



Strategy for sustainability in a Brazilian sugarcane industry

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Abstract

Purpose – The purpose of this paper is to suggest the application of systemic methodologies, such as Soft Systems Methodology (SSM), to develop sustainability strategies and solve problems involving the sustainability of organizations and their operations. The sustainability paradigm implies the need for changes in current production systems, societal organization and use of the natural resources that are essential to all life forms. Sustainability, as a new paradigm, modifies the way in which organizations operate to make companies responsible for sustainable development and ensure that resources are available for future generations. Sustainable development requires a broad new development strategy that encompasses political, economic, social, technological and environmental dimensions.

Design/methodology/approach – As a method of analysis the research will use the application of SSM in a case study from the sugarcane industry. The basic scientific thought paradigm, inherited from Bacon and Descartes, no longer holds in modern society, which requires a new way of perceiving the world by following a systemic and integrated approach to address complex problems.

Findings – This study advances the understanding of how the systemic approach can aid the development of corporate sustainability strategies.

Originality/value – The basic pillar of the new sustainability paradigm is the systemic view. The systemic approach should guide the development of corporate strategies. This study followed a qualitative approach to better understand how organizations can use the systemic approach in the development of sustainability strategies.

Keywords Strategy, Sustainability, Brazil, Sugarcane industry, Systemic approach

Paper type Research paper

1. The sustainability paradigm and corporate strategies

Environmental concerns have increased the awareness of the limitations of the modern conception of nature and its disastrous consequences. The basic paradigm of scientific thoughts, inherited from Bacon and Descartes, no longer holds in today's society. Understanding the complexity of ecology has led to new insights on the effects of human activities on the environment, the planet and the biosphere (Sachs, 2002). The adoption of a new development model requires a shift from the traditional view to a systemic and integrated perspective that facilitates the management of complexity.

This new perspective must be incorporated into all sectors of society, especially industrial production, to enable the more efficient management of natural resources. The challenge of this millennium is to manage increasingly limited resources in the face of increasing global demand (Parris and Kates, 2003). The severity of the ecological crisis demands the rise of a new society in which product values are determined by their real costs and not by capitalist market rules that focus on maximizing profits and encourage wasteful life-styles (Hémery *et al.*, 1993).

Corporate sustainability consists of ensuring long-term economic viability and, at the same time, contributing to the socio-economic development of communities, the health of the environment and the stability of society (Ethos, 2009). The concept of corporate sustainability involves sustainable economic growth that is aligned with social development and environmental conservation. It therefore entails an ethical and



transparent relationship with all stakeholders and targets that are aligned with sustainable development principles, preservation of environmental and human resources for future generations, respect for diversity and promotion of social equity.

Private businesses are genuinely interested in sustainable development because it represents a good strategic option. Businesses are motivated by results and the immediate interests of shareholders. However, investors favor corporations that implement sustainable policies (Marcovitch, 2006). Sustainability is a challenge for businesses and forces them to move toward the adoption of new strategies and values. Therefore, many changes are required to enable companies to adapt to the new development models. Many companies have already engaged in social projects to foster ethical responsibility, transparency and quality in all public relationships. Although these initiatives show positive results, they are often isolated efforts that are disconnected from the business strategy and do not reflect a commitment toward sustainable development. In many cases, businesses are not able to incorporate actual changes in intrinsic values and therefore support isolated actions without genuine commitment.

To become a sustainable business, it is necessary for sustainability to be incorporated into the business strategy, it is crucial to define goals and evaluations of the organizational performance (Auld *et al.*, 2008; Ki-Hoon, 2011). “Sustainability needs to be in the core of the business and bring innovation; it should not be an artifact for the employees to ‘feel good once a year’” (Werbach, 2010, p. 67). Success will depend on the capacity to find innovative solutions that address global issues and, simultaneously, fulfill stakeholder needs. Companies that are unable to develop the capacity to innovate will have difficulties in remaining viable in current market conditions (Esty and Winston, 2006). The development of sustainable strategies will therefore become essential for the survival of both corporations and the planet.

According to Werbach (2010), strategists focussed on sustainability must change the traditional way of thinking and take the key principles of sustainable development into consideration, including the following:

- (1) integrating short- and long-term objectives in the sustainability strategy;
- (2) including unforeseen energy and raw materials costs;
- (3) working for a global population of nine billion with a rapidly aging population in many of the richest countries;
- (4) planning for change;
- (5) valuing transparency;
- (6) building from the inside out;
- (7) demonstrating that “our people are our most important asset”;
- (8) facilitating profound induction processes and long-term benefits for employees;
- (9) maintaining close ties with external organizations and businesses; and
- (10) implementing continuous cyclical actions.

For sustainability to be incorporated into corporate strategies and for managers to take actions that reflect sustainability in business, changes in attitudes, cultures and interests are necessary (Mebratu, 1998). However, the first step involves changing

perspectives to enable a view of the world and its complex problems through a systemic and integrated perspective.

The basic pillar of the new sustainability paradigm is the systemic view. This vision allows for flexible ideas because it is based on a multidisciplinary approach that seeks to establish a dynamic and harmonious balance through the combination of the natural and behavioral sciences (Belico and Silveira, 2000). The systemic approach should guide the development of corporate strategies.

2. Systemic approach in corporations

The systemic approach was developed as a response to the scientific need to address complexity. The need to address the world's complexity was therefore one of the drivers for the development of the systemic approach (Martinelli and Ventura, 2006).

The complexity of a system results from the many internal states it might exhibit. The larger the number of internal states, the more intricate their causal relationships are (Donaires, 2006). Managing complexity is a growing challenge.

It is clear that the traditional conception of orthodox science based on causality and determinism is not suitable to address some of the new challenges of modern times. The complexity of the poorly structured problems that are increasingly faced by managers indicates that the reductionism of the scientific method is unsuitable to address situations of great complexity (Checkland, 1985). It is necessary to find more holistic alternatives to understand reality and that allow for the more effective management of reality. These holistic alternatives contribute to advancing knowledge, promoting societal development, enhancing the efficiency of public institutions and creating more competitive markets (Donaires, 2006).

According to the theory of the systemic approach, the complexity of a system is defined by its elements, characteristics and inter-relationships as well as its degree of organization. According to Espejo *et al.* (1996), complexity is the capacity of a system to adopt a large number of states or behaviors, which can be measured by the system's variety (i.e. a system's number of possible states).

Effective organizations are able to remain viable (Espejo *et al.*, 1996). Viable systems have the internal capacity to solve known and unforeseen problems. However, despite their independence in relation to the resolution of problems, viable systems act within the environmental context and can be affected, directly or indirectly, by external factors.

The complexity and variety of the environment in which the organization is situated make understanding all aspects of its operations very difficult. According to Espejo *et al.* (1996), complexity is the ability of a system to adopt a large number of states or behaviors and can be measured by variety, which is a system's number of possible states.

The systemic approach suggests the recurrent management of control and communication. The primary activities of the company must be autonomous, and decisions must be made based on their functions instead of on their positions. According to Martinelli and Ventura (2006), system management has two basic functions: planning and control. System control consists of both planning for changes and monitoring the implementation of plans. It views the company as a unit that is associated with a complex and unknown environment, taking into consideration the company's views of the world as well as those of its collaborators. Additionally, system control acknowledges the process of individual and organizational learning, corroborating the idea that each system and subsystem must be viable.

The understanding of the systemic approach allows for a wider comprehension of systems, the relationships between subsystems, and how systems learn and evolve.

3. Methodology

This study followed a qualitative approach to better understand how organizations can use the systemic approach in the development of sustainability strategies. The first stage included an in-depth review of the systemic approach that is applicable to the management of organizations that have already understood the need for a wider and integrated view of problem solving and strategic planning. The next stage consisted of a case study using Soft Systems Methodology (SSM) to understand the complexity of a company in the sugarcane industry. The objective of the case study was to identify a framework for the development of practices that are related to corporate sustainability strategies from a holistic perspective.

The application of SSM is justified because this systemic method was “designed to assist in the resolution of soft issues, which are of complex nature and involve many human elements” (Martinelli and Ventura, 2006, p. 163) and to provide practitioners with new ways of thinking or guidance to address the world’s complexity (Zexian and Xuhui, 2010). This methodology is useful in allowing for different views of the same problem to be included in the same analysis, e.g. the many stakeholders with diverging views that are part of the same system (Martinelli and Ventura, 2006).

According to Zexian and Xuhui (2010), SSM, created by Peter Checkland in the 1960s, passed through a long process of change that was driven by reflection and practice. SSM aimed to systemically solve poorly structured corporate problems. In their study, the authors criticize the subjectivity and idealism of the SSM model.

The systemic approach includes methodologies that should be understood as a group of methods that systemically deal with the management of problems. The systemic methodologies were created to address the call for alternatives to traditional approaches and are now considered to represent a new scientific methodology for the study of organizations (Martinelli and Ventura, 2006, p. 56). The systemic methodologies are classified as hard or soft. According to Martinelli and Ventura (2006, p. 58), the former requires rigor and quantitative analysis, reflecting the influence of the systems theory of the exact sciences. In contrast, the latter has a more flexible and adaptable nature (depending on the context) because soft methodologies “are structured but react to the environment, altering their short-term functions and gradually changing in the long-term without losing their identity.”

The SSM is a soft methodology, which was developed from the observation that not all problems and situations faced by corporations are of a precise nature (Martinelli and Ventura, 2006, p. 163).

Typically, soft problems are complex and involve many human elements and diverging points of view (*Weltanschauungen*) held by different stakeholders. SSM was designed to formulate and resolve soft problems. In contrast, the Viable System Model aims to obtain the optimal solution for well-structured problems that have clearly defined objectives.

The application of SSM follows seven stages between the rationalization of the real and systemic worlds (Martinelli and Ventura, 2006, p. 163):

- (1) Exploring the poorly defined problem situation through observation and with the objective of collating information.

- (2) Defining and structuring the problem situation by relating structure and process, such as by identifying people's concerns and roles, the power hierarchy and all other existing relationships that characterize the problem.
- (3) Formulating root definitions of relevant systems to advance knowledge and identify their main elements. It is the transformation of the real world into the systemic world. To this end, Checkland and Scholes (1990) suggests the use of the mnemonic CATWOE (clients, actors, transformation process, *Weltanschauung*, owner, environmental constraints).
- (4) Building conceptual models, which include the ideal situations required for each of the previously formulated root definitions to achieve their expected outcomes.
- (5) Comparing stage 4 with stage 2; the comparison provides insights into the topics that will be discussed and the solutions and changes that might be required.
- (6) Selecting the changes that will be implemented based on discussion and assessing whether they are desirable and feasible.
- (7) Proposing actions to improve the problem situation and defining how they will be implemented.

According to Martinelli and Ventura (2006), one of the main features of the application of SSM is the detailing of the system and its functioning, which often "unveils details previously hidden and assist in the structuring of thought."

4. Application of SSM: a case study of the sugarcane industry

SSM was employed in the selected company with the goal of better understanding its sustainability strategies. Specific objectives included the evaluation of main challenges and the formulation of recommendations to enhance the integration of sustainability into the corporate strategy.

4.1 The company

The Balbo Group (established in 1946) currently has the capacity to mill five million of tons of sugarcane, which is supplied by more than 300 independent producers and by a specific Balbo Group company that owns lands. Balbo Group operates these lands through partnerships. The Group has benefited from the production of electricity from the sugarcane waste in its unit for 14 years, allowing it to be self-sufficient in meeting the energy needs of its industrial activities. The Group produces sugar, organic sugar, ethanol, organic ethanol, biodegradable plastic and other sugarcane byproducts. The company's mission is to explore the sustainable agri-business potential of sugarcane and other agricultural products.

4.2 Stage 1: exploring the problem situation

The Balbo Group has strong sustainability practices related to production process and product innovation. However, the company is concerned with the lack of integration and adaptation of sustainable practices in its corporate management model. Its sustainable practices are unstructured and not always linked to the corporate strategy.

4.3 Stage 2: defining and structuring the problem situation

The sustainability practices of the Balbo Group are diverse and involve processes and products. As previously mentioned, the Group's companies are self-sufficient in the production of electricity. Additional produced energy is supplied to the state's energy distribution company (Companhia Paulista de Força e Luz). The Balbo Group is a pioneer in Brazil in the co-production of electricity from sugarcane waste. It produces enough energy to supply the demand of a city with a population of 80,000. The Group plans to enlarge its energy co-production activities and has commercialized carbon credits from three harvests.

In-house technological research has allowed for the use of new products, such as biodegradable plastic and organic products. These products promote sustainability and are underpinned by the principles of using fewer natural resources and creating less environmental impact.

The solid and liquid organic effluents from industrial processes are recycled for agronomic applications. The global system of raw sugarcane production and harvest, established in 1987, is one of the most important applications of agronomic research and mechanization. By harvesting without crop burning, this new production system allowed for the optimization of the use of organic industrial waste as a source of nutrients and the practice of organic composting in rotating crop systems. These practices contributed to the Group being awarded the status of a large-scale organic sugarcane producer. According to major international certification agencies, the Group is the world's largest organic agri-business company.

As a predecessor to its Cana Verde Project, in 1986, the Group implemented a reforestation program using native Brazilian species. The main objectives of the program were the creation and integration of islands of biodiversity in agricultural areas, the protection of water resources and the improvement of conditions for wildlife. The preservation of native forests and the creation of islands of biodiversity within sugarcane plantations provide better conditions for wildlife and promote ecological balance. Nurseries of native Brazilian species with the capacity to produce more than 90,000 seedlings per year support the plan of creating new forest areas. More than 700,000 trees have been planted. The creation of new forest areas and the maintenance of existing ones promote ecological corridors along bodies of water and often connect the islands of biodiversity. In addition to these green islands, landscape management includes the maintenance of access roads. In organic farms, the main roads are maintained through the addition of crushed rubble. Rubble recycling is an economic, useful and efficient measure that meets the needs of the community and local authorities, who find a use for the rubble left by roadsides or in empty or disused land in nearby towns.

Dust caused by heavy vehicle and machinery traffic is another concern of the Cana Verde project. All internal tracks and roads are watered before receiving more traffic. The majority of these routes are already covered with grass. As an additional result of organic practices and reforestation, streams have formed naturally within agricultural areas. This process would have been unimaginable during the time of traditional agricultural practices. Because the soil is covered by organic waste, rainwater does not completely evaporate and is able to infiltrate the soil, thereby feeding these extremely clean local streams that are part of the effort to recreate the elements of nature. The environmental monitoring of agricultural areas requires evidence-based knowledge of land use and land cover. The company mapped land use and land cover using satellite images and field work. A geographical information system (GIS) was developed for the

collation and management of agricultural and environmental data, including land use and land cover. The GIS has allowed for biodiversity gains to be quantified and cartographically displayed using objective and measurable criteria based on landscape ecology. Important environmental actions taken by the company include landscape and habitat diversification; the creation of new areas of native vegetation; the protection, maintenance and enrichment of existing forest areas; the development of ecological corridors; wildlife management; improvement of water quality and availability as well as accessibility to fauna; abandonment of sugarcane burning and fire practices (harvesting raw sugarcane); the total cessation of the use of agrochemicals (chemical inputs); the exclusive use of organic fertilization (pesticides and other chemical substances are no longer used); biological control of pests; soil management; erosion control; the increased capacity for water to infiltrate the soil; the increased availability of water in several sub-basins; the banning of wood harvesting or collection; enforcement of hunting bans; the installation of physical barriers to control unauthorized access to preserved areas; and environmental education for employees.

The Group also exhibits a special concern toward its human resources. In 1980, the Group created a Social-Health Program and a multidisciplinary team to analyze and monitor the health and quality of life of its employees and their families. Currently, the Group has approximately 3,400 employees, and including their families, the program serves a population of 9,800 people. Approximately 11,000 people live in houses that are provided free of charge by the Group and are located in urban villages with access to education, leisure and health services (including prevention and education). Due to the quality of its Social-Health Program, the Group received the Eco Prize for Corporate Contribution to the Community awarded by the Brazilian-American Chamber of Commerce. The Group also takes part in other important social responsibility projects, such as the TEAR project, which is funded by the World Bank, and partners with several local organizations and charities, such as daycare centers and orphanages, to help the local community.

Through the Cana Verde project, the Group has greatly reduced its use of manpower in the fields, as 90 percent of the harvest is conducted by machines. The rural working consists of 1,500 members, 70 percent of whom have permanent positions and 30 percent of whom have seasonal positions; of these, 15 percent are filled by migrant workers. The projection for 2013 is for 95 percent of the harvest to be conducted mechanically with approximately 500 people remaining to manually harvest the sugarcane due to cultural links with traditional practices. No new rural workers will be employed, and the remaining workers will be trained and reallocated to other jobs within the company. The Group has a strong retention policy across its sectors (from the agricultural to the administrative functions), in which employees are encouraged to build their careers within the company. This policy also applies to sugarcane cutters: upon their 45th birthday, because they have become less suitable for the physically demanding harvesting work, they are trained to undertake jobs in other areas.

The growth of mechanization has increased the demand for qualified employees, and the company has invested in professional development, qualification and training. However, the demand exceeds the in-house process of developing internal talent. Thus far, 100 employees from the agricultural sector have been trained to undertake jobs in other areas within the company. The existing in-house professional development policy is based on the assessment of the needs of the company and its employees, which often

receives assistance from the National Service for Industrial Training (Serviço Nacional de Aprendizagem Industrial). The company also offers support through scholarships for employees to engage in professional development outside the company.

Despite the consistent implementation of sustainability practices, the Group does not have an adequate functional structure to develop and manage these practices, which are developed in an uncoordinated manner and are not aligned with the company's strategic business plan. Furthermore, the functional sectors of the company are isolated from its sustainability practices, which are only discussed informally and within management board meetings. The sustainability practices are created as opportunities arise without following a strategic plan. The majority of the sustainable products were incorporated into the company's portfolio based on their viability and profit. The Group understood that sustainability could add market value to sugar and ethanol, which are considered to be commodities of low aggregate value. The sustainable processes were implemented as a way to improve productivity and quickly respond to the social demand for engagement with environmental regulations and concerns. The Group is involved in many legal actions due to environmental damage, indicating that its sustainable practices are reactive. There is no proactive initiative from management to incorporate sustainability into the corporate strategy.

4.4 Stage 3: formulating root definitions of relevant systems

This stage involves the definition of the elements that form the system. In this case study, the system specifically concerns the sustainability practices of one company operating in the sugarcane sector. Following CATWOE, the root definitions of the analyzed system are presented below:

C (clients of the system): the focus of the analysis is sustainability; therefore, all stakeholders are considered to be clients of the system. The municipalities that use the electricity that is co-produced by the company and the Companhia Paulista de Força e Luz, which distributes the energy; employees; cooperatives that trade sugar and ethanol; companies that buy sugarcane byproducts (e.g. Natura buys organic ethanol); sugarcane producers; the government; and the local community.

A (actors of the system): the main actors concerned with sustainability practices are the directors of the company, especially the president, who makes most of the decisions on the topic.

T (transformation of the system): the basic transformation process of the analyzed system is the creation of processes and products that promote sustainability. The main objectives of these sustainability practices are to reduce the legal actions taken against the company and increase profits.

W (*Weltanschauung* – shared vision): the shared vision is represented by the company having implemented many sustainability practices and that there is no longer a need to create specific mechanisms for their development or to integrate sustainability into the functional areas of the company or its management model.

O (owners of the system): the owners of the company.

E (environmental constraints of the system): the company has a strong focus on financial returns, around which the system is organized. The president of the company is the chief financial officer, and any discussion about sustainability involves how it can reduce legal actions or generate higher profits. Another constraint relates to the competitive crisis faced by the sugarcane industry in Brazil, which limits the interest in investments in areas that are perceived to be secondary.

4.5 Stage 4: building conceptual models (systemic world)

Considering the situation under analysis, the creation of a functional sector responsible for the development and management of sustainability practices would be an important initiative. The creation of this sector would foster a continuous debate about sustainability within an organized framework that is integrated into the business strategy. The company could invest resources and efforts in the development of mechanisms, such as sustainability indicators (e.g. Global Reporting Initiative) and social balance, to assist in the management and control of sustainability practices.

The creation of a code of conduct and a sustainability report are also actions to be suggested to the company. All of the initiatives described above can contribute to developing and disseminating sustainability values and promoting them in the culture of the company, especially if incorporated by the management board. It would also be relevant for the company to invest more in innovative social projects that are connected with its business strategy. Enhancing existing efforts to train employees is also a desirable and viable alternative.

4.6 Stage 5: comparing the systemic world with the real world

The company has consistently implemented sustainability projects and is able to generate sustainability-related product and process innovations. However, the management board, which is composed of the owners, believes that it is not necessary to create a functional area or devote any additional resources to managing sustainability practices.

4.7 Stage 6: desirable and feasible changes

- (1) creation of a functional area – desirable but not feasible;
- (2) development of sustainability indicators – desirable but not feasible;
- (3) development of social equity – desirable and feasible;
- (4) creation of a code of conduct – desirable and feasible;
- (5) investment in social projects, training of agricultural workers – desirable and feasible; and
- (6) development of sustainability reports – desirable and feasible.

In the company's current situation, the creation of a functional area and the development of sustainability indicators are not viable. The development of a program for social equity requires a person or group of people who are dedicated to centralizing the information regarding sustainability practices. This would be a viable and low-cost mechanism that could easily be implemented by the company. The same applies to the code of conduct and the sustainability report. The training and qualification of agricultural workers is also viable, fulfills the company's need for qualified employees and addresses community concerns about the impact of increased mechanization.

4.8 Stage 7: taking actions to improve the problem situation

- (1) engaging collaborators in the development of the code of conduct and sustainability report;
- (2) realizing the interests of collaborators and selecting some of them to form an internal committee for ethics and sustainability;

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- (3) training company managers to understand sustainability issues;
 - (4) improving communication of sustainability actions and practices within the company and to the market;
 - (5) implementing gradual changes in habits and culture to integrate the importance of sustainability into the company as a whole; and
 - (6) creating partnerships for the development of innovative social projects, especially to expand the training and qualification of employees.

5. Conclusions

Through the SSM tool, it was possible to more critically and widely understand the sustainability management practices and initiatives at the Balbo Group. The importance of the systemic view and, more specifically, the SSM methodology, in assisting the Group to address complex decision making is evident. To obtain a holistic view of the issues at hand, all system actors and their relationships should be taken into consideration in the decision-making process.

The present paper begins a debate on how sustainability requires a new attitude toward the world, beyond the reductionism and mechanicism that enables it to be embedded into corporate strategies. The systemic methodologies are helpful in assisting managers to use the systemic view in strategic decision-making processes. Developing a systemic view and managing an organization according to the systemic approach depends on the ability of managers to change their ways of thinking. A holistic and integrated view will enable managers to adopt systemic methodologies.

Sustainable development is based on the idea of a network of interacting actors and elements that affect society as a whole. Therefore, the systemic view and approach are aligned with the idea of sustainability, providing the foundation for the understanding of the complexity of the planet. This paper suggests the use of systemic methodologies, such as SSM, for the creation of strategies that promote sustainability and contribute to the resolution of problems concerning the sustainability of organizations and their operations.

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