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A systematic literature review for developing sustainability assessment tool: formulating the state of the art and future direction

Y Sari^{1,2}, A Hidayatno¹, A Suzianti¹ and M Hartono²

¹ Department of Industrial Engineering, Faculty of Engineering, Universitas Indonesia, Jalan Kampus UI, Depok, West Java, Indonesia

² Department of Industrial Engineering, Faculty of Engineering, University of Surabaya, Jalan Raya Kalirungkut, Surabaya, East Java, Indonesia

E-mail: akhmad@eng.ui.ac.id, ysari@staff.ubaya.ac.id

Abstract. Sustainability, with the concept of “triple bottom line”, has been growing as a “*trending topic*” recently. It is no longer a paradox; it is now about how to turn this challenge or opportunity into day-to-day management decisions to achieve advantage in both financial performance and corporate sustainability. In conjunction with it, there is a growing need for a better way to develop, assess and measure organization’s sustainability performance. This paper discussed a three-stage systematic literature review that is being deployed as the research framework, to scope how sustainability assessments have been developed recently and to formulate the State of the Art for future research. It reviewed 63 selected articles out of 875 papers from Science Direct database. Based on our review, as the novelty proposed by this publication, there were two major approaches used in developing sustainability assessment i.e. criteria-based and model-based approaches. Both approaches had similar popularity in publication: 57% for criteria-based and 43% for model-based. Each had its strengths and weaknesses, but the model-based approach was chosen for future development of the conceptual framework. Furthermore, the review indicated that several main concepts were being used for sustainability assessment and guided the future development into the concept of Business Process Management and Corporate Sustainability.

1. Introduction

Organizations are facing more challenges in the globalized world because society now demands them to be also responsible on creating a more sustainable world. They are forced to think about the impact of their actions in a more diverse way to include social and environment responsibility. The application of sustainability concept has been interpreted differently by industry and academia in Indonesia. For example, Unilever, a well-known consumer goods manufacturer in Indonesia, helped to develop the welfare of farmers and suppliers of raw materials or to reduce the use of chemicals that had negative impacts to the environment through its “*Sustainable Living Plan*” program. Djarum Foundation, a prominent foundation in Indonesia, built building and laboratory facilities for universities through its corporate social responsibility program. Some related studies ([1], [2], [3], [4]) revealed that the sustainability concept has been applied in many aspects such as performance measurement, economic, educational and social life.

In order to achieve corporate sustainability as a competitive advantage, organizations need to manage their business process especially at the strategic level. Business processes are divided into: (a)



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core processes, (b) support processes, (c) managerial processes ([5], [6]). The role of business process was initially mentioned by [7] and later developed by [8] who described that managing the core process would create a competitive advantage of an organization, controlling the support process would enable competitive advantage, meanwhile the managerial process would ensure sustainable competitive advantage.

In terms of managing the business processes, a methodology for Business Process Improvement which was formed by [9] described that the initial phase of seven-step Business Process Improvement is the need of readiness assessment. To measure the readiness level of an organization before any business process improvements are made, an assessment tool that is designed appropriately is obviously needed. The readiness of an organization can be measured through a well-designed assessment tool so that the result of its assessment provides the foundation for the analysis or improvement.

For that same purpose, the development of sustainability assessment tool becomes necessary; it will be a set of methods, forms or maps that organizations can use to assess their readiness in initiating sustainability efforts or to chart their progression in achieving their target of sustainability. It now turned out as some research questions, namely "*What sustainability indicators will be used? How should the indicators be selected? How should the measurement process be done? Should there be any framework constructed to carry out the assessment process?*". Therefore, this paper review aimed to conduct a systematic literature review, to scope how sustainability assessments had been developed recently and to provide viewpoint and foundation for the development of sustainability assessment.

2. Research Method

A systematic literature review was introduced in this article as an effective method to review multiple research papers or publications, in which the process was conducted through three stages [10]: (1) stage of planning the review; (2) stage of conducting the review; (3) stage of reporting and dissemination.

Table 1. Three stages of Systematic Literature Review (SLR) as research method

<i>Stage</i>	<i>Activities</i>
Stage1	<p><i>Planning the review</i></p> <p>Review basic concepts of sustainability and perform meta-analysis on sample of 15 related published articles, which aimed to:</p> <ol style="list-style-type: none"> Gain comprehensive understanding Identify the terms for searching articles and publication year <ul style="list-style-type: none"> Terms being used to search for the paper in title, abstract, and keywords are: (<i>sustainability indicator OR sustainability metric</i>) AND (<i>sustainability assessment OR sustainability performance OR performance measurement OR sustainability performance measurement</i>) AND (<i>corporate sustainability OR corporate sustainability model OR strategic management</i>) Publication year: 2010 - 2016 Determine targeted publishers <ul style="list-style-type: none"> Targeted publishers: Science Direct, Emerald, Springer, Taylor & Francis, Wiley In this review paper, the review process was initially attempted to Science Direct Define criteria for classifying the articles to support the analysis
Stage2	<p><i>Conducting the review</i></p> <p>Select articles to be reviewed, based on the terms and criteria defined in previous stage:</p> <ol style="list-style-type: none"> From title, abstract and keywords: filtering the papers with the defined terms. Total search: 875 articles. From full paper, skimming reading on introduction, research methods and conclusions, to select valid articles for the review, classifying articles according to the classification criteria. Valid: 63 articles (7.2%) From selected full paper: focused reading, deep understanding and analysis about sustainability indicator and corporate sustainability
Stage3	<p><i>Reporting & Dissemination</i></p> <ol style="list-style-type: none"> After selecting articles (2nd round of previous stage) from electronic database Science Direct and after 30% reading (3rd round on previous stage),

<i>Stage</i>	<i>Activities</i>
	b. Prepare initial draft of the review result to be published in the international conference.
	c. Conclude main aspects of SLR and future directions for conceptual framework of SAT to assess sustainability initiatives in corporate level

As recommended by [12] and deployed by [11], these stages of systematic literature review were also performed in this review paper, the detailed was shown in Table 1. In the first stage, the literature review was planned by reading the references (books) that contained basic concepts of sustainability as well as performing meta-analysis. The planning stage was aimed to: (a) gain the comprehensive understanding about the research topic, (b) identify proper terms for searching the paper in the next stage of review, (c) determine the targeted journal publishers or electronic databases and (d) define the criteria to classify the articles for data analysis.

3. Results & Discussions

After the planning stage of systematic literature review, the review process continued by searching the articles from scientific database Science Direct, giving the result of 875 articles whose titles, abstracts or keywords fitted the defined terms and publication years. Then, by skimming reading to introduction, research methods and conclusions, there were 63 (or 7.25% of 875) articles valid as selected papers for further analysis. For the 63 selected articles, the meta-analysis was performed to collect information about: authors, publication year, publisher name, industry sector, underlying concept to formulate the indicators/models, and outcoming model/framework. The following results and discussions were made based on the meta-analysis.

Based on the review, to assess sustainability performance of an organization, there are two primary approaches in developing sustainability assessment:

- A. Criteria-based approach.** Many publications showed that the formulation of indicators in the sustainability assessment often used the concept of sustainability or Triple Bottom Line which comprised of three aspects: people, profit and planet. The sustainability indicators could be derived from literature review ([13], [14]) or selected based on some criteria ([15], [16]). It designed a general set of sustainability indicators that were suitable to be applied in all sectors but it was limited to a specific industry [15] meanwhile [16] derived sustainability indicators to assess an eco-industrial park, and those specific indicators were limited to be used for any other industries.
- B. Model-based approach.** Some sustainability assessments were also done through the development of a model. For example, [17] proposed the sustainability aspect into the Balanced Scorecard method [18], known as the Sustainability Balanced Scorecard (SBSC).

Table 2. Two primary approaches in formulating indicator, with their strengths & weaknesses

Approach	Strengths	Weaknesses
Criteria based selection	<ul style="list-style-type: none"> • It provides a general set of common sustainability indicators to easily be chosen • These common indicators are also available for specific industry • It can be easily integrated with the current organization strategy as new key performance indicators 	<ul style="list-style-type: none"> • Indicators in the criteria can be difficult to choose due to its similarities • Selection of the indicators can be subjective without measuring the appropriateness and quality of the indicators used. A right way of filtering the indicators is necessary. • Organizations might have difficulties in identifying whether they have achieved sustainability or not
Model based selection	<ul style="list-style-type: none"> • It creates a clear ideal model on how a sustainable organizations operates and functions. • The gap between ideal and current conditions will make it easier to plan and develop process and activities • It creates a more robust sustainability indicators because it is based on a proven 	<ul style="list-style-type: none"> • It debates on how ideal model is actually ideal • Some models are industry specific, that might not be easy to generalize • Some models might require major changes in the current strategy of the organizations

ideal model

- With the ideal model in sight, organizations can develop stages to measure their closeness on achieving their ideal conditions

As mentioned previously, it was found that there were two primary approaches in formulating and selecting sustainability indicators, and based on the review, both approaches have their strengths and weaknesses as described in Table 2. Then, both approaches were set as the criterion for classification. For criteria-based approach, it was found that some research determined the indicators directly (from literature review and underlying concepts then the indicators were formulated) or indirectly (a particular mechanism was applied to filter a set of indicators that being derived from literature review and underlying concept). The review showed that, from these 63 selected articles, there were 27 selected articles (43% out of 63) in model-based approach and 36 articles (57% out of 63) articles in criteria-based approach. For the criteria-based approach, it can still be divided into: 43% were not using any filtration methods (directly) to formulate the indicators and 14% were using certain filtration methods (indirectly). Descriptive statistics based on selected papers were conducted. Figure 1 showed that articles within these topics of interest (i.e. sustainability indicator or corporate sustainability model) have been increasing for the last five years, from 5 articles in 2012 to 23 articles in 2016. The same trend also occurred to the articles which used criteria-based approach with no filtration (CNF) and model-based approach (M), there were 2 articles of CNF in 2012 increasing to 11 articles in 2016 and 1 articles of M in 2012 increasing to 9 articles in 2016. Given the number of articles, 1 article of criteria-based model with filtration (CF) in 2012, and there was no related publication in 2011, 2012 and 2013, and 3 articles in 2016; it indicated articles of criteria-based approach with filtration were rare and had no trend in quantity year to year.

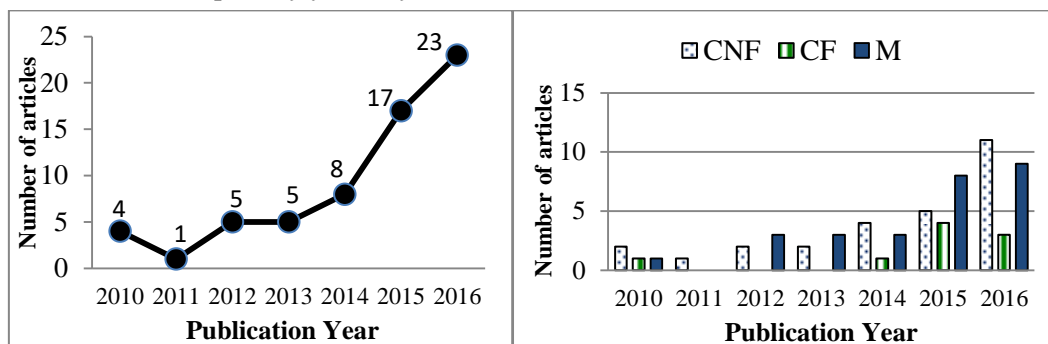


Figure 1. Distribution of number of publications per year

(left) for topics of sustainability indicators or models, (right) for specific classification

Notes: CNF: criteria-based approach no filtration, CF: criteria-based with filtrations, M: model-based)

Table 3 indicated that about 33% of the selected articles were discussing about sustainability assessment for general corporations, meanwhile 67% of them were discussing the same issue for specific industry sectors which majority covered the sectors of supply chain & logistic, public service and information technology. Among 36 selected articles using criteria-based approach, environmental dimension was the highest percentage (89%) being used to assessment sustainability. However, the development of indicators for other dimensions, namely social and economics (81% and 64%) were also increased recently. Table 4 also summarized that qualitative and quantitative indicators have almost equal percentage of usage.

Table 3. Distribution of Industrial Sectors

Industry Sector	Percentage	# of articles
General corporation	33	21
Specific industry	67	42
<i>For 42 specific industry sector, there were:</i>		# of articles

Supply Chain & Logistics (e.g. retailer, port, logistics service provider)	6
Public Service (e.g. urban design, water service, park, electricity)	5
Information Technology (e.g. green IT, service centre, telecommunication service)	3
Manufacturing, Tourism, University, Micro Small Medium Enterprise	3 foreach industry
Automotive, Energy, Forestry, Mining, Textile	2 foreach industry
Fashion, Fishing, Forensic, Hospital, Local Government, Project Management	1 foreach industry

Table 4. Criteria-based approach: dimensions and type of sustainability indicators

Criteria-based approach	# of Articles	Dimensions of Sustainability				Type of Indicators	
		Environment	Social	Economic	Additional	Qualitative	Quantitative
No Filtration	27	23	20	16	12	20	16
Filtration	9	9	9	7	7	5	6
<i>Total</i>	36	32	29	23	19	25	22
Percentage		89%	81%	64%	53%	69%	61%

For model-based approach, there were 27 articles being selected because the researches discussed the development of sustainability models using certain basic concepts. Table 5 listed the underlying concepts that used to develop the model. Given the percentage of usage, Business Process Management was placed as the most-frequent-used underlying concept; with the percentage of usage was 37%. It was followed by Corporate Sustainability and Supply Chain Management as the second and third highest percentages, with the percentages of usage were 33% and 22% respectively.

Table 5. Model-based approach: distribution of underlying concepts and developed models

Underlying Concepts	# of articles (percentage)	Developed Models
Business Process Management (BPM)	10 (37%)	Process Analysis Method, Green Performance Indicators, Sustainable Management System, Systemic Navigation Framework, Sustainability exploitation & exploration, Corporate Sustainability Activity framework, Triple-layered Business Model Canvas, Sustainability Business Model, Campus Sustainability Assessment, Sustainable Strategic Management
Corporate Sustainability (CS)	9 (33%)	Process Analysis Method, Green Performance Indicators, Sustainable Management System, Systemic Navigation Framework, Sustainability exploitation & exploration, Corporate Sustainability Activity framework, Sustainability Business Model, Campus Sustainability Assessment, Sustainable Strategic Management
Supply Chain Management (SCM)	6 (22%)	Sustainability SCM, Green SCM, Multi-methodological approach, Risk Management Approach, Sustainability Supply Chain Performance, Assessment of Supply Chain Sustainability Framework
Triple Bottom Line (TBL)	5 (19%)	Urban Water Service Sustainability, Economic and Socio-economic assessment, Efficiency Model, Triple-layered Business Model Canvas, Product life cycle phases
Engineering Management (EM)	4 (15%)	Energy Management Maturity Model, Energy Efficiency Model, Sustainable Systems Integration Model-Metrics Framework, Energy Efficiency Model
Balanced Scorecard (BSC)	3 (11%)	BSC Strategic Framework, BSC Model, Sustainability BSC (SBSC)
Product Life Cycle	1 (4%)	Product life cycle phases

4. Conclusion

This paper described on how the three-stage systematic literature review gave a scientific contribution in providing, for the best of authors' understanding, a helicopter-view about the expansion of the publications related to the interest topic. It started from (i) planning the literature review by defining specific terms to search the articles, determining targeted publisher, publication year and classification criteria, (ii) conducting the review by skimming the title, keywords, abstract

and reading the introduction, methodology and conclusion of selected articles, then (iii) reporting the result by concluding main issues and providing guidance for future directions.

Regarding to the topic of interest i.e. the development of sustainability assessment tool, the systematic literature review filtered only 63 articles or 7.2% out of 875 articles from Science Direct electronic database; however, the distribution of number of publications has shown an uptrend within last five years. It identified two primary approaches that were used in designing the sustainability assessment i.e. criteria-based approach (assessment indicators were derived directly or indirectly from literature review) or model-based approach (the development of a certain model was done prior to the formulation of the assessment indicators).

In general, there were two major issues to be concluded from the result of the literature review. Firstly, both approaches had similar popularities in publications; there were 27 articles (or 43%) of 63 selected articles that using model-based approach, another 43% of them were criteria-based approach with no filtration and the rest 14% were criteria-based using a specific filtration method to select the indicators. Furthermore, the review indicated that the approaches were balance in strengths and weaknesses, for instance, it was easy for criteria-based approach to formulate a set of indicators, but it might be difficult because of the similarities among indicators and the subjectivity in selection. For future direction, with model-based approach, it could create a more robust indicator based on a proven ideal model but it might be difficult to find how ideal a model was. However, a model-based approach appears more appropriate because a model can be an identifier to distinguish an assessment tool from others; a model can describe the constructs and their relationships. Business Process Management and Corporate Sustainability Model will be studied further to determine the constructs of the model. The model will be developed for general corporations and will be validated by applying it to some case studies.

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