, 50,  
749 pp.166-188. <http://dx.doi.org/10.1108/00251741211203515>.

750 Harms, D., Hansen, E. G. and Schaltegger, S. 2013. Strategies in sustainable supply  
751 chain management: An empirical investigation of large german companies.  
752 *Corporate Social Responsibility and Environmental Management*, 20,  
753 pp.205-218. <http://dx.doi.org/10.1002/csr.1293>.

754 Hassini, E., Surti, C. and Searcy, C. 2012. A literature review and a case study of  
755 sustainable supply chains with a focus on metrics. *International Journal of*  
756 *Production Economics*, 140, pp.69-82.  
757 <http://dx.doi.org/10.1016/j.ijpe.2012.01.042>

758 Heckman, J.J., 1979. Sample selection bias as a specification error. *Econometrica*,  
759 47(1), pp. <http://dx.doi.org/10.3386/w0172>.

760 Hervani, A., A., Helms, M., M. and Sarkis, J. 2005. Performance measurement for  
761 green supply chain management. *Benchmarking: An International Journal*, 12,  
762 pp.330-353. <http://dx.doi.org/10.1108/14635770510609015>

763 Hillman, A.J. and Dalziel, T., 2003. Boards of directors and firm performance:

764 Integrating agency and resource dependence perspectives". *Academy of*  
765 *Management Review*, 28(3), pp.383-396.  
766 <http://dx.doi.org/10.5465/AMR.2003.10196729>.

767 Hubbard, G., 2009. Measuring organizational performance: beyond the triple bottom  
768 line. *Business Strategy and the Environment*, 18(3), pp.177-191.  
769 <http://dx.doi.org/10.1002/bse.564>.

770 Huq, F. A., Stevenson, M. and Zorzini, M. 2014. Social sustainability in developing  
771 country suppliers An exploratory study in the ready made garments industry of  
772 Bangladesh". *International Journal of Operations and Production Management*,  
773 34, pp.610-638. <http://dx.doi.org/10.1108/Ijopm-10-2012-0467>

774 Hutchins, M. J. and Sutherland, J. W. 2008. An exploration of measures of social  
775 sustainability and their application to supply chain decisions. *Journal of*  
776 *Cleaner Production*, 16, pp.1688-1698.  
777 <http://dx.doi.org/10.1016/j.jclepro.2008.06.001>.

778 Jensen, M. C. 2002. Value maximization, stakeholder theory, and the corporate  
779 objective function. *Business Ethics Quarterly*, 02, pp. 235-256  
780 <http://dx.doi.org/10.2307/3857812>

781 Johnson, R.A. and Greening, D.W., 1999. The effects of corporate governance and  
782 institutional ownership types on corporate social performance. *Academy of*  
783 *Management Journal*, 42(5), pp.564-576. <http://dx.doi.org/10.2307/256977>.

784 Jones, T. M. 1995. Instrumental stakeholder theory: A synthesis of ethics and  
785 economics. *Academy of Management Review*, 20(2), pp. 404-437.  
786 <http://dx.doi.org/10.5465/AMR.1995.9507312924>.

787 Joyner, B.E. and Payne, D., 2002. Evolution and implementation: A study of values,  
788 business ethics and corporate social responsibility. *Journal of Business Ethics*,  
789 41(4), pp.297-311. <http://dx.doi.org/10.1023/A:1021237420663>.

790 Keupp, M.M., Palmie, M., and Gassmann, O., 2012. The Strategic Management of  
791 Innovation: A Systematic Review and Paths for Future Research. *International*  
792 *Journal of Management Reviews*. 14, pp. 367-390.  
793 <http://dx.doi.org/10.1111/j.1468-2370.2011.00321.x>.

794 Koh, S. C. L., Genovese, A., Acquaye, A. A., Barratt, P., Rana, N., Kuylenstierna, J.  
795 and Gibbs, D. 2013. Decarbonising product supply chains: design and  
796 development of an integrated evidence-based decision support system – the  
797 supply chain environmental analysis tool (SCEnAT). *International Journal of*  
798 *Production Research*, 51, pp.2092-2109.  
799 <http://dx.doi.org/10.1080/00207543.2012.705042>

800 Koh, S. C., Morris, J., & Ebrahimi, S. M. (2016). Integrated Resource Efficiency:  
801 Measurement and Management. *International Journal of Operations and*  
802 *Production Management*.

803 Kumar, S., DeGroot, R. A. and Choe, D. 2008. Rx for smart hospital purchasing  
804 decisions: The impact of package design within US hospital supply chain.  
805 *International Journal of Physical Distribution and Logistics Management*, 38,

806 pp.601-615. <http://dx.doi.org/10.1108/09600030810915134>

807 Lake, A., Acquaye, A., Genovese, A., Kumar, N. and Koh, S. C. L. 2015. An  
808 application of hybrid life cycle assessment as a decision support framework  
809 for green supply chains". *International Journal of Production Research*, No.53,  
810 pp.6495-6521. <http://dx.doi.org/10.1080/00207543.2014.951092>.

811 Leseure, M.J., Bauer, J., Birdi, K., Neely, A., and Denyer, D., 2005. Adoption of  
812 promising practices: a systematic review of the evidence. *International Journal*  
813 *of Management Reviews*. 5, pp. 169-190.  
814 <http://dx.doi.org/10.1111/j.1460-8545.2004.00102.x>.

815 Li, Y. J., Zhao, X. K., Shi, D. and Li, X. 2014. Governance of sustainable supply  
816 chains in the fast fashion industry. *European Management Journal*, 32,  
817 pp.823-836. <http://dx.doi.org/10.1016/j.emj.2014.03.001>

818 Liu, S. F., Kasturiratne, D. and Moizer, J. 2012. A hub-and-spoke model for  
819 multi-dimensional integration of green marketing and sustainable supply chain  
820 management". *Industrial Marketing Management*, 41, pp.581-588.  
821 <http://dx.doi.org/10.1016/j.indmarman.2012.04.005>.

822 Matos, S. and Silvestre, B. S. 2013. Managing stakeholder relations when developing  
823 sustainable business models: the case of the Brazilian energy sector. *Journal of*  
824 *Cleaner Production*, 45, pp.61-73.  
825 <http://dx.doi.org/10.1016/j.jclepro.2012.04.023>

826 Meho, L.I. and Yang, K., 2007. Impact of data sources on citation counts and rankings  
827 of LIS faculty: Web of Science versus Scopus and Google Scholar. *Journal of*  
828 *the American Society for Information Science and Technology*, 58(13),  
829 pp.2105-2125. <http://dx.doi.org/10.1002/asi.20677>.

830 Metta, H. and Badurdeen, F. 2013. Integrating Sustainable Product and Supply Chain  
831 Design: Modeling Issues and Challenges. *IEEE Transactions on Engineering*  
832 *Management*, 60, pp.438-446. <http://dx.doi.org/10.1109/Tem.2012.2206392>.

833 Morali, O. and Searcy, C. 2013. A Review of Sustainable Supply Chain Management  
834 Practices in Canada. *Journal of Business Ethics*, 117, pp.635-658.  
835 <http://dx.doi.org/10.1007/s10551-012-1539-4>

836 Moed, H. F. 2010. The Source-Normalized Impact per Paper (SNIP) is a valid and  
837 sophisticated indicator of journal citation impact. arXiv preprint  
838 arXiv:1005.4906.

839 Muduli, K., Govindan, K., Barve, A. and Geng, Y. 2013. Barriers to green supply  
840 chain management in Indian mining industries: a graph theoretic approach.  
841 *Journal of Cleaner Production*, 47, pp.335-344.  
842 <http://dx.doi.org/10.1016/j.jdepro.2012.10.030>

843 Nagurney, A., Nagurney, L. S. and Li, D. 2015. Securing the Sustainability of Global  
844 Medical Nuclear Supply Chains Through Economic Cost Recovery, Risk  
845 Management, and Optimization. *International Journal of Sustainable*  
846 *Transportation*, 9, pp.405-418.  
847 <http://dx.doi.org/10.1080/15568318.2013.779127>.

848 Newbert, S.L., 2007. Empirical research on the resource-based view of the firm: an  
849 assessment and suggestions for future research. *Strategic Management Journal*,  
850 28(2), pp.121-146. <http://dx.doi.org/10.1002/smj.573>.

851 Pimentel, B. S., Gonzalez, E. S. and Barbosa, G. N. O. 2016. Decision-support  
852 models for sustainable mining networks: fundamentals and challenges. *Journal*  
853 *of Cleaner Production*, 112, pp.2145-2157.  
854 <http://dx.doi.org/10.1016/j.jclepro.2015.09.023>.

855 Pittaway, L., Robertson, M., Munir, K., Denyer, D., and Neely, A., 2004. Networking  
856 and innovation: a systematic review of the evidence. *International Journal of*  
857 *Management Reviews*, 5, pp. 137-168.  
858 <http://dx.doi.org/10.1111/j.1460-8545.2004.00101.x>.

859 Rostamzadeh, R., Govindan, K., Esmaeili, A. and Sabaghi, M. 2015. Application of  
860 fuzzy VIKOR for evaluation of green supply chain management practices.  
861 *Ecological Indicators*, 49, pp.188-203.  
862 <http://dx.doi.org/10.1016/j.ecolind.2014.09.045>.

863 Sanders, W.G. and Carpenter, M.A., 1998. Internationalization and firm governance:  
864 The roles of CEO compensation, top team composition, and board structure.  
865 *Academy of Management Journal*, 41(2), pp.158-178.  
866 <http://dx.doi.org/10.2307/257100>.

867 Sarkis, J. and Dhavale, D. G. 2015. Supplier selection for sustainable operations: A  
868 triple-bottom-line approach using a Bayesian framework. *International Journal*  
869 *of Production Economics*, 166, pp.177-191.  
870 <http://dx.doi.org/10.1016/j.ijpe.2014.11.007>

871 Schuler, D. A., and Cording, M. 2006. A corporate social performance–corporate  
872 financial performance behavioral model for consumers. *Academy of*  
873 *Management Review*, 31(3), pp. 540-558.  
874 <http://dx.doi.org/10.5465/AMR.2006.21318916>.

875 Seuring, S. and Müller, M. 2008. From a literature review to a conceptual framework  
876 for sustainable supply chain management. *Journal of Cleaner Production*, 16,  
877 pp.1699-1710. pp.1699-1710. <http://dx.doi.org/10.1016/j.jclepro.2008.04.020>.

878 Seuring, S., Sarkis, J., Müller, M. and Rao, P., 2008. Sustainability and supply chain  
879 management—an introduction to the special issue. *Journal of Cleaner*  
880 *Production*, 16(15), pp.1545-1551.  
881 <http://dx.doi.org/10.1016/j.jclepro.2008.02.002>.

882 Shen, L. X., Olfat, L., Govindan, K., Khodaverdi, R. and Diabat, A. 2013. A fuzzy  
883 multi criteria approach for evaluating green supplier's performance in green  
884 supply chain with linguistic preferences. *Resources Conservation and*  
885 *Recycling*, 74, pp.170-179. <http://dx.doi.org/10.1016/j.resconrec.2012.09.006>

886 Subramoniam, R., Huisingh, D. and Chinnam, R. B. 2009. Remanufacturing for the  
887 automotive aftermarket-strategic factors: literature review and future research  
888 needs. *Journal of Cleaner Production*, 17, pp.1163-1174.  
889 <http://dx.doi.org/10.1016/j.jclepro.2009.03.004>.

890 Taticchi, P., Garengo, P., Nudurupati, S. S., Tonelli, F. and Pasqualino, R. 2015. A  
891 review of decision-support tools and performance measurement and  
892 sustainable supply chain management. *International Journal of Production*  
893 *Research*, 53, pp.6473-6494.  
894 <http://dx.doi.org/10.1080/00207543.2014.939239>.

895 Tranfield, D., Denyer, D. and Smart, P. 2003. Towards a Methodology for Developing  
896 Evidence-Informed Management Knowledge by Means of Systematic Review.  
897 *British Journal of Management*, 14, pp.207-222.  
898 <http://dx.doi.org/10.1111/1467-8551.00375>

899 Thorpe, R., Holt, R., Macpherson, A. and Pittaway, L., 2005. Using knowledge within  
900 small and medium- sized firms: A systematic review of the evidence.  
901 *International Journal of Management Reviews*, 7(4), pp.257-281.  
902 <http://dx.doi.org/10.1111/j.1468-2370.2005.00116.x>

903 Tseng, S. C. and Hung, S. W. 2014. A strategic decision-making model considering  
904 the social costs of carbon dioxide emissions for sustainable supply chain  
905 management. *Journal of Environmental Management*, 133, pp.315-322.  
906 <http://dx.doi.org/10.1016/j.jenvman.2013.11.023>

907 United Nations. Department of Economic. 2007. Indicators of sustainable  
908 development: Guidelines and methodologies. United Nations Publications.

909 Vachon, S. and Mao, Z. M. 2008. Linking supply chain strength to sustainable  
910 development: a country-level analysis. *Journal of Cleaner Production*, 16,  
911 pp.1552-1560. <http://dx.doi.org/10.1016/j.jclepro.2008.04.012>.

912 Vahabzadeh, A. H., Asiaei, A. and Zailani, S. 2015. Green decision-making model in  
913 reverse logistics using FUZZY-VIKOR method. *Resources Conservation and*  
914 *Recycling*, 103, pp.125-138.  
915 <http://dx.doi.org/10.1016/j.resconrec.2015.05.023>.

916 van Hoek, R. and Johnson, M. 2010. Sustainability and energy efficiency: Research  
917 implications from an academic roundtable and two case examples.  
918 *International Journal of Physical Distribution and Logistics Management*, 40,  
919 pp.148-158. <http://dx.doi.org/10.1108/09600031011018064>

920 Verghese, K. L., Horne, R. and Carre, A. 2010. PIQET: The design and development  
921 of an online streamlined LCA tool for sustainable packaging design decision  
922 support. *International Journal of Life Cycle Assessment*, 15, pp.608-620.  
923 <http://dx.doi.org/10.1007/s11367-010-0193-2>

924 Waddock, S. A., and Graves, S. B. 1997. The corporate social performance-financial  
925 performance link. *Strategic Management Journal*, 18(4), pp. 303-319.  
926 <http://www.jstor.org/stable/3088143>

927 Wakefield, J (2016) Apple, Samsung and Sony face child labour claims, BBC News,  
928 [Online] <http://www.bbc.co.uk/news/technology-35311456> (accessed  
929 06/04/2016)

930 Wang, H. F. and Hsu, H. W. 2010. Resolution of an uncertain closed-loop logistics  
931 model: An application to fuzzy linear programs with risk analysis". *Journal of*

932 Environmental Management, 91, pp.2148-2162.  
933 <http://dx.doi.org/10.1016/j.jenvman.2010.05.009>  
934 Wu, Z. and Pagell, M. 2011. Balancing priorities: Decision-making in sustainable  
935 supply chain management. *Journal of Operations Management*, 29,  
936 pp.577-590. <http://dx.doi.org/10.1016/j.jom.2010.10.001>.  
937 Zhang, Z. H. and Awasthi, A. 2014. Modelling customer and technical requirements  
938 for sustainable supply chain planning. *International Journal of Production*  
939 *Research*, 52, pp.5131-5154. <http://dx.doi.org/10.1080/00207543.2014.899717>  
940 Zingales, L. 1998. Survival of the Fittest or the Fattest? Exit and Financing in the  
941 Trucking Industry. *The Journal of Finance*, 3, pp.905-938.  
942 <http://dx.doi.org/10.1111/0022-1082.00039>  
943