Using The Sustainability Balanced Scorecard As An Experiential Learning Tool: A Multi-Case Analysis

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***Abstract*—This paper introduces a Sustainability Balanced Scorecard (SBSC) to help companies track and measure sustainability performance throughout their supply chains. The framework is developed using a Design Science Research approach and extends the traditional four Balanced Scorecard (BSC) perspectives - Financial, Customer, Internal Process, and Learning & Growth by incorporating environmental and social measures. The SBSC is applied to two real-world organizations, identified as Company A and Company B, to examine how sustainability goals can be translated into measurable indicators across the four BSC perspectives. The results demonstrate that both organizations maintained financial growth while advancing significant sustainability initiatives, including emissions reduction, renewable energy adoption, circularity, supplier engagement, and sustainability innovation. These findings support the value of integrating sustainability objectives into the BSC to clarify how sustainability initiatives contribute to competitive capabilities. The results demonstrate that the SBDC framework is an educational tool that business faculty focusing on experiential learning can use to convert sustainability strategy into evidence-based performance measures and practical and actionable managerial implications.**

Keywords—Business Education; Case Analysis; Design Science Research; Experiential Learning, Supply Chain Sustainability; Sustainability Balanced Scorecard

I. INTRODUCTION

Sustainability has become an important aspect of organizations that provide services or produce products for their customers. As the need grows in organizations, so does the need for tracking and measuring environmental and social performance while also keeping the company financially stable or growing. Balanced Scorecards (BSCs) are a popular tool tasked with providing a balanced review of a company's performance, allowing the evaluation of environmental and social aspects of a company's activities [1].

Many scholars have already embedded these features into the Sustainability Balanced Scorecard (SBSC), embedding triple-bottom-line goals of sustainability - financial, environmental, and social - into each of the original four BSC dimensions [2]-[4], including Financial, Customer, Internal Process, and Learning & Growth [5]. Doing so, companies can actively track and measure strategic environmental and social value alongside other competitive capabilities, such as profitability. According to Mio et al. [6], an SBSC framework can turn high-level sustainability strategies into operations by incorporating sustainability targets into traditional BSC perspectives.

Despite its promise, many organizations still lack a standard framework to measure sustainability performance, especially across complicated supply chains. To bridge this gap, leveraging a Design Science Research (DSR) approach [7], [8], we developed an SBSC framework. This approach emphasizes developing and testing a framework to address real-world challenges. We validated the applicability of the proposed framework by applying it to two real-world organizations: Company A, a global electronics maker, and Company B, a heavy-industry tools distributor, to see how well the SBSC aligns sustainability indicators with overall corporate strategy. This gap also provides an opportunity for business students to investigate further. For example, an experiential learning SBDC project can be designed so that students apply their broad sustainability theoretical knowledge by analyzing sustainability reports and disclosures, connect and classify organization's sustainability initiatives based on scoreboard perspectives, and evaluate and conclude if sustainability claims are reinforced by financial and operational indicators.

II. METHODOLOGY

In this study, we use a Design Science Research (DSR) approach, which focuses on building and testing practical frameworks to solve real-world problems [8]. The DSR paradigm can be implemented in six stages [9]: define the problem, set the goal, design the artifact, demonstrate the artifact, evaluate the artifact, and communicate the results. Similar DSR stages can used for converting classroom concepts

such as sustainability into a rigorous, practice-oriented analysis.

First, we define the major problem. In this research, the problem refers to the issue that companies struggle to measure sustainability performance consistently across their supply chains. In the second step, we set our goal, which is developing a BSC that incorporates sustainability aspects into its indicators in each of the four traditional BSC areas. In the third phase, we develop the SBSC framework by

TABLE 1: SBSC FRAMEWORK WITH POTENTIAL CROSS-SECTIONAL SUSTAINABILITY INDICATORS

SBSC Perspective	Indicators	References
Financial	Eco-efficiency ratio (sales per ton CO2e); Energy cost savings from efficiency programs; Revenue share from sustainable or circular products; Carbon intensity per unit of revenue; Return on Sustainability Investment (ROSI).	[11], [1], [6]
Customer	Market share of eco-labeled or low-carbon products; Participation in take-back or repair programs; Customer satisfaction with sustainable products; Brand reputation for sustainability.	[1], [12], [13]
Internal Process	Percentage of sustainable suppliers; Share of renewable energy in operations; Waste recycling rate; Lifecycle emissions per product; Energy consumption per unit output; Recycled content percentage.	[11], [1], [14], [6]
Learning & Growth	Community/educational sustainability projects; Patents or projects related to sustainability; R&D expenditure on green innovation; Employee training in sustainability; Employee engagement in sustainability initiatives.	[1], [13], [12]

choosing sustainability indicators that fit within each BSC area. The fourth step involves examination of the proposed framework with two case studies related to two real-world companies. In step five, the framework's performance is evaluated regarding its effectiveness in capturing sustainability performance in the case analyses from two organizations. This process follows recursive logic [10], focusing on building theory from case research in iterations of a proposed framework (See Table 1 above).

III. CASE STUDIES

The two case studies examined with the proposed SBSC framework are named Company A and Company B. Company A is a multinational technology firm that is well-known for its innovative products and services to consumers. The firm drives a vertically integrated supply chain and has implemented several sustainability and circular economy initiatives. Company B is an international business-to-business industrial distributor specializing in fastening and assembly technologies. This company has implemented sustainability initiatives primarily oriented toward process efficiency, supplier engagement, and climate responsibility.

The two companies were selected due to their sustainability-centric supply chains as well as the availability of data related to sustainability initiative outcomes. These empirical data were collected from annual reports, environmental progress reports, sustainability reports, sustainability disclosures, company websites, and news outlets. Table 2 provides a summary of the sustainability-related initiatives and activities in the two companies.

A similar two-organization case analysis, used by the authors of this study, can be adapted into an applied learning project. As part of the class team project, students follow a structured process that initiates with understanding the company context, progresses through evidence collection and SBSC mapping, and concludes with gap analysis and managerial recommendations. For each phase of the structure, it is advisable to clearly state the teams' tasks and the learning value.

IV. RESULTS

We examined the proposed framework through the two case studies. First, the framework was employed to measure the sustainability-related performance of Company A's sustainability initiatives and actions. Next, the framework was applied to Company B, measuring its sustainability performance and identifying additional sustainability indicators needed to improve the SBSC framework.

TABLE 2: SUMMARY OF COMPANY A AND COMPANY B SUSTAINABILITY-RELATED INITIATIVES AND ACTIVITIES

Company A	Company B
Achieve complete carbon neutrality throughout the entire supply chain by 2030; cut emissions by 75% by 2030 compared to 2015; source all product and packaging materials from recycled or renewable sources; renewable energy projects; redesigned products with a circular economy mindset.	Geared fundamentally to the circular economy; establish sustainability approach relying on Climate, Material Life Cycles, and Social Standards; improve resource utilization by reuse and recycling; reduce GHG emissions from the supply chain; ensure responsible supplier practices; align with the Paris Agreement and United Nations Sustainable Development Goals.

The final framework was then obtained from examining the twocases on the initial proposed SBSC framework. From and instructional perspective, this structure illustrates how an experiential learning project moves from evidence to interpretation. The tables display how sustainability actions can be linked into scorecard measures and assessed against critical outcomes such as emissions reduction, renewable energy use, circularity, and revenue growth., among others.

Under the SBSC framework (see Table 3), Company A's sustainability-related initiatives and actions were evaluated across the four BSC perspectives. The Financial perspective includes management of energy consumption, GHG emissions, materials handling, and waste management throughout facilities and the supply chain. Since 2018, all of Company A's locations worldwide have operated exclusively on renewable energy. The Customer perspective reflects how Company A integrates sustainability as a feature of its marketing mix due to consumer demand for sustainable products. The Internal Process perspective includes functions such as energy use, emissions, material handling, and waste management throughout facilities and the supply chain. The Learning & Growth perspective captures Company A's investments in innovation, people, and organizational learning related to sustainability.

Company B's sustainability metrics were also organized across the four BSC perspectives (see Table 4). The Financial perspective includes returns on investments in efficiency and renewable energy, revenue derived from sustainable product lines, and long-term financial resilience. The Customer perspective includes detailed environmental information through Environmental Product Declarations, carbon footprints, and disclosure of sustainability efforts.

TABLE 3. COMPANY A SUSTAINABILITY MEASURES AND MATCHED SBSC METRICS

Perspective	Measurements
Financial	60% GHG emissions reduction with 65% revenue increase (2015-2024); avoided 41 MtCO2e through renewables.
Customer	Carbon-neutral products; more than 50% recycled content; 100% renewable manufacturing; enhanced repairability.
Internal Process	All facilities run on 100% renewable power; 17.8 GW clean energy through suppliers; high recycled material use (24% by weight).
Learning & Growth	R&D in green innovation, including 99% recycled rare-earth magnets; community outreach.

TABLE 4. COMPANY B SUSTAINABILITY MEASURES AND MATCHED SBSC METRICS

Perspective	Measurements
Financial	Sales increased 40% (2020-2023) while emissions decreased; strong credit rating (A) maintained.
Customer	Environmental Product Declarations and carbon footprints for products; sustainable packaging and circular product offerings.
Internal Process	Climate footprint analysis and reduction programs; renewable energy use of 915 GWh; 47% self-generation; waste recycling of 52.2%; product/material lifecycle management.
Learning & Growth	Climate education through biweekly sustainability-oriented sessions; supplier capacity building through code of conduct and risk audits.

The Internal Process perspective covers operations and supply-chain processes, including energy and material management, waste, procurement practices, supplier data, and climate strategy. The Learning & Growth perspective reflects employee engagement, climate-responsible training, supplier development, and sustainability-oriented collaboration.

After collecting results from the two cases and following a recursive approach, the developed SBSC framework was obtained. Compared with the initial framework proposed in Table 1, the updated framework provides a more comprehensive and generalized measurement tool that can be scaled to various cases in different industries. The revised framework (see Table 5) addresses compliance with sustainability goals and objectives while also incorporating innovation, transparency, circularity, and capability building into the measurement platform.

V. DISCUSSION AND EDUCATIONAL IMPLICATIONS

According to the results from the SBSC frameworks, it can be concluded that the framework could flexibly accommodate diverse corporate strategies while strongly implementing sustainability initiatives. Company A's approach is driven by products and innovations embedded in services and products. Its SBSC highlights metrics such as carbon-neutral product releases and recycled content, aligning with its brand and customer expectations.

TABLE 5. FINALIZED SBSC FRAMEWORK

SBSC Perspective	Indicators
Financial	Eco-efficiency ratio (sales per ton CO2e); Energy cost savings from efficiency programs; Revenue share from sustainable or circular products; Carbon intensity per unit of revenue; Return on Sustainability Investment (ROSI); Sustainability-linked financing ratio; Green innovation investment share.
Customer	Market share of eco-labeled or low-carbon products; Participation in take-back or repair programs; Customer satisfaction with sustainable products; Carbon footprints for products; Brand reputation for sustainability; Sustainable packaging adoption rate; Average product life-cycle footprint; Sustainability disclosure and transparency index.
Internal Process	Percentage of sustainable suppliers; Share of renewable energy in operations; Waste recycling rate; Lifecycle emissions per product; Energy consumption per unit output; Recycled content percentage; Upstream and downstream emissions coverage; Material circularity rate; Product/service repairability or upgrade index; Extent and quality of supplier data disclosure on sustainability.
Learning & Growth	Community/educational sustainability projects; Patents or projects related to sustainability; R&D expenditure on green innovation; Employee training in sustainability; Employee engagement in green initiatives; Supplier sustainability training participation; Internal sustainability awareness coverage; Digital analytics capability index for tracking and improving sustainability performance.

Company B's approach is more oriented toward process and supply chain, with SBSC measurements highlighting clean energy utilization, materials, and supplier management across the organization.

Despite these differences, both companies could apply their SBSCs to link sustainability initiatives and actions to competitive capabilities. Both scorecards share common sustainability goals, such as reducing emissions and enabling circularity. For Company A, the scorecard makes explicit how renewable investments and material recovery feed into profitability. For Company B, the SBSC connects operational efficiency and risk reduction to long-term financial stability. The DSR-driven SBSC framework therefore functions as a structural approach for mapping available data, assessing progress, and identifying measurement gaps.

The educational value of SBSC projects is significant because they help students view sustainability as a measurable management system, and helps build skills in disclosure analysis, comparative analysis, tradeoff assessment, and metric development for experiential supply-chain, and strategy courses.

VI. CONCLUSION

This study proposed an SBSC framework for supply-chain sustainability performance, developed through a DSR approach. The DSR approach ensured that the framework was grounded in both theory and practice and that it was iteratively refined based on the needs of real-world cases. The framework was applied to two leading companies. The case analyses showed that the SBSC could effectively capture diverse sustainability strategies and measure sustainability-related performance. In Company A, product innovation and renewable energy metrics were highlighted, whereas Company B addressed sustainability through process efficiencies and supplier stewardship. Despite different approaches, the SBSC revealed that both companies achieved tangible sustainability-related outcomes, including significant emission reductions alongside growth.

By providing a framework for managers to link sustainability goals and initiatives to performance measures within existing BSC perspectives, the proposed SBSC facilitates the translation of strategic sustainability objectives into operational metrics. Future research could expand this framework by integrating value-chain analysis and exploring adoption in more industries. Lastly, from an educational perspective, the framework offers an experiential project-based learning model that allows students to apply sustainability analytics, systems thinking, and strategic analysis through a realistic managerial assignment.

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