

Procedimiento para el control de gestión sostenible en la industria cubana del mueble: capacitación

Procedure for Sustainable Management Control in the Cuban Furniture Industry: Training

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RESUMEN: El presente artículo tiene como objetivo diseñar un procedimiento de control de gestión con enfoque sostenible como herramienta de capacitación derivado de la colaboración universidad-empresa. Los métodos empleados fueron el estudio de caso, entrevistas y Proceso de Análisis Jerárquico. Se diagnosticó un sistema fragmentado con predominio financiero y latencia informativa de 72 horas. El procedimiento resultante, estructurado en cinco fases con indicadores ponderados, se validó en talleres participativos. Los resultados demuestran que la articulación universidad-empresa, respaldada por el marco legal cubano que promueve la integración ciencia-producción, resulta determinante para transferir conocimiento y desarrollar capacidades organizacionales orientadas a la gestión sostenible.

Palabras clave: Gestión; Sostenibilidad; Decisiones; Industria; Universidad-Empresa; Capacitación

ABSTRACT: This article aims to design a management control procedure with a sustainable approach as a training tool derived from university-industry collaboration. The methods employed were case study, interviews, and the Analytic Hierarchy Process. A fragmented system with a financial emphasis and 72 hour information latency was diagnosed. The resulting procedure, structured in five phases with weighted indicators, was validated in participatory workshops. The results demonstrate that the university-industry partnership, supported by the Cuban legal framework that promotes the integration of science and production, is decisive in transferring knowledge and developing organizational capabilities aimed at sustainable management.

Keywords: Management; Sustainability; Decisions; Industry; University-Industry; Training

Introduction

Management control has evolved from an exclusively financial conception toward systemic approaches that incorporate the triple bottom line: economic, environmental, and social (Schaltegger et al., 2022).

Despite these conceptual advances, the Cuban furniture industry still shows a clear disconnect between existing control systems and the daily decisions made in the workshops. Decisions such as optimizing wood cutting, scheduling drying processes, or managing waste involve inevitable trade-offs: increasing yield can raise waste levels; speeding up processes increases energy consumption; and intensifying production sometimes compromises occupational safety.

This issue is particularly relevant in a sector where, according to available data, approximately 68% of raw materials must be imported and waste levels are around 20%.

National research has made significant contributions to strategic management control, although there is a gap in linking these systems with sustainability at the operational level. Even more notable is the limited attention paid to using these processes as vehicles for staff training and development-a dimension that could enhance technological appropriation and the sustainability of implemented improvements.

Cuba has a regulatory framework that supports and encourages collaboration between academia and the productive sector. The Constitution of the Republic, in its Article 21, establishes that the State promotes the advancement of science, technology, and innovation as essential elements for economic and social development. This constitutional provision places the integration of academic knowledge with productive needs at the highest level of the legal system (Asamblea Nacional del Poder Popular, 2019).

Based on this mandate, the Guidelines of the Economic and Social Policy of the Party and the Revolution, specifically Guideline 103, direct to “continue advancing in the improvement of scientific-productive poles and their contribution to local development, strengthening the link between universities and productive and service entities” (Partido Comunista de Cuba, 2021). This guideline provides the strategic direction for universities to play a leading role in solving business problems.

At the operational level, Decree-Law 7/2020 “On the Public Administration System” institutionalizes, in its provisions on productive poles and value chains, the mechanisms for collaboration between science, technology, and innovation entities and companies (Council of State, 2020)

This regulation creates the conditions for knowledge transfer and co-creation of solutions to go beyond individual initiatives and become systematic practices.

In addition, Decree 363/2020 “On Development and Innovation Units” establishes the creation of organizational structures designed to manage linkages and innovation projects, thereby legitimizing the participation of academics in solving business problems and facilitating the allocation of resources for these activities (Council of Ministers, 2020)

This regulatory framework creates a favorable environment for universities, as transformative agents, to build bridges with the productive sector. The goal is to co-create solutions that are not limited to solving immediate technical problems, but also strengthen organizational learning (Alfonso et al., 2021).

From this perspective, the design of management tools must incorporate knowledge transfer strategies that ensure their appropriation by workers, in line with current legal guidelines.

Therefore, the objective of this study is to design a sustainable management control procedure for the Cuban furniture industry, based on an empirical diagnosis and a university-industry collaboration model. This procedure aims to serve simultaneously as a management tool and as a resource for staff training, in accordance with the regulatory framework that promotes the integration of science and production.

Development

Sustainable management control and the university’s educational role

Sustainable management control can be understood as a formal information system that facilitates decision-making aligned with both organizational strategy and the principles of sustainable development (Schaltegger et al., 2022). Classic authors laid the foundations of this field (Anthony, 1965; Kaplan & Norton, 1996), although the contemporary challenge lies in its practical implementation and the effective integration of non-financial dimensions into daily production activities (Burritt & Christ, 2021).

At the same time, the specialized literature on knowledge management emphasizes the importance of university-industry linkages as a bidirectional learning mechanism. Interventions in organizations should not be limited to delivering a product (e.g., a procedure); it is more beneficial to conceive them as action-training processes in which researchers facilitate and business actors appropriate the knowledge, thereby ensuring the sustainability of improvements (Melnyk et al., 2022).

Legal Basis for University-Business Collaboration in Cuba

In the Cuban context, this collaborative approach finds institutional support in the legal framework described above. Decree-Law 7/2020 institutionalizes the creation of productive poles and value chains in which universities and research centers play a leading role as generators of knowledge and solutions. Decree 363/2020, in turn, provides the organizational instrument to formalize this collaboration through Development and Innovation Units, structures that can be based either in universities or in companies.

This legislation does not merely allow the proposed linkage; it explicitly encourages it. It provides a framework for action that legitimizes university intervention in solving business problems and turns the university into an active agent of territorial development. This pedagogically oriented perspective, legally supported, is the one adopted in the present research, where the University of Guantánamo and the University of Holguín act in accordance with their legal competencies to transfer knowledge and develop capabilities in the DUJO Company.

Empirical context and collaboration methodology

The research was conducted at the Cuban Furniture Industry Company, commercially known as DUJO, a benchmark entity in eastern Cuba with more than five decades of experience. Its mission focuses on producing and marketing furniture with high quality and competitiveness standards, contributing to social well-being. However, it faces structural challenges that affect its sustainability and motivated the present intervention.

A mixed-method research design was used, structured in three phases, with university-industry collaboration as the cross-cutting axis, developed in accordance with the provisions of Decree 363/2020 for the execution of innovation projects between scientific and productive entities.

In Phase I (Theoretical-Analytical), the university team conducted a systematic literature review of publications from 2020 to 2025 in the Scopus and Web of Science databases to establish the conceptual framework. In Phase II (Participatory Diagnosis), a case study was carried out at DUJO, applying semi-structured interviews with twelve managers and specialists, accumulating 168 hours of structured observation in key workshops, and analyzing 52 internal documents.

The findings were submitted to a Delphi panel composed of eight experts (academics and managers) for validation and consensus. Finally, in Phase III (Design and Formative Validation),

the procedure was designed and the indicators were weighted using the Analytic Hierarchy Process (AHP) (Saaty, 2008), with the participation of eight experts.

The proposal was validated in three participatory workshops involving 22 managers and workers. These workshops were conceived not only as evaluation instances but also as action-training spaces where feasibility was discussed, feedback was collected, and the learning process around the new control approach began.

Diagnosis results: an Opportunity for Organizational Learning

The diagnosis revealed an unbalanced management control system with serious limitations in supporting decision-making. Financial indicators accounted for 82% of those used, while environmental indicators reached only 12% and social indicators 6%. This fragmentation resulted in operational decisions that optimized the economic dimension locally but neglected environmental and social impacts (Table 1).

In addition, an average information latency of 72 hours was identified between the occurrence of a relevant event and its availability for decision-making, reflecting a slow and predominantly reactive information flow.

In 91% of the decisions analyzed, no feedback was identified linking operational aspects with the strategic sustainability guidelines. These gaps, rather than insurmountable limitations, were interpreted as an opportunity to design an intervention that, while restructuring the control system, would also serve as a diagnostic and learning exercise for the participating managers and workers.

Table 1.

Gaps in the current management control system at the Guantánamo Furniture Company

Dimension	Existing indicators	Critical gaps	Impact on decision-making
Economy	18 (82%)	Partial, not integrated with other dimensions.	Inappropriate allocation of resources, local optimization.
Environmental	2 (12%)	Scattered, unsystematic, and lacking clear objectives	Environmental factors not reflected in the cost.

Social	1 (6%)	A complete lack of safety and well-being indicators.	Occupational hazards that are not proactively managed.
Temporary	72-hour waiting period	Slow and reactive information flow.	Missed opportunities for improvement, delayed decisions.

Source: Own elaboration

Proposed procedure: A cycle of continuous improvement and training

To overcome the identified gaps, a cyclical procedure inspired by the PDCA cycle (Plan-Do-Check-Act) was designed. It is structured in five phases that explicitly incorporate training as a cross-cutting element.

The procedure begins with the Training, Awareness-raising, and Diagnosis phase, during which the university team trains key actors in the concepts of sustainable control and the use of the tools to be implemented, in line with Guideline 103 on capacity building in productive entities. This step is essential to ensure understanding and commitment, turning the procedure into a means for competency development. The subsequent phases are **Design of the sustainable control system**, Implementation, **Operation and Monitoring**, and Evaluation and Improvement; these are conceived as iterations where action and reflection occur simultaneously. See Figure 1.

The backbone of the system is the multidimensional indicator matrix. Table 2 presents an example for the carpentry workshop, where the weights of the dimensions (Economic = 0.40; Environmental = 0.35; Social = 0.25) were obtained through AHP, reflecting expert consensus with a Consistency Ratio (CR) below 0.10. An “Associated Training Action” column was also included to explicitly show how monitoring each indicator can become a learning moment for the person responsible.

Figure 1.

Procedure for Management Control with a Sustainable Approach

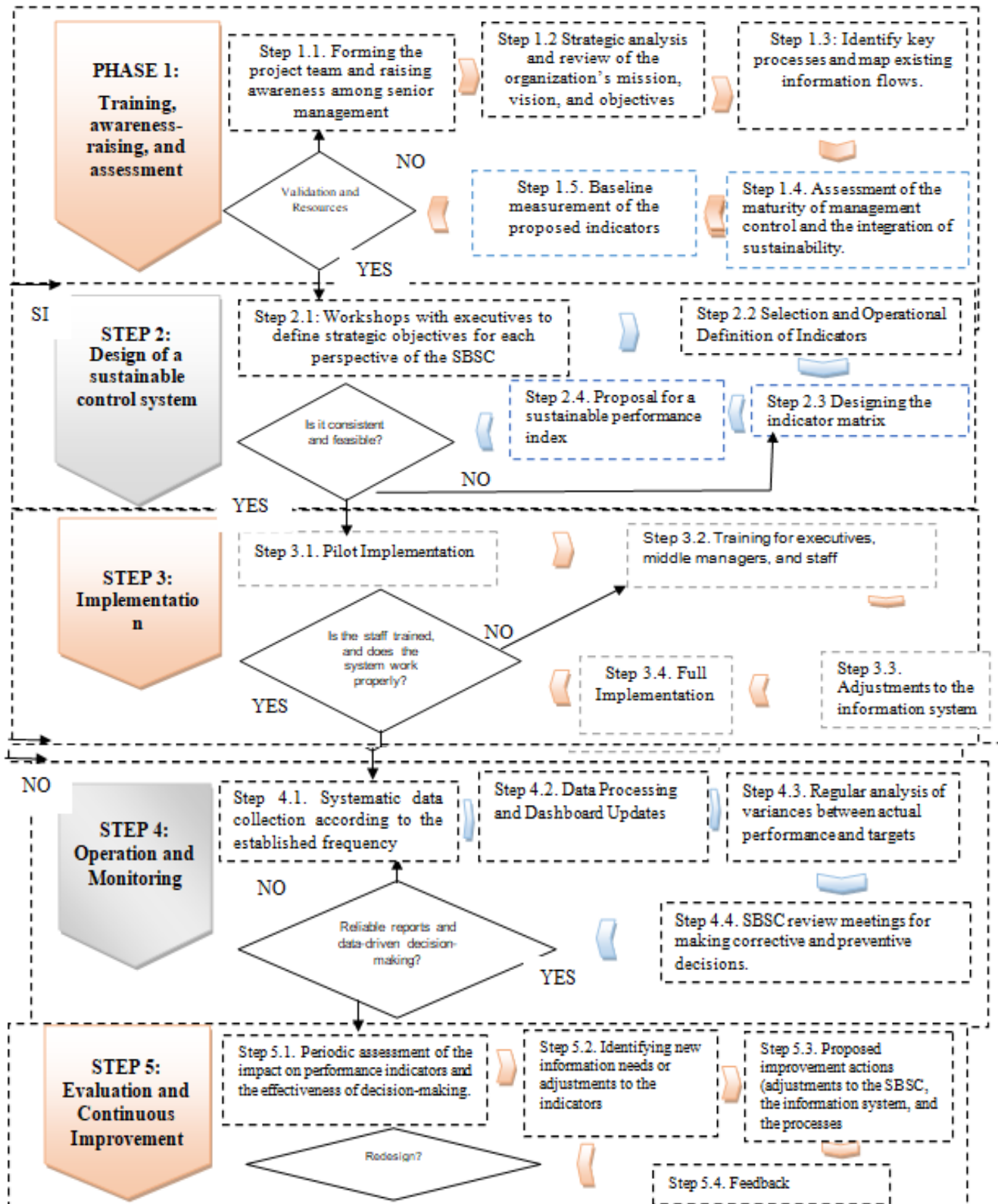


Tabla 2.

Sustainable Management Control Matrix for the Carpentry Shop

Dimension	AHP weight	Indicator	Unit	Frequenc y	Person in charge	Related Training Activity
Economy	0.40	Unit production cost	CUP/unit	Diary	Workshop Manager	Analysis of Variations at the Morning Meeting
	0.40	Labor productivity	u/h-male	Weekly	Workshop Manager	Best Practices Workshop with High-Performance Teams
	0.40	Percentage of plan completion	%	Diary	Workshop Manager	Feedback Session on Causes of Non-Compliance
Environme ntal	0.35	Percentage of wood waste	%	Diary	Quality Technician	Training in cutting optimization and patternmaking
	0.35	Energy consumption per cubic meter	processed kWh/m ³	Diary	Energy Technician	Course on Energy Efficiency in Drying
	0.35	Percentage of waste recycled	%	Monthly	Environmental Specialist	Talk on the circular economy and waste management
Social	0.25	Accident Frequency Rate	N° accidents /200000 h-h	Monthly	CyMAT Specialist	Training in the Identification of Workplace Hazards
	0.25	Hours of training received	per worker	Quarterly	RRHH	Related to the implementation of the training plan
	0.25	Workplace Climate (Survey)	Scale of 1–5	Semester	RRHH	Workshop on Improving the Workplace Environment

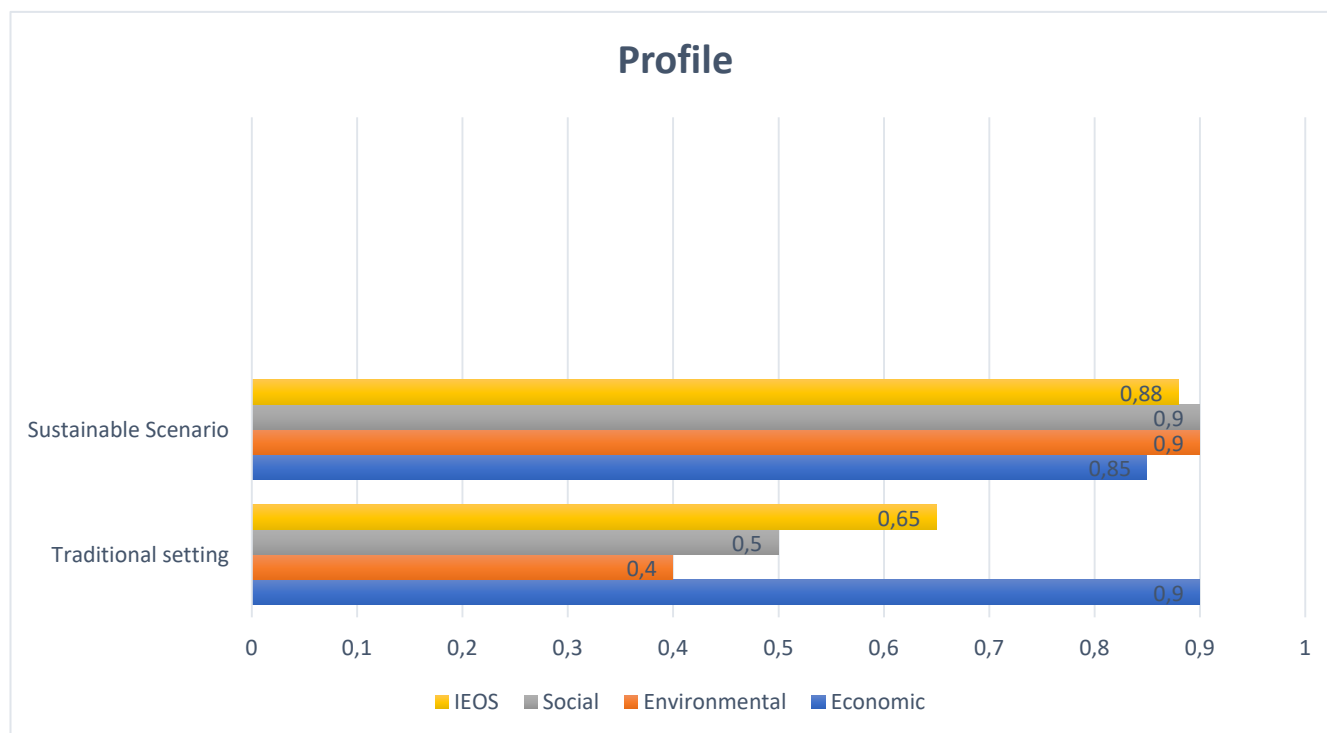
Source: Compiled by the author. Note: CyMAT (Working Conditions and Environment)

To facilitate interpretation, we propose the Sustainable Performance Index (SPI), which weights the normalized performance of each dimension. An SPI below 0.85 triggers a participatory root-cause analysis, turning the deviation into an opportunity for improvement and learning. Figure 2 illustrate how the IEOS also allows for the comparison of different decision-making scenarios,

highlighting trade-offs. In the example, the “Sustainable” scenario, although it has slightly lower economic performance than the “Traditional” scenario, compensates with high environmental and social scores, achieving an IEOS above the 0.85 threshold, unlike the traditional scenario.

Figure 2.

Sustainable Performance Profile (IEOS) under different decision-making scenarios



Source: Compiled by the author

Validation of the proposal: technical feasibility and user acceptance

The validation conducted in the participatory workshops yielded highly positive results. In the evaluation using an anonymous questionnaire with a five-point Likert scale, the technical feasibility of the procedure scored an average of 4.55, equivalent to 91% acceptance. The willingness to use it—organizational acceptance—reached an average of 4.20, or 84% acceptance. Qualitatively, participants highlighted that the co-design process and the clarity of the procedure facilitated understanding and generated confidence in its future application. These results validate the pedagogical approach of the intervention and demonstrate the relevance of the collaboration model established by Decree 363/2020.

Conclusions

The research confirms that integrating sustainability criteria into the management control of the Cuban furniture industry is an essential requirement for optimizing operational decisions. The analysis shows that current systems—which are fragmented and suffer from information delays—jeopardize competitiveness and organizational sustainability in the medium term.

The main contribution of this work lies in the design of a sustainable management control procedure that goes beyond the merely technical to incorporate a pedagogical approach structured around university-business collaboration, grounded in the Cuban legal framework—the Constitution of the Republic, Guideline 103, Decree-Law 7/2020, and Decree 363/2020.

The procedure, with its matrix of indicators weighted using AHP and its Sustainable Performance Index, not only provides a tool for more balanced decision-making; by including an initial training phase and conceiving validation as a space for learning-action, it also becomes a vehicle for knowledge transfer and the development of internal capabilities within the company, in full alignment with the country's science and innovation policies.

It is concluded that the university-business partnership, manifested in the co-creation of solutions and in context-specific training programs, constitutes an effective and legally sound model for addressing complex business management challenges. The high level of acceptance and perceived viability among DUJO stakeholders validate this approach and demonstrate that, while a favourable legal framework is a necessary condition, the willingness and commitment of stakeholders are also required to realize the potential offered by the regulations.

Future research should focus on the long-term implementation of the procedure, documenting its impact on both management indicators and the evolution of staff competencies, as well as its adaptation to other manufacturing sectors in the country.

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