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Sustainability Balance Scorecard: Literature Review and Clustering of Performance Indicator

Sustainability Balance Scorecard: Tinjauan Literatur dan Pengelompokan Indikator Kinerja

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ABSTRAK

Menjawab tantangan pembangunan berkelanjutan, perusahaan membutuhkan pendekatan terpadu dalam manajemen kinerja yang mencakup aspek ekonomi, sosial, dan lingkungan. Pendekatan ini tidak hanya berorientasi pada profit, tetapi juga memperhatikan kesejahteraan manusia, kepedulian sosial, dan lingkungan. Pendekatan ini juga mencakup kemampuan untuk menghubungkan strategi dengan tindakan nyata. Oleh karena itu, penerapan Sustainability Balanced Scorecard (SBSC) menjadi penting dalam manajemen kinerja. Penelitian ini bertujuan untuk mengkaji perkembangan studi SBSC selama satu dekade terakhir. Tinjauan literatur sistematis dilakukan untuk mengidentifikasi, mengevaluasi, dan menginterpretasikan SBSC berdasarkan penelitian sebelumnya. Hasilnya mencakup peta publikasi, taksonomi penelitian, dan meta-analisis indikator kinerja SBSC.

Keywords: Manajemen kinerja, *sustainability balance scorecard, systematic literature review*.

ABSTRACT

Answering the challenges of sustainable development, companies require an integrated approach to performance management in economic, social, and environmental aspects. This approach is not only profit-oriented but also addresses the needs of human welfare, social, and environmental concern. The approach also includes the ability to link strategy with action. Therefore, it is important to apply the sustainability Balanced Scorecard (SBSC) in performance management. The research aims to study the development of SBSC studies for the last decade. A systematic literature review has been conducted to identify, evaluate, and interpret SBSC based on previous research. The results described publication map, the taxonomy of research, and meta-analysis of SBSC performance indicators.

Kata kunci: *Performance management, sustainability balance scorecard, systematic literature review.*

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INTRODUCTION

The challenges of sustainable development have attracted the attention of the world community because they care about social concerns, climate change, Corporate Social Responsibilities (CSR), and the impact of the company's business activities. Sustainability is a major concern and an important indicator to improve the competitiveness of companies and manufacturing systems (Huang & Badurdeen, 2017; Chang & Cheng, 2019; Choi *et al*., 2019; Lopez *et al*., 2007; Faulkner & Badurdeen, 2014). This is reinforced by Amrina *et al.* (2016) and Agrawala *et al*. (2016), that many companies have started to pay attention to holistic environmental performance evaluation, forcing the industry to expand its responsibility for the environment both locally and globally.

Sustainable development is seen as something that is increasingly valuable in developing better strategies for sustainable green manufacture Faulkner and Badurdeen (2014). And become the main strategy in an effort to add value (Lopez *et al*., 2007). It is also a shared commitment from large companies to take a focus on long-term sustainable development rather than short-term benefits (Choi *et al*., 2019).

Performance management systems in companies and manufacturing are then developed with a sustainable concept that includes economic, social and environmental performance (Baumgartner & Rauter, 2017; Schaltegger & Wagner, 2006). As well as using multidimensional concepts in strategies that can link the vision of the company / organization in operations (Amrina *et al*., 2016; Doˇcekalová & Kocmanová, 2016; Edgeman & Eskildsen, 2014; Baumgartner & Rauter, 2017; Agrawala *et al*., 2016; Schaltegger & Wagner, 2006).

The concept of sustainable development is in line with the sustainable development agenda for 2012 which is implemented in response to the demands of world leaders to address poverty, inequality and climate change in the form of concrete actions. The sustainable development agenda that was born in the United Nations Conference on Sustainable Development (United Nations), Rio + 20, sets a series of targets that can be applied universally and can be measured in balancing the three dimensions of sustainable development, namely environmental, social, and economic (United Nation, 2012).

In the context of sustainable business management, there is a strong desire to balance and integrate social, economic and environmental measures. The existing road maps, frameworks and systems do not comprehensively support the transformation of the sustainability business. It also does not allow decision makers to explore the interrelationships and influences between dimensions. In some cases, decision making is based on a vision but is separated into various silos, while strategies are not mapped to execution and sustainability modeling and reporting processes are not coordinated (Ahmed & Sundaram, 2012).

Literature Review

The Sustainability Balanced Scorecard (SBSC) is an evolution of the traditional Balanced Scorecard (BSC), designed to integrate sustainability dimensions—social, environmental, and economic—into corporate management (Kaplan & Norton, 1992). Influenced by the Triple Bottom Line (TBL) framework, SBSC emphasizes the balance between profit, people, and planet (Elkington, 1997). It extends beyond the BSC by explicitly incorporating social and environmental objectives into performance perspectives (Figge *et al*., 2002), enabling companies to contribute to sustainable development in a more integrated and holistic manner.

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The economic dimension of SBSC focuses on financial stability and efficient management, ensuring that companies can maintain sustainability efforts even under financial pressure. This balance enhances competitiveness by improving cost efficiency and strengthening market positioning (Hansen & Schaltegger, 2016), making sustainability not only relevant but also profitable in the long term. The social dimension integrates employee well-being, corporate social responsibility, and community relations into business strategies. This strengthens stakeholder relationships and helps meet growing social expectations (Hansen & Schaltegger, 2016). It can be incorporated through customer and learning perspectives in the traditional BSC or as a separate focus (Kaplan & Norton, 2000), bridging the gap between business goals and social impact (Figge *et al*., 2002).

The environmental dimension emphasizes responsible resource management and reducing negative environmental impacts. By adding an environmental perspective to the BSC framework, companies can identify performance indicators that support ecological sustainability (Schaltegger & Wagner, 2006). This includes measuring energy efficiency, emissions reduction, and waste management, aligning these with strategic objectives (Hansen & Schaltegger, 2016). Integrating environmental aspects strengthens a company's ecological responsibility and enhances its image.

RESEARCH METHOD

The research was conducted through literature studies on the latest research on the sustainability balance scorecard and the triple bottom line in the last ten years. The literature study was conducted using the Systematic Literature Review (SRL) method which according to Kitchenham and Charters (2007) is a research method using secondary data which aims to identify, evaluate and interpret something based on previous research. The SRL method is carried out through stages: Literature search using the keywords "Sustainability Balance Scorecard (SBSC) and Triple Bottom Line.

RESULT AND DISCUSSION

Research Mapping

Based on a review of the literature and previous studies, the research taxonomy is mapped in alignment with the purpose of the research, the expected research output, the generated model, the formulated indicators, the verificator for model testing, and the application of the model as a management tool, as illustrated in Figure 1. Furthermore, the analysis framework derived from research conducted over the past 10 years is summarized and classified into several key aspects, including the conceptual framework, perspective addition, techniques for formulating indicators or indices, the framework's implementation within organizations, application transformation, decision support systems, and contributions to the implementation of the Sustainable Balanced Scorecard (SBSC), as detailed in Table I.

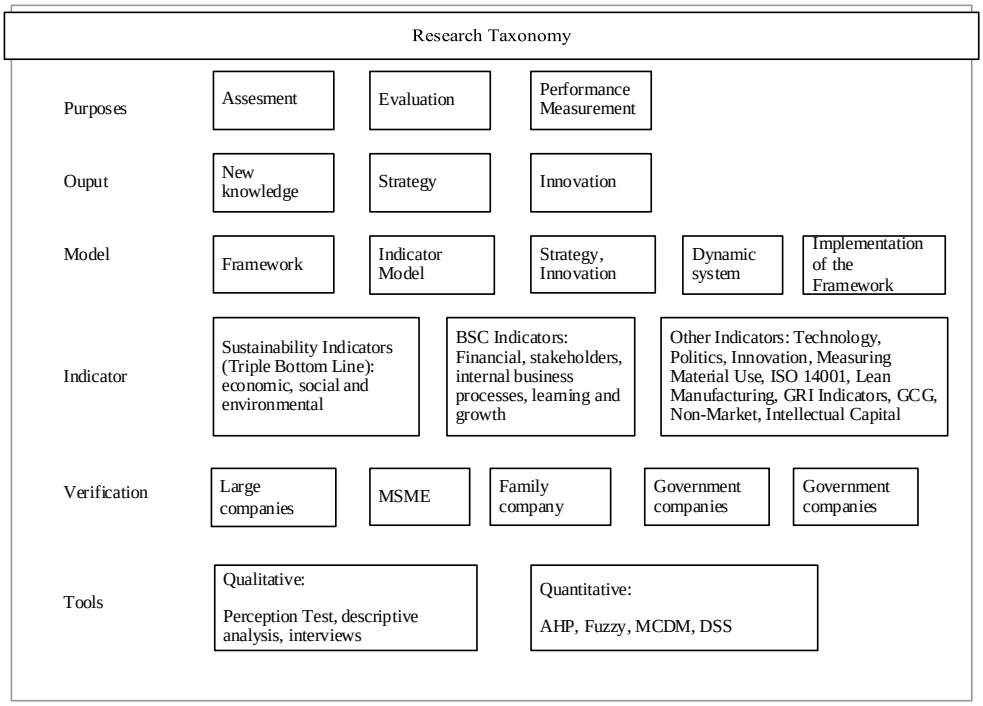

Figure 1. Taxonomy Research the last descade.

Table 1. Research Mapping SBSC the last decade

Analysis Framework	Scope	Author
Conceptual framework	Integration Model	Helleno *et al*. (2017); Figge *et al*. (2002); Fulop *et al*. (2014); Journeault (2016); Chalmeta Palomero (2011); Baumgartner and Rauter (2017)
	Measurement / assessment model	Jiang *et al*. (2018); Edgeman and Eskildsen (2014); Dyllick and Hockerts (2002)
	Framework	Franca *et al*. (2017); Broman and Robert (2017); Mohammed *et al*. (2019); Petrini and Pozzebon (2009); Nawaz and Koc (2018)
	Methodology	Angelakoglou and Gaidajis (2015); Faulkner and Badurdeen (2014)
Perspective Addition	Intellectual capital	Bautista *et al*. (2016)
	Corporate governance	Do˘cekalová and Kocmanová (2016)
	Financial and non financial	Kalender and Vayvay (2016)
	Lean Manufacturing	Helleno *et al*. (2017)
Technique for formulating indicators / indexes	Integrating QFD and fuzzy MADM methods (Hsu *et al*., 2017); sustainability index (Beekaroo *et al*., 2019); The relationship between TBL and BSC (Junior *et al*., 2018); Product Service System (PSS) (Lee *et al*., 2012); GRI (Nikolaou and Tsalis., 2013); ISO 14001 (Campos *et al*., 2015).	

Analysis Framework	Scope	Author
Implementation of the framework in the organization	Semi-conductor industry (Hsu *et al*., 2011; Lu *et al*., 2018); the automotive industry (Stoycheva *et al*., 2018); oil palm (Jamaludin *et al*., 2018); bioenergy (Rimppi *et al*., 2016); Health, Safety and Environment (HSE) (Heidari *et al*., 2017); benefit corporation (Wilburn & Wilburn, 2014); Small and Medium Enterprises (UKM) (Falle *et al*., 2016); Dayton Industrial Assessment Center (UD-IAC) (Choi *et al*., 2019); entrepreneurship Molecke and Pinkse (2017); sustainable entrepreneurship (Palmaa & Dobes, 2010); cement industry (Amrina *et al*., 2016).	
Transform application	Roadmap for implementation transformation (Ahmed & Sundaram, 2012); managerial transformation (Lahtinen and Yrjola, 2019); managing sustainability change (Isaksson *et al*., 2015); the potential and constraints of the transformation process (Hansen & Schaltegger, 2017).	
Decision Support System	*Decision Support System (DSS) (*Zarte *et al*., 2019)*; combination of Multi-Criteria Decision Making (MCDM) methods, Fuzzy logic, and dynamic system modeling* (Chaker *et al*., 2017).	
Contribution to the implementation of SBSC	Improve the efficiency of environmental sustainability assessment of industrial systems (Angelakoglou & Gaidajis, 2015); bringing awareness to managers (Barlettaa *et al*., 2018); support sustainable and strategic development (Broman and Robert, 2017); improve the sustainability performance of palm oil mills (Jamaludin *et al*., 2018); enhance the role of strategic management (Figge *et al*., 2002); reducing the gap in three dimensions of sustainability (Jiang *et al*., 2018); support innovation and business model design (Franca *et al*., 2017); creating social benefits and benefits (Wilburn & Wilburn, 2014).	

Clustering Performance Indicator

The performance indicators produced are based on literature studies, then clustering is carried out to see the leveling indicators produced based on Doˇcekalová and Kocmanová (2016) regarding the complex structure of performance indicators. The performance indicator structure model can be seen in Figure 2, 3 and 4.

Table 2. Criteria of Sustainability Balance Scorecard at economy dimension

Financial		
Profit (Chang & Cheng, 2019; Hsu *et al*., 2011; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016)	Investment (Chang & Cheng, 2019; Zarte *et al*., 2019)	Cost (Kamali & Hewage, 2017; Zarte *et al*., 2019; Jamaludin *et al*., 2018; United Nation, 2012)
Operating income (Asiaei & Jusoh, 2017)	Facilities (Huang & Badurdeen, 2017)	Operating expenses (Doˇcekalová & Kocmanová, 2016)
Sales growth (Asiaei & Jusoh, 2017)	Equipment (Huang & Badurdeen, (2017)	Cost reduction (Kaplan & Norton, 2000)
Percentage of increase in net margin (Journeault, 2016)	Return on Investment (Doˇcekalová & Kocmanová, 2016)	
Cash flow (Doˇcekalová & Kocmanová, 2016)		

Production and service creation (Baumgartner & Rauter, 2017) Revenue growth (Kaplan & Norton, 2000) Personal income (Hahn & Figge, 2016) Revenue by sector contributing to gross state products (Hahn & Figge, 2016)	Innovation and Technology (Baumgartner & Rauter, 2017) Investment return (Kaplan & Norton, 2000)	
Stakeholder		
Green image (Hsu *et al*., 2011)	Regulatory satisfaction (Agrawala *et al*., 2016)	
Investment of green innovation technology (Hsu *et al*., 2011)	Anti-bribery (Hsu *et al*., 2011) Corporate sustainability reporting (Hsu *et al*., 2011)	
Internal Business Process		
Production rate (Jamaludin *et al*., 2018)	Market share (Doˇcekalová & Kocmanová, 2016; Bautista *et al*., 2016)	Structure efficiently the internal value driving processes (Kaplan & Norton, 2000)
	Added value (Doˇcekalová & Kocmanová, 2016)	
Inventory (Huang and Badurdeen, 2017) Product lifecycle analysis (Helleno *et al*., 2017) Quality assurance (Chang & Cheng, 2019) Losses of product (Jamaludin *et al*., 2018) Incorporating innovate process development (Kaplan & Norton, 2000)	Process technology and innovation capability (Agrawala *et al*., 2016)	Materials efficiency variance (Asiaei & Jusoh, 2017) Rate of scrap loss material (Asiaei & Jusoh, 2017) Manufacturing lead time (Asiaei & Jusoh, 2017) Labor efficiency variance (Asiaei & Jusoh, 2017) Maintenance efficiency (Sénéchal, 2017)
Learning and Growth		
Governance (Chang & Cheng, 2019)	Level of employee satisfaction (Chang and Cheng, 2019; Hsu *et al*., 2011; Agrawala *et al*., 2016; Bautista *et al*., 2016)	
Collaboration (Huang & Badurdeen, 2017) Knowledge Management (Huang & Badurdeen, 2017) Corporate transparency and accountability (Chang & Cheng, 2019) Research and Development (Huang & Badurdeen (2017; Chang and Cheng, 2019; Doˇcekalová & Kocmanová, 2016) Integrated management (Kamali & Hewage, 2017) Employment distribution by sector (Hahn & Figge, 2016)	Employee competency (Agrawala *et al*., 2016) Training (Journeault, 2016; Hsu *et al*., 2011; Kaplan & Norton, 2000) Internal skills and capabilities in order to align them to the strategic goals of the organization (Kaplan & Norton, 2000) Salary and benefits (Helleno *et al*., 2017) Health programs and safety employees (Helleno *et al*., 2017; Chang & Cheng, 2019; Asiaei & Jusoh, 2017; Kamali &	

	Hewage, 2017; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016; Agrawala *et al*., 2016; Bautista *et al*., 2016; Jamaludin *et al*., 2018) Skilled labor (Helleno *et al*., 2017; Chang & Cheng, 2019; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016; Sénéchal, 2017; Kaplan & Norton, 2000) Recruitment and selection (Helleno *et al*., 2017; Chang & Cheng, 2019; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016; Sénéchal, 2017) Hours of training (Helleno *et al*., 2017; Chang & Cheng, 2019; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016; Sénéchal, 2017) performance evaluation for employees (Helleno *et al*., 2017; Chang & Cheng, 2019; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016; Sénéchal, 2017) Employment practices (Chang & Cheng, 2019; Agrawala *et al*., 2016; Bautista *et al*., 2016) career development (Chang & Cheng, 2019; Agrawala *et al*., 2016; Bautista *et al*., 2016) Employee contracts (Chang & Cheng, 2019; Agrawala *et al*., 2016; Bautista *et al*., 2016) Safety and security (Kamali & Hewage, 2017) Percentage of employees covered by collective agreement (Doˇcekalová & Kocmanová, 2016)

Table 3. Criteria of Sustainability Balance Scorecard at social dimension

Financial
Economic impacts (Asiaei & Jusoh, 2017; Kamali & Hewage, 2017)
Public health (Helleno *et al*., 2017)
Increase in local community employment opportunities (Chang & Cheng, 2019)
Influence on local social development (Kamali & Hewage, 2017)
Cultural and heritage conservation (Kamali & Hewage, 2017)
Regional (local) materials (Kamali & Hewage, 2017)
Stakeholder
Perception of corporate image and reputation (Journeault, 2016)
Corporative philanthropy (Helleno *et al*., 2017)
social standard certified (Hsu *et al*., 2011)
Corporate Image (Agrawala *et al*., 2016)
Customer satisfaction (Hsu *et al*., 2011; Asiaei & Jusoh, 2017; Journeault, 2016; Kamali & Hewage, 2017; Doˇcekalová & Kocmanová, 2016; Kaplan & Norton, 2000; Agrawala *et al*., 2016)
Customer health and safety (Hsu *et al*., 2011; Zarte *et al*., 2019)

Stakeholder participation (Agrawala *et al*., 2016) Investors satisfaction (Agrawala *et al*., 2016) Community investment (Hsu *et al*., 2011) Avoiding discrimination (Hsu *et al*., 2011) Loyalty (Kaplan & Norton, 2000)
Internal Business Process
Process Business base social standard (Hsu *et al*., 2011) Number of innovations carried out related to sustainable maintenance (Sénéchal, 2017)
Learning and Growth
Community Development (Helleno *et al*., 2017; Journeault, 2016; Zarte *et al*., 2019) Number of local employees / number of employees (Journeault, 2016) labor sources (Agrawala *et al*., 2016) discrimination (Agrawala *et al*., 2016; Bautista *et al*., 2016) Female labor force participation rate (Hahn and Figge, 2016)

Table 4 Criteria of Sustainability Balance Scorecard at environment dimension

Financial		
Environmental investments (Doˇcekalová & Kocmanová, 2016)	Environmental costs (Doˇcekalová & Kocmanová, 2016)	Company image in relation to the environment (Helleno *et al*., 2017)
Environmental accounting (Hsu *et al*., 2011)	Recycling cost (Agrawala *et al*., 2016)	Product material content (Huang & Badurdeen, 2017) Use of environmentally friendly raw materials (Chang & Cheng, 2019) Reduction of the use of hazardous substances (Chang & Cheng, 2019; Hahn & Figge, 2016) Environmental certified (Hsu *et al*., 2011) Air quality (Bautista *et al*., 2016) Soil quality (Bautista *et al*., 2016)
Stakeholder		
Energy efficiency (Huang & Badurdeen, 2017; Chang & Cheng, 2019; Kamali & Hewage, 2017; Doˇcekalová & Kocmanová, 2016; Hahn and Figge, 2016)	Material efficiency Huang and Badurdeen (2017)	
Energy from renewable resources (Huang & Badurdeen, 2017; Kamali & Hewage, 2017; Doˇcekalová & Kocmanová, 2016) Energy consumption (Hsu *et al*., 2011)	Renewable materials (Kamali & Hewage, 2017) diversity (Agrawala *et al*., 2016)	

Internal Business Process	
Environmental management system (Huang & Badurdeen, 2017; Kamali & Hewage, 2017; Zarte *et al*., 2019; Agrawala *et al*., 2016; Bautista *et al*., 2016)	
Emission (Huang & Badurdeen, 2017)	Risk evaluation of hazardous substance (Hsu *et al*., 2011)
3 R's (Reduce, Reuse, Recycle) culture (Helleno *et al*., 2017)	Greenhouse gas emissions (Hsu *et al*., 2011)
Policy / environmental standards (Helleno *et al*., 2017)	Waste volume (Hsu *et al*., 2011)
	Use of hazardous substance (Hsu *et al*., 2011)
Indicators and environmental goals (Helleno *et al*., 2017)	Natural habitat conservation (Zarte *et al*., 2019)
Structure responsible for the environment (Helleno *et al*., 2017)	Pollution production control (Agrawala *et al*., 2016)
Biodiversity monitoring (Helleno *et al*., 2017)	Disposal capability (Agrawala *et al*., 2016)
Environmental aspects and impacts (Helleno *et al*., 2017)	Greenhouse gases balance (Bautista *et al*., 2016; Zarte *et al*., 2019; Doˇcekalová & Kocmanová, 2016)
Treatment / disposal of waste; consumption of hazardous materials (Helleno *et al*., 2017)	Solid waste management (Slaper, 2011)
Reduction of greenhouse gas emissions (Chang & Cheng, 2019; Kamali & Hewage, 2017)	
Noise emissions (Chang & Cheng, 2019; United Nation, 2012)	
Learning and Growth	
Employee diversity (Asiaei Jusoh, 2017)	Sustainable consciousness of top management (Hsu *et al*., 2011)

The development of SBSC research in the past 10 years has grown rapidly. Figure 1 and Figure 2 show the various aspects that have been researched. SBSC which is an integration of the BSC developed by Kaplan and Norton (1992) obtaining a balanced calculation method between non-monetary strategic factors and factors that significantly influence the economic success of a business. The SBSC concept is in line with the development of the Triple Bottom Line (TBL) concept developed by Elkington (1998). The Triple Bottom Line is defined as a performance measurement framework that combines three performance dimensions: social, environmental and financial. By focusing on comprehensive investment returns, relating to performance along the dimensions of profit, people and planet (3P) (Amrina *et al*., 2016; Journeault, 2016; Ahmed & Sundaram, 2012; Agrawala *et al*., 2016; Slaper, 2011; Kalender & Vayvay, 2016).

SBSC can answer industry challenges that are not only profit-oriented but also sensitive to human, social and environmental friendly welfare needs (Elkington, 1998). A strategic management tool that is often used as a performance measure that can formulate strategies to operations is the Balance Scorecard (Rabbani *et al*., 2014). Elkington (1998) defines the dimensions of the TBL concept as follows: (a) economics: represents earnings and earnings per share as part of a firm's accounting; (b) environment: shows that the environmental agenda of company executives has been set to meet market expectations; and (c) social: consisting of social, political and ethical problems. Govindan *et al.* (2016) complement the TBL concept by building a sustainable corporate economy by ensuring stakeholder liquidity and financial returns; environmentally friendly companies committed to preserving the ecosystem; and is socially sustainable which enriches the community with social management capital.

The SBSC is widely recognized as a valuable decision aid approach to sustainability management. SBSC plays an important role in shaping corporate sustainability proportionally (Hansen & Schaltegger, 2014; Schaltegger & Wagner, 2006). SBSC is the mainstay of organizational operations in implementing strategies that are tailored to the external context of the company and internal resources and capabilities (Fulop *et al*., 2014). Sustainable development aims for economic, environmental and social development that meets current needs and does not hinder future generations (Baumgartner & Rauter, 2017; Schaltegger & Wagner, 2006). This requires a holistic, multidimensional and strategic performance assessment (Amrina *et al*., 2016; Doˇcekalová & Kocmanová, 2016; Edgeman & Eskildsen, 2014; Baumgartner & Rauter, 2017; Agrawala *et al*., 2016; Schaltegger & Wagner, 2006). The use of SBSC is expected to answer the challenges of evaluating company performance in the context of sustainable development.

The advantages of using SBSC are:

1. Achievement of stakeholder needs (Dyllick and Hockerts, 2002).
2. Shifting the focus towards the bottom line, namely profit and social benefits, introducing the term "benefit company" (Wilburn and Wilburn, 2014).
3. Focus on long-term sustainable development rather than short-term benefits (Choi *et al*., 2019).
4. Management transformation in the form of changes in culture, structure and practices that move the socio-technical system towards a more sustainable form of production (Lahtinen and Yrjola, 2019).

However, the weaknesses of using SBSC based on the review literature are:

1. The instrument for implementing the concept and framework in a structured manner in terms of design and operation still needs to be explored more deeply (Chalmeta & Palomero, 2011).
2. The need for more concrete guidance that will enable businesses to act strategically and successfully in a sustainable manner (Ahmed & Sundaram, 2012; Baumgartner & Rauter, 2017).
3. Some structural weaknesses in the SBSC design methodology are based on an intuitionist mental model and subjective judgment (Chaker *et al*., 2017).
4. Implementation of SBSC is a complex process that must be carried out with a strong commitment from the top management team, established planning, and integration of sustainable behavior into the thinking and daily activities of all elements within the company (Soriano *et al*., 2009).
5. Simplification of complex phenomena can lead to overly simplified conclusions (Doˇcekalová & Kocmanová, 2016).
6. SBSC involves a complex decision-making process (Zarte *et al*., 2019), so that social, economic and environmental aspects need to be kept in balance. Most of the available sustainability frameworks are qualitative in nature and the trade-offs between environmental, social and economic sustainability domains are rarely examined (Stoycheva *et al*., 2018).
7. Difficulty integrating the three dimensions of sustainability (TBL) (Edgeman & Eskildsen, 2014).
8. The challenges that must be faced are classified as formidable, namely formulating the most appropriate SBSC architecture for a specific organizational context (Chaker *et al*., 2017).

9. It is necessary to understand how the size, age and resources of a company affect the company's ability to meet stakeholder expectations regarding accountability for its social impacts (Molecke & Pinkse, 2017; Lahtinen & Yrjola, 2019).
10. Need to customize the methodology for different types of industries (Chaker *et al*., 2017; Faulkner & Badurdeen, 2014).

CONSLUSION

The results of the review literature show a taxonomic picture and mapping of SBSC research results for a decade. Which broadly includes a variety of objectives, outputs, models, indicators, verification as case studies and tools used for research. The development of research mapping has included a conceptual framework, perspective addition, techniques for formulating indicators, implementation of the framework in the organization, and transform application.

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