

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

3 Decision Making: Theory and Practice

4 Mengfeng Gong^{1*}, Andrew Simpson¹, Lenny Koh¹, Kim Hua Tan²

5
6 ¹The University of Sheffield
7 Centre for Energy, Environment and Sustainability
8 Logistics and Supply Chain Management Research Centre
9 Management School, Conduit Road, Sheffield S10 1FL, UK

10
11 ²Nottingham University Business School
12 Jubilee Campus
13 Wollaton Road
14 Nottingham, NG8 1BB, UK

15
16 * Corresponding author: Mengfeng Gong (mgong2@sheffield.ac.uk)
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20 **Abstract**

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

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37 **Keywords:** *Business Decision Making; Corporate Governance Mechanism;*
38 *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

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

100

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

122 examination of this interrelationship under different governance mechanisms and
123 conditions and call attention to the contingency perspective in future study.

124

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

132

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

138

139 **2. Methodology**

140

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

159

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

164 (Hubbard, 2009). The triple bottom line, of environmental, social, economic
 165 sustainability is a central concept to help operationalize sustainability (Elkington,
 166 1997, Seuring and Müller, 2008). As such, three search strings (“environmental
 167 sustainability” AND “management”, “economic sustainability” AND “management”,
 168 and “social sustainability” AND “management”) are searched using 2 databases:
 169 Scopus and Web of Science, using key word search of [“Environmental sustainability
 170 AND management”], [“Economic sustainability AND management”] and [“Social
 171 sustainability AND management”] within title, abstract and keyword fields (Table 1).
 172 The sample period covers from January 2007 to March 2016, to ensure this study
 173 reflect the recent development in this field.

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

181
 182

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	

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

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

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

205

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

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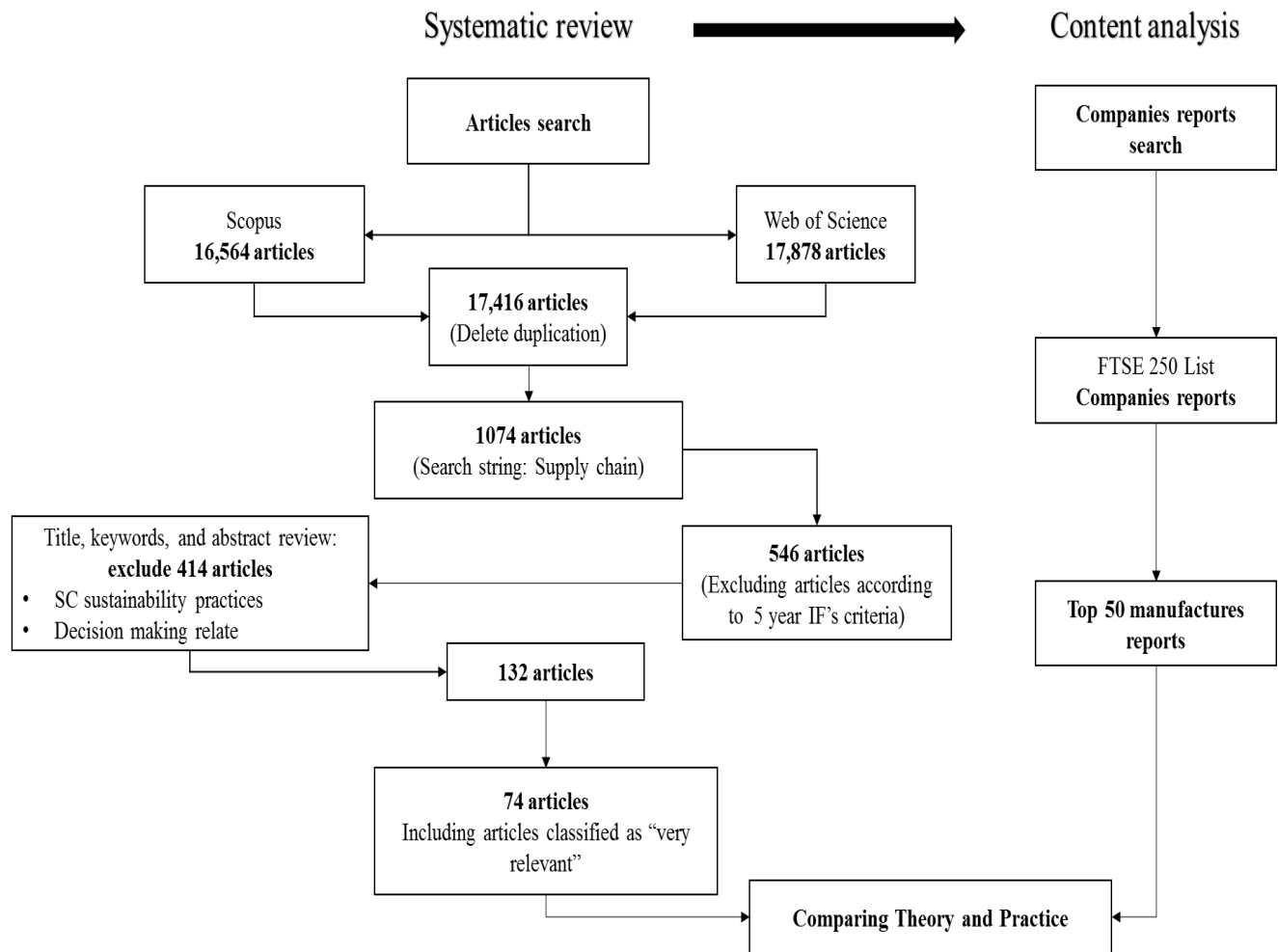


Figure 1: The Methodology Overview

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

228

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

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

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 248

249 3. Findings and Discussion from the Systematic Literature 250 Review

251

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

261

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

264

265

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

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267
268

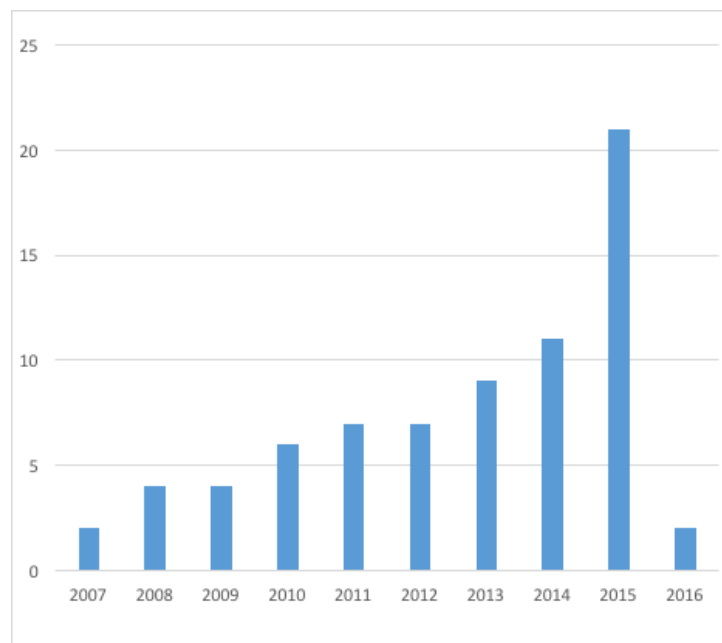


Figure 2: Time distribution of sample publications

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

274 fundamental nexus of the debate on the interrelationship between sustainable
275 performance metrics in business decision-making models. These are discussed below:
276

277 ***3.1 Triple-bottom line perspective:***

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

295
296 It is worthwhile to note that most papers in the authors' sample have made a
297 concerted effort to advance environmental measurements. Measurements include, but
298 not limited to carbon emission (Koh et al., 2013; Lake et al., 2015; Gadema and
299 Oglethorpe, 2011; Fichtinger), natural and material resources usage (Liu et al., 2012;
300 Pimentel et al., 2016; Wu and Pagell, 2011) and waste generated from products and
301 materials (Nagurney et al., 2015; Vergheze, 2010; Bai and Sarkis, 2014). Hassini et al.,
302 (2012) suggested that although there is no obvious shortage of environmental metrics,
303 it is still challenging to know when to use which one and how to decide between these.
304 A more fine-grained industry-oriented performance metrics should be studied and
305 developed to answer this call. Over the sample period, the authors saw a diversified
306 sample of industries across different institutional background including: the
307 construction minerals industry in China (Chen et al., (2015); US hospital industry
308 (Kumar et al., 2008), U.S. Diaper production case (Adhitya et al., 2011); Brazilian
309 energy sector (Matos and Silvestre, 2013); automotive suppliers (Subramoniam,
310 2009); Food industry (Gadema and Oglethorpe, 2011) and fashion industry (Li,
311 2014).

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

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

333

334 Table 3 outlines the performance measures of the three perspectives of the triple
335 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)

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

346

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

356

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

361

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

380 economic performance.

381

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

394

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

406

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

419

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

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

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

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

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

476

477 *3.2 The difference between academic theory and industrial practice*

478

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

492

493 To collect this data, multiple data sources are used, including Annual Reports (AR),
494 Corporate Responsibility Report (CRR), and Sustainability Report (SR). This study
495 focuses on the financial year 2015 because this provided the most up to date
496 information for each company. The reports were download directly from the
497 companies' website and the sample companies are presented in Table 4. The
498 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

502

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

517

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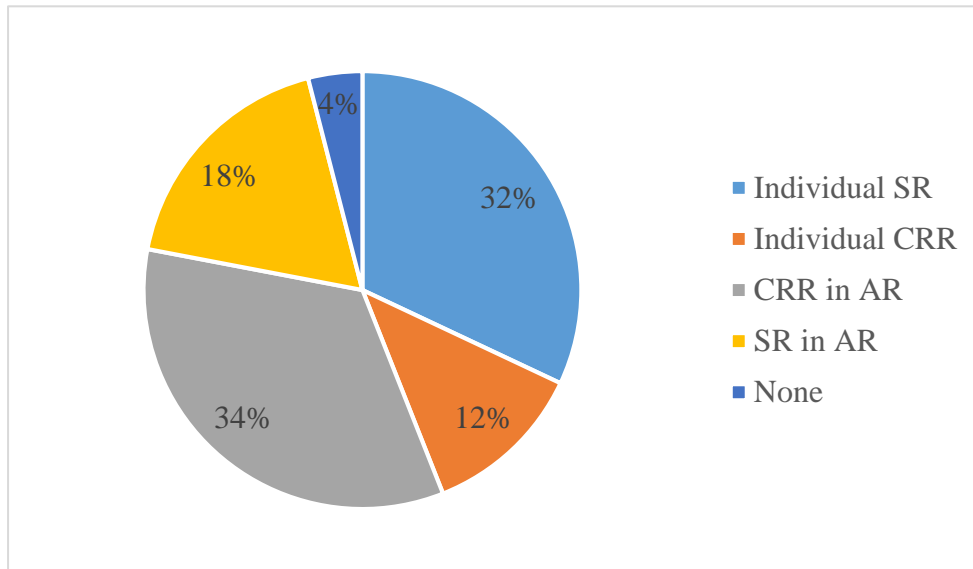


Figure 3: Distribution of companies' SR and CRR disclosure

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520

521

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

527

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

539

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

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

555

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

569

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

577

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

582

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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	0	1	0	1	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

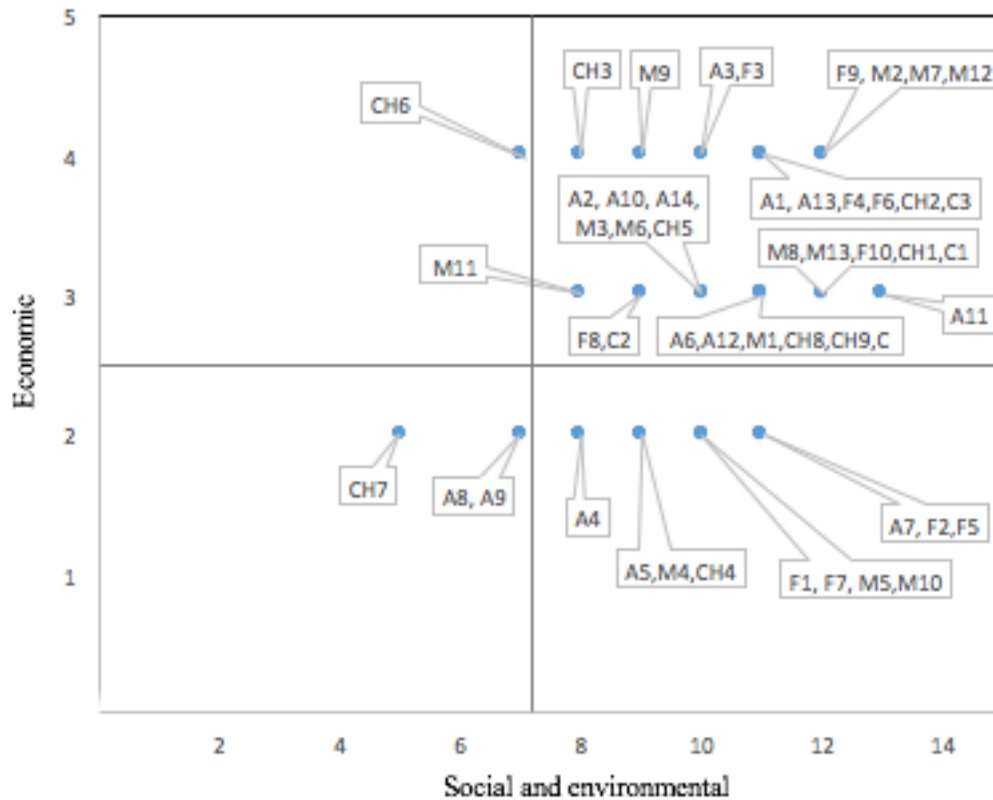


Figure 4 Distribution of performance metrics employed by industries

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

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

618

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

627

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

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