

Article

# Drivers of Sustainable Innovation Strategies for Increased Competition among Companies

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**Abstract:** The present study aims to analyse the sustainable innovation strategies that companies can implement in their business models in order to improve their economic performance and become more competitive in the marketplace. This study uses a qualitative methodology based on the case method of nine companies. It was concluded that companies have concerns about environmental issues, translated into the implementation of sustainable practices in their business models, not because they are legal obligations, but because they incorporate sustainability in their strategic vision. Thus, companies add considerable value to their value chain and obtain a better strategic positioning in relation to competitors. It was also found that companies intend to implement innovative sustainable practices and that some companies have a business model that already incorporates sustainability strategies. Additionally, concerning sustainable innovation, we concluded that companies innovate in the manufacturing process (producing more with less) and with the product (modifying their product to make it more sustainable and greener). However, companies generally adopt a defensive sustainability strategy. This article is original because it simultaneously contributes to the development of the literature on sustainable innovation, sustainable strategies and company performance. It also recommends that companies improve their sustainable innovation strategies in business models to obtain a sustainable competitive advantage.

**Keywords:** sustainable innovation; sustainability strategies; business model; business performance; eco-efficiency



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## 1. Introduction

Innovation is one of the drivers of the development and economic growth of countries. Being a preponderant characteristic of developed countries, it is also essential for the generation of competitive advantage in increasingly competitive markets [1]. According to Schumpeter [2], innovation can be seen as a capacity that, when well applied, allows individuals, companies, regions or countries to obtain this competitive advantage. Currently, the focus is not only on the economic growth of countries and/or companies merely quantitatively but an economic growth with quality, i.e., sustainable through qualitative changes in the production composition, in the organization of economic activities and the economy structure [3].

Sustainable innovation has been getting more and more attention due to its importance and relevance in an increasingly global world. The growing increase in consumption imposes ever higher levels of production. Over the years, it has been observed that a balance between what is extracted from nature that wears out the ecosystem and what is needed to satisfy consumption has yet to be achieved [4]. Veiga [5] proposes that

sustainability indicators be established to simultaneously evaluate ecosystem resilience, quality of life and corporate economic performance.

When the innovation process is applied in organizations with sustainable practices, without neglecting their objectives, we reach innovation technologies that translate into the production of green products [6,7]. In this context, Artiach et al. [8] states that the company must make a contextual analysis of the market where it operates to know if it's now sustainable products will be absorbed by the market, since consumers will not always adopt an ecological stance, particularly in relation to prices. Green products sometimes have higher prices compared to common products [9,10]. According to Menezes and Dapper [11], the implementation of innovative sustainable practices is a challenge for companies, which goes beyond mere legal obligations.

Business aspirations related to sustainability may result from a practice based on acceptance, whereby companies limit themselves to respond to the measures adopted to meet the external pressures of legislation and stakeholders [12,13], i.e., reactive measures. They can also be the result of a proactive stance, seeking to be ahead of these pressures (adoption of proactive strategies) as a way to differentiate themselves from competitors to improve their competitive position [9]. Thus, it is important to know the real reason for the implementation of sustainable practices in companies, since when the company is motivated toward this type of practice for merely fiscal reasons, i.e., to comply with imposed legislation, there is a resistance to the adoption of radical innovation measures within organizations, which can jeopardize the success of sustainable projects [14].

In this context, it is important to determine the companies' motivation to apply strategies that include sustainability concerns in their business models and assess the impact of these strategies at the organization level of production processes and economic performance [8,15]. Thus, the objective of this study is to analyze the sustainable innovation strategies that companies can implement in their business models to improve their economic performance and become more competitive in the marketplace. Thus, the research questions are: What are the sustainable innovation strategies adopted by the companies under study? What are the implications in the business model and in the value chain of companies that adopt sustainable practices?

This study differs from others already published on this theme in that it is a case study based on interviews conducted with companies with different characteristics (sector of activity, market and size), making the analysis more comprehensive. On the other hand, this study simultaneously analyzes the relationship between innovation, sustainability and economic performance of companies, providing, in addition, some guidelines for the implementation of sustainable innovation practices in their business models. Most studies address these themes independently as, for example, those of Pinsky and Kruglianskas [4] and Menezes and Dapper [11] that deal with sustainability and innovation, those of Klein et al. [16] that address sustainability-oriented business models and those of Chen and Liu [17] that evaluate the economic performance of industrial companies.

This study found that the interviewed companies are concerned about environmental issues, incorporating in their business model these concerns and implementing sustainable practices. This occurs not because they are legal obligations but because companies have a strategic vision focused on sustainability, which increases their value chain considerably [18,19]. It was also found that companies are interested in implementing innovative practices related to sustainability and that three of the interviewed companies have a strategically defined business model that already incorporates these practices.

The study is structured as follows. The first section introduces the topic, including the issue under analysis, the objectives, and the study's originality. The following sections present the literature review, the methodology used in this study and the results obtained, together with a discussion of them. Finally, conclusions, limitations and future lines of research are presented.

## 2. Review of the Literature

### 2.1. Sustainable Innovation

Innovation is the capacity that organizations have to implement new products or transform existing products through new combinations of materials used in production processes or adding qualities to the product in order to meet the needs of the market in which it is located [20]. It can also be understood as a process in which the company finds unmet market needs that enable the creation of new products, using innovative ideas of practical use [21].

There are many types of innovation, depending on its source and scope. Menezes and Dapper [11] focused on product innovation, which consists of the introduction of a product or service already existing in the market with modifications of its characteristics and ease of use, or in the introduction of a new product in the market. Pinsky and Kruglianskas [4] defined process innovation as innovation linked to the operational side, ranging from the implementation of a new production method (machinery), or significantly improved, to distribution conditions. Aksoy [22] defines marketing innovation as the implementation of a new method of marketing with significant changes in product design or packaging, product positioning, promotion or pricing. Finally, organizational innovation which can be considered more comprehensive as it addresses a complete restructuring in the company's business practices, ranging from the company's internal operational process to relationships with external agents [23].

Pinsky and Kruglianskas [4] state that innovation oriented to sustainability has several denominations in the literature, such as sustainable, green, eco or environmental innovation. Chen et al. [24] define sustainable innovation as a set of activities that modify product design (marketing innovation) and those that modify production, both with the aim of eliminating negative impacts on the environment and obtaining environmentalist value [25]. Green product innovation refers to the introduction of a new product or service that is environmentally friendly [26]. Green process innovation is the proactive adaptation of production processes using green technologies and designs that decrease risks to the ecosystem [17].

A company benefiting from differentiation, environmental risk reduction, cost reduction, and sales increases with differentiated products, can improve its profit margins, brand value and company reputation in society [18,19]. According to Foss and Saebi [27], companies with sustainable commitments are more likely to innovate, although the aforementioned benefits may take a few years to achieve. When companies opt for eco innovative practices, they must be willing to delay, in the first years, their priorities in the financial sphere in favour of an organizational structure that favours environmental protection and adopting clean and sustainable technologies [28]. The company should move towards a common goal, i.e., all its departments (marketing, R&D, human resources and production) should work in an interconnected manner in order to develop and achieve sustainability in the company [29,30].

### 2.2. Sustainable Management Strategies

The concept of sustainability, namely sustainable development, became known worldwide as of 1987, when it was first used by the "World Commission on Environment and Development (WCED)" in its report "Our Common Future", also known as the Brundtland Report. The responsibility towards sustainability of companies gained legitimacy when the Triple Bottom Line emerged. This term gained popularity with the publication of Elkington [31]. In this study, Elkington [31] includes the responsible management approach, arguing that companies should consider the following three dimensions of development (Triple Bottom Line) in their management: environmental, social and economic. The environmental dimension encompasses the protection of the environment and natural resources (local, regional and global); the economic dimension includes subsidies/incentives and taxes/penalties to promote environmental efficiency; and the social dimension includes

corporate responsibility, business ethics, worker protections and fair trade. All dimensions are interconnected through sustainability [32].

Often companies adopt sustainable practices as a mere form of strategic investment [33] since it involves costs related to the purchase of equipment, greener raw materials, implementation of stricter quality control and sustainability reports. Bradshaw et al. [34], on the other hand, analyze sustainable management practices as strategies that must only be implemented when it is advantageous for the company to practice them. Other authors believe that such practices only translate into reality when corporate objectives are limited by some social and environmental considerations [14].

One of the barriers to sustainable organizational practices is often the companies' own partners or shareholders, since innovation can be seen as an investment, and its return can only be in the long term. This fact makes it uninteresting for partners and shareholders to invest in sustainable practices if their objective is to maximize their wealth in the short term [34]. It is in this sense that the relationship between corporate performance and social responsibility is so important. The question then arises: will companies with sustainable strategic management have good economic performance?

Before we analyze this relationship, it is important to say that the company's performance reflects the extent to which a company successfully achieves its goal, which is closely linked to its competitive advantage in the market [35]. Companies manage to improve their performance when they invest in value creation and capture activities [36].

Moskowitz [37] analyzed the financial performance of sustainable companies, examining 14 companies and concluding that socially responsible companies pose a low risk to investors. However, Aupperle, et al. [38] pointed out that the small subjectively selected sample makes these conclusions potentially unreliable. The truth is that from the numerous studies conducted, the results are quite divergent. However, most of the studies reviewed by Beurden and Gössling [39] show with 68% certainty that there is a positive relationship between social responsibility and corporate financial performance, while 26% show no significant relationship between social responsibility and economic performance, and only 6% of these studies state that there is a negative relationship between corporate social responsibility and economic performance [40].

Du et al. [41] reinforces the positive relationship between sustainability and organizations' good performance. Claudy et al. [42] present, as a cause of this positive relationship, the efficiency gains those sustainable practices originate and the differentiating factor of the company against the competition, allowing achievement of a competitive advantage. Sustainability, in radical innovations, can lead specifically to new business models since they comprise new combinations of products and services and incorporate the value of new business models, capitalizing companies [43,44].

Governments have been increasingly encouraging sustainable practices. Haas [45] argues that sustainable innovation is motivated by governments through measures that reduce the private cost of project development (driving technological advance) or that increase private profit from successful innovation (attracting demand). Subsidies to government-funded corporate R&D initiatives, increasing knowledge transfer capacity, supporting education and training initiatives, and funding demonstration projects are examples of how public policies based on the approach of boosting technological advances can incentivize eco-innovation projects by reducing costs for firms [43]. In contrast, intellectual property, tax benefits and rebates for consumers of new technologies, government procurement of products, and taxes on competing technologies are some public policy approaches based on demand pull [46].

Environmental responsibility has emerged in recent decades as a response to the problem of environmental pollution, which has been occurring since the emergence of the Industrial Revolution, reaching increasingly higher levels [47] and creating greater environmental awareness in society. This new environmental awareness encompasses companies, one of the major agents associated with the pollution process [48,49], meaning

that companies are increasingly oriented to the social environment, to the environment and the corporate social responsibility [50].

However, according to Seroka-Stolka and Fijorek [12], environmental orientation may simply result from a business practice based on acceptance, whereby companies simply respond to measures taken to meet external pressures from legislation and stakeholders to avoid economic and/or social costs. In contrast to this reactive positioning, other companies take a proactive stance, seeking to stay ahead of these pressures as a way to differentiate themselves from competitors to improve their competitive position [9]. Companies that recognize the potential benefits of improved environmental performance, integrating environmental concerns into their strategies, lead to corporate social responsibility positively affect product innovation [9].

Pollution is the main challenge of any sustainable management and can be considered a form of waste because it consumes resources and increases costs without any compensation [51]. As a result of environmental practices, organizations have made efforts to develop products and services that reduce pollution, require less packaging and less energy consumption, and eliminate their raw materials' toxicity [52]. Companies should opt for the production of products that are enabled for use more than once, i.e., products that are reusable. An organization promotes sustainability when it encourages the increase of social, economic and environmental capital through its policies [53]. Organizations committed to and qualified in the implementation of eco-innovations develop training and education programs focused on environmental management, develop innovative product designs, and also include organizational efforts aimed at reducing social and economic impacts, aiming at continuous improvement of processes and products and their relationships with stakeholders [54].

Georgescu-Roegen [55] emphasizes that large companies usually make greater investments in the research and development department and, as such, in these cases, it is easier to implement eco-innovations in organizations. On the other hand, micro and small companies, according to Georgescu-Roegen [55], implement sustainable practices by means of the personnel's own creativity in production processes and by recycling and reusing materials. Studies show that consumers prefer companies that assume social and environmental responsibilities. It is recommended that companies disclose or publicize their environmental care in order to attract new customers and preserve the old ones [14].

Odum and Barrett [56] state that when referring to sustainable and innovative companies, this does not refer to the fact that companies cease to apply technologies in their production process, which would currently be impossible given that manufacturing production costs are high. On the contrary, it refers to the use of technologies that increase resource productivity in order to be able to reduce the pressure on natural capital stocks [55]. Production processes that are elaborated in a strongly manual manner, in addition to high costs, usually make use of large quantities of raw materials, which decreases their productivity [57]. Speth [58] translates the idea of sustainable development into a perspective of qualitative improvement, the ability to meet what is lacking (needs and desires) without quantitatively increasing production. The compatibility between corporate objectives, technological development and wealth generation is plausible within an environmental perspective that attempts to find ways to avoid greater environmental errors [59].

### 2.3. Sustainable Management Model

We can state that due to the almost daily advancement of technology and the fact that we are inserted into an increasingly globalized world, economic, institutional, environmental and social factors have undergone continuous changes [44]. These factors have led companies to consider different scenarios and maintain, in a sustainable way, their profitability, growth and presence in the markets, thus generating the development and implementation of new strategies, tools and business management models [60].

Arvizu et al. [61] states that a management model is an auxiliary tool of management used to make a rigorous and well-structured analysis of the company's performance, iden-



tification of their deviations and how to rectify them through guidelines for continuous improvement, which aim to guide efforts to achieve the defined objectives. Duque et al. [62] analyzes the management model as the way to organize and combine the organization resources to meet the defined objectives. When the company implements radical sustainability innovations, new business models may emerge since they often comprise new combinations of products and services, as well as a new value proposition generated by the new business models implemented in the company [63].

According to Klein, Spieth and Heidenreich [16], the management model should be founded, in any organization, on three important bases: the production processes, the human resources, and the technology applied. Only with these three pillars, acting together and in a coordinated manner, the organizational objectives can be achieved and, therefore, should be considered in the management models. Casadesus-Masanell and Ricart [64] state that there are practices that must be observed when designing any management model, such as the strategy, because it allows the company to stay focused on the objectives, creating efficient tactics for the achievement of the same and promoting continuous growth and a culture; the creation of a culture strongly inspired by good performance should be privileged over any other option. It is essential that the company has a horizontal structure that facilitates communication between the various departments of the company in order to obtain greater speed in solving internal problems [60].

When a company commits to being sustainable, the three pillars mentioned above (production processes, human resources and applied technology) are restructured in order to respond to the new business reality [65].

The differences between companies regarding the processing, interpretation and implementation of the information collected depend in part on the strategic orientation adopted [66]. Companies adopt strategic orientations in order to obtain competitive advantages, and they may be market-oriented [67], technology-oriented [68], or entrepreneurial-oriented [69]. Mehrabian and Russell [70] explain that the company, upon receiving information, for example, the increase in emissions of pollutant gases, according to its market orientation, may trigger internal evaluations to find a solution to the problem. Thus, companies may approach their customers (i.e., market orientation), seek new technologies (technology orientation) or seek new market opportunities (entrepreneurial orientation) to find one or several potential solutions [65]. This problem, the moment the company adopts a sustainable orientation, will cause the company to readapt its business model, since processing the sustainability issue, based on the company's orientation, will change its target customers, product portfolio, value chains or revenue models [50].

This means that, upon detecting a problem that acts as an external stimulus, the company will tend to adopt general attitudes such as commitment to sustainability, which triggers further processing and interpretation behaviour through different strategic orientations (i.e., market, technological and entrepreneurial orientation), resulting in strategic responses deployed in business model changes [16].

### 3. Methodology

The aim of the study is to analyse the sustainable innovation strategies that companies can implement in their business models in order to improve their economic performance and become more competitive in the market.

This study uses a qualitative methodology based on the case method. To this end, interviews were carried out with nine companies; this number of interviews can be considered acceptable given that it is a case study. This methodology is the most appropriate because, according to Lopes et al. [71] and Moreira et al. [72], this methodology provides authentic data, i.e., enables understanding the interviewees' points of view. The fact that the questions are more open makes possible a greater level of depth in the answers because it allows for knowing the phenomenon under study presented in the literature, in the view and experience of the interviewee himself [73].

For the interviews, a semi-structured questionnaire with open questions was prepared. The semi-structured questionnaire was previously applied by Kneipp et al. [74] and contains questions related to the implementation of sustainable practices in companies, business models, sustainable strategies, and also questions that allow identifying innovative practices based on sustainability.

The nine companies selected for this case study were based on a convenience sample, but they had to present some sustainable practices. It is a convenience sample because it is not easy to identify companies with some sustainable practices available to provide the information under study. In early October 2020, the companies were contacted and invited to participate in this study. In this first contact, the study's objective was explained, and it was assessed whether the companies had considered sustainable practices. The interviews were carried out remotely by Zoom in October and November 2020. The interviewees in these companies were top managers, and the average duration of the interviews was one hour. After the interviews, transcription to Microsoft Excel took place, with coding of responses by subject and topic. Subsequently, everything was analyzed, and the Results section was written.

Regarding the characterization of the sample (Table 1), the companies that make up the sample operate in different activity sectors (industry, commerce and services), different locations (B and E are foreign companies and the others are national) and have different sizes measured by the number of employees (A, E and G are large companies and the others are small companies). The objective of selecting for our sample companies with different characteristics (in terms of sector, location and size) allows us to draw more comprehensive conclusions, verifying if the adoption of sustainable practices is more frequent in companies of a given sector and/or a given location and/or a given size.

**Table 1.** The companies and interviewees.

| Company | Sector     | No. of Employees | What it Sells   | Position of the Interviewee                | Experience in the Current Position | Training   | Classification as to Size |
|---------|------------|------------------|---|--|------------------------------------|--|---------------------------|
| A       | Industrial | 510              | Cakes, biscuits, croissants, popcorn, crackers, Toasted bread         | Manufacturing Director                     | 16 years                           | Mechanical Engineering   | Large company             |
| B       | Trade      | 8                | Provision of services and sales                                       | Administrative/financial Director          | 4 years                            | Management Computer Engineering  | Small business            |
| C       | Trade      | 3                | Bread, Cakes, Savoury   | Manager                                    | 8 years                            | Basic Education  | Small business            |
| D       | Services   | 4                | Services in the area of communication, Projects of investment         | Manager                                    | 2 years                            | PhD in Management  | Small business            |
| E       | Industrial | 1000             | Oil, gas and derivatives  | Manager                                    | 2 years                            | PhD in Management  | Large company             |
| F       | Services   | 20               | Cleaning, maintenance and rehabilitation of sanitation infrastructure | Manager of qualidade, ambiente e segurança | 8 years                            | Master in Environmental Technologies and Degree in Environmental Engineering | Small business            |
| G       | Industrial | 50               | Pre-cooked meals  | Manager of production                      | 12 years                           | Degree in Industrial Engineering and Management                              | Large business            |
| H       | Services   | 4                | Construction and maintenance of infrastructure                        | Manager                                    | 6 years                            | Master in Management   | Small business            |
| I       | Services   | 17               | Construction Materials  | Manager                                    | 22 years                           | Basic Education  | Small business            |

## 4. Results

### 4.1. Sustainable Strategic Innovation Management

#### 4.1.1. Strategic Positioning for Sustainable Innovation

Regarding the type of innovation, Company A classifies its innovation as innovation at the level of the manufacturing process since, when producing, it considers the reduction of raw material waste and recycling, wastewater treatment and has an annual electricity contract that allows for energy savings. The motto of this company is to produce more with less. Company E applies product innovation since the product itself (energy) is undergoing a transformation from fossil energies (more polluting) to renewable energies (sustainable). Company B, C, and D do not present innovative characteristics. Company F also uses innovation at the process level, using unique processes in Portugal to solve problems in terms of water collectors with the reuse of wasted water. Companies G and H also use process innovation in order to save costs and improve the quality of products and services provided.

As for the degree of novelty, only company E is developing an activity with an incremental degree of novelty because it has the perspective of eliminating all CO<sub>2</sub> emissions by 2050. Company I uses product innovation, seeking to choose innovative and more sustainable products to resell to its customers. Regarding sustainability strategies, company D implements an accommodative strategy since the company considers in its business model some sustainable practices through the adaptation of business to society and the environment. Companies F, G, H and I also adopt strategies with a degree of incremental novelty by incorporating innovations in their products and services in terms of material sustainability and product manufacturing. Company E has a proactive strategy since it establishes partnerships with companies in the energy industry for research and development of energy solutions that are less polluting, cheaper and more sustainable. Companies F, G, H and I also have a proactive strategy, looking for more sustainable and better quality/price solutions for their products and services. Company A, B and C apply a defensive strategy.

#### 4.1.2. Sustainable Innovation Practices

Regarding the company's integration with local communities and stakeholders to generate social and environmental benefits, Company A generates environmental benefits by recycling plastic, metal, and wood. Company B reuses used oils to produce soap for communities, and part of this profit is used in donations to households. Company C has a partnership with another company that collects used oils from the bakery for subsequent reuse. Company D is based on a logic of eco-efficiency, seeking to work with clients who wish to improve their environmental efficiency, namely, in the management of their own industrial waste, and also works with a client for whom they licensed a construction and demolition waste recycling unit, which is later reincorporated into construction. Company E has partnerships with large metropolises in order to increase the number of recharges for electric vehicles. Company F generates socio-environmental benefits as it provides sanitation services, essential for human and environmental survival. Companies G, F and I conduct garbage separation and recycling. Company H, in addition to recycling waste and materials left over from the works, uses solar panels for greater energy efficiency.

Regarding the company's interaction mechanisms with stakeholders, it was found that all companies, in different ways, report to their stakeholders. For example, companies D and I hold regular meetings to hear needs and share objectives with employees and shareholders.

Regarding the sustainable solutions in order to maximize the benefits for society and the environment, it was found that all interviewed companies present sustainable solutions, i.e., the reuse of waste. And in the production of products and/or services with less use of resources, aiming to reduce waste, emissions and pollution, Company A treats wastewater. This company makes an annual electricity control report that allows energy savings, produces more with fewer resources, recycles plastic, metal and wood. Company B reuses machine oil, and Company D reduces paper consumption, trying to increasingly



use digital processes in its activity to reduce environmental impact. Companies E and H maximize water energy efficiency and reduce carbon dioxide emissions.

#### 4.1.3. Maximising Energy and Water Efficiency and Emission Reduction

Regarding practices to improve energy efficiency, we found that most companies have practices to improve energy efficiency because companies A, C, E and G are companies whose production process consumes a lot of energy and that adopts saving measures to avoid the waste of electrical energy and, thus, produce in a more sustainable way, namely, through the use of solar panels. With regard to practices to improve water efficiency, Company A treats wastewater, while Companies D and C use piped water, which is clearly an example of a sustainable practice. The remaining companies do not apply any practice to improve their water efficiency.

As to practices to reduce emissions in the supply chain, Company E is concerned with selecting suppliers that supply recycled products, i.e., those with sustainable practices. Company F reuses water by recycling it and company H uses smart faucets to reduce water consumption per use. The other companies do not adopt any practices in their supply chain.

#### 4.1.4. Creating Value from Waste

Regarding the transformation of waste, eliminating the concept of waste, i.e., the reuse of the company's refuse, Company A, E, G, H and I recycle waste, paper, plastic and the raw material itself. Company B uses the oil that leaves the machines as raw material for the production of soap. Company F, in addition to the recovery and reuse of water, has vehicles that retain solids through a water filtering system inserted into the vehicles themselves. Residues, such as the sands present in a river collector, are subsequently dried, which will cause them to lose volume and size and then be deposited in residual landfills. The remaining companies do not apply such practices.

In reducing economic and environmental costs by reusing material and transforming waste into value, all companies (with the exception of C and D) claim that they seek to eliminate "waste", which allows them to transform costs into profits. Since, with the pursuit of reducing environmental impact, they produce other products without using many more resources.

#### 4.1.5. Delivery of Functionality Rather than Ownership

With regard to the product-service system, Company B applies this system by providing machine assembly and repair services and by selling industrial machinery. Company E provides consumable stock management services, and the products produced are, specifically, petroleum and its derivatives. Company F repairs sanitation systems to make them more environmentally sustainable and Company G changes pre-cooked meal menus to use organic and more sustainable products. The remaining companies have not adopted this system into their management.

### 4.2. Business Model of the Companies

#### The Value Proposition of the Company

Company B considers its business model as efficient, focused on the production of quality machines, which have an added utility for the customer, increasing efficiency in the production process of its customers. Company D is a customer-oriented company providing quality consulting services, which allow a better internal control of their customers (companies). Company E states that the model implemented by the company is dynamic and focused on investment in innovative companies throughout the value chain, in order to accelerate the development and commercialization of new technologies, products and services. Companies F and G consider their business model sustainable, both in economic and environmental terms. Company I defines its business model by proximity to customers and suppliers. It was found that six of the questioned companies have a defined business

model, which states the pillars on which they intend to develop their activities, as well as the differentiating characteristics. The other three companies do not have the same logic of establishing a complete business model, limiting themselves only to defining the activity performed.

With regard to the form of the company value proposition, this is related to economic, social and environmental criteria. Company B, manages to join the social and environmental component, reusing the oil and the subsequent donation to charities, which forms the company's image to customers, increasing the demand for the company's products. Company D creates economic value for their clients' companies, proposing to customers, since it is a consulting firm, the adoption of environmental practices. Company E selects companies and projects based on economic, social and environmental criteria, i.e., it seeks partners that share the same objectives as the company. Company G has environmental criteria in its value proposition due to the high importance given to recycling and the use of reusable materials. The remaining companies do not perform this combination.

#### *4.3. Degree of Modification of the Business Model, Supply Chain and the Relationship with Customers*

With regard to the modification of their business model based on sustainability activities and decisions, companies A, B, E, F and G have changed their business model, with company B changing from mechanical machinery to electronic machinery and company E in the process of changing from fossil energy to renewable energy. As for companies C, D, H and I, there was no change in their business model.

Regarding the way the company involves its suppliers in the sustainable management of the supply chain, Company A states that it has a wide range of suppliers, so it makes agreements with those who have the same ecological point of view. Company B seeks suppliers that have less polluting electronic machines. Company E, in the same perspective, chooses to select suppliers that present complete and integrated proposals in terms of sustainability. Company G is looking for environmentally certified suppliers.

In terms of customer relationships, consumers prefer companies that assume social and environmental responsibilities. It is recommended that companies disclose this and publicize their environmental care in order to attract new customers and preserve the old ones (Lourenço et al., 2012). Company A, in particular, has a strategy that goes beyond legal compliance because it not only wants to increase its efficiency but also to be recognized by its customers and the general public. For this, they have invested in certification. Company C seeks to create economic value for their clients' business (as it is a consulting firm), encouraging the best environmental practices so that the company contributes to the development of its employees, their families and the region in which it operates. Company E enters into partnerships with consumers, particularly in large cities, in order to provide more efficient energy solutions. Company C makes investments in sustainable marketing products to increase customer demand for this type of product, to the detriment of other products. Company G increasingly supplies its meals with less use of plastic packaging, government requirement and customer demand.

## **5. Discussion of Results**

This study aims to analyse the sustainable innovation strategies that companies can implement in their business models in order to improve their economic performance and become more competitive in the market.

Chen, Lai and Wen [24] and Liu, Dai and Cheng [25] define sustainable innovation as a set of activities that modify product design (marketing innovation) and production, both intending to eliminate negative impacts on the environment and obtain environmental value. Companies' adoption of sustainable practices is viewed as a mere form of strategic investment by McWilliams, Siegel and Wright [33], since it involves costs. On the other hand, Bradshaw, Cordaro and Siegel [34] analyse sustainable management practices as strategies that must only be implemented when it is advantageous for the company to

practice them. Lourenço, Branco, Curto and Eugénio [14] believe that such practices only exist because corporate objectives are limited by some social and environmental considerations. As a result of environmental practices, organizations have made efforts to develop sustainable products and services, i.e., those that do not contribute to pollution, require less packaging and less energy consumption, and choose cleaner raw materials [52]. Companies should opt for producing products that allow use more than once, i.e., are reusable. An organization promotes sustainability when it encourages the increase of social, economic and environmental capital through the policies adopted [53]. When a company implements radical sustainability innovations, new business models can emerge, as they often comprise new combinations of products and services, as well as a new value proposition generated by the new business models implemented in the company [63]. According to Klein, Spieth and Heidenreich [16], the business model must be founded, in any organization, on three important bases: production processes, human resources and applied technology. When a company makes the commitment to be sustainable, the three bases mentioned above (production processes, human resources and applied technology) are restructured in order to respond to the new reality of the company [65].

In relation to company A, we can verify that according to Hileman [75], this company can be considered ecological at the industrial level since production methods are geared towards the protection of ecosystems and the health of future generations. We also verify that the company considers that consumers prefer companies that assume social and environmental responsibilities. They chose to make disclosure, “advertising” of their environmental care, in order to attract new customers and preserve the old ones [14], through investment in practices that would grant it certification in legal terms (RSTO and UTZ). The shareholders of this company are focused on growth and sustainable profitability, so the barrier predicted by Bradshaw, Cordaro and Siegel [34] does not arise in this company. Another noteworthy aspect is that the company managed to increase its production without increasing energy-related costs, a very important and advantageous fact, according to Humphreys, Wong and Chan [52]. The company also has environmental practices such as wastewater treatment, recycling of plastics, paper, metal and wood, control and monitoring of gases released into the atmosphere, use of clean energy such as photovoltaic power generation and consumption of electricity from wind power, achieving an increase in efficiency throughout the value chain, which makes its production process more sustainable. In addition to this, by developing packaging without plastics, they have managed to make it more compact and efficient and, in this way, have redesigned existing products and made them more sustainable. The concept developed by Amil, Nasional, Badan and Zakat [60] was confirmed because this company has changed and developed strategies and tools, as well as changed its own management model, in favour of new models based on sustainability. These are proactive strategies, since they integrate environmental or social objectives in the majority of business processes and, in part, in products.

In Company B, according to the classification of innovation presented in the literature by Menezes and Dapper [11], the innovation implemented by the company is product innovation, since the machines used for the sale were changed to be more sustainable, changing from mechanized machines (more polluting) to industrial machines (less polluting). Regarding the value chain, the company implemented sustainable practices, and its value chain increased. This result confirms the results analyzed by Beurden and Gössling [39], who show that there is a positive relationship between social and financial business performance. This sales and services company manages to increase efficiency throughout the value chain by implementing recycling processes, reusing parts and the equipment itself, and reusing machine oils that will later be used for soap production. Thus, the company achieves sustainable development since it performs its activities from a perspective of qualitative improvement, and its activity can be framed in the triple helix model [32,58,76]. Therefore, it is possible to affirm that this company benefits from the eco-efficiency strategy since it is able to transform its costs into profits by identifying innovative opportunities (trying to reduce costs as much as possible by reusing machinery and using oils for the

subsequent production of soap). We were able to verify that, even though it is a micro-entity that operates in a market where sustainability is not a reality in most companies, it seeks to implement sustainable development practices.

Company C has implemented sustainable practices related to waste minimization and reuse. It has alliances with companies that reuse oils and other waste, and intending to reuse the leftovers of food. In this microenterprise, the implemented sustainable practices are in line with the conclusions obtained by Georgescu-Roegen [55], i.e., micro and small enterprises implement sustainable practices through the staff's own creativity in production processes and through the implementation of recycling and reuse of materials. We conclude that the company applies a more reactive strategy since its objective is to comply with the legislation, and this compliance implies the implementation of some sustainable practices.

Company D can be classified as a flexible company, capable of readapting to different scenarios, or, in this case, a new scenario involving facing external pressures (competition) and maintaining its profitability in a sustainable way, implementing strategies and tools, such as reducing consumption in order to avoid wasting electricity, and incorporating sustainable business management models [60]. It seeks to specialize in best practices, including those of a sustainable nature, even though it is a company that is not directly linked to industrial activities, which are the biggest polluters from a business point of view. It strives so that sustainable practices are implemented in the companies where it provides consulting services, thus suggesting to the various client companies new innovative and sustainable practices in order to achieve a positive result and market positioning, confirming the idea mentioned by Beurden and Gössling [39]. Finally, by having alternatives for the replacement of products by services, with the use of software on iCloud, paid on a rental basis, the company shows an ability to understand the preferences and tastes of consumers and to meet their needs, combining digital and physical methods (development of new business models). The results show that the company has implemented business strategies aimed at sustainability, namely proactive strategies, integrating the environmental or social objectives in most of the business processes and in parts of the products, despite this not being part of the company's main objective [77].

In company E, we conclude that the management applied by the company is a sustainable management since it fits into the definition presented by Lourenço, Branco, Curto and Eugénio [14], which states that sustainable management consists in achievement of the economic objectives of the company (profit maximization), taking into account the well-being of future generations through sustainable practices. We also verified that shareholders acting as barriers to the implementation of sustainable practices, identified by Bradshaw, Cordaro and Siegel [34], was not observed in this company. This is because the company will have already managed to generate the expected return in the long term due to it having existed in the market for a long time. The company adopted sustainable practices as an opportunity for innovation and made strategic alliances with other companies in order to implement new creative and more sustainable energy solutions (such as having partnerships with large metropolises, such as London and Houston) so as to be able to increase the number of recharges of electric vehicles. All these transformations fit into the idea advocated by Amil, Nasional, Badan and Zakat [60], that companies undergo changes and develop strategies and tools, changing their own traditional business management model for another based on sustainability.

With these internal practices, it is possible to induce and appeal to partner companies to experiment with sustainable technological solutions, materials or processes. They also aim to increase efficiency in value chains, making them sustainable by having the ability to redesign operations to produce less carbon dioxide emissions and generate less waste, such as reducing and producing fossil fuels and maximising energy efficiency. These solutions reinforce the idea of organizations committed to and qualified in the implementation of eco innovations advocated by Chiu and Yang [54].

In addition, their suppliers are selected on the basis of common company objectives, namely sustainability. They develop sustainable products and services and try to redesign

the existing ones, i.e., they are aware that the latter are harmful to the environment. By assuming the commitment to sustainable production processes, human resources and applied technology are restructured in order to respond to the new reality of the company [65]. Finally, the development of new business models based on sustainability and innovation is confirmed, being necessary to conduct a study of the current needs and identify the future needs of consumers to develop energy solutions that suit both the consumers themselves and the environment. This multinational company generally implements a proactive business strategy since it integrates environmental or social objectives into the core business logic. We verified that this company also practices innovation at the product level, since according to Menezes and Dapper [11], product innovation refers to changes in existing products, and this company is changing the product that is already marketed (fossil energy) for a less polluting and more sustainable product (solar energy).

Company F, being a cleaning, maintenance and rehabilitation company of sanitation infrastructures, uses sustainable innovation at the process level (Pinsky and Kruglianskas [4]), looking for more sustainable solutions for the treatment of urban sanitation and waste from sanitation [25]. Therefore, the innovation process is incremental, adopting solutions to existing services in order to be more sustainable and of better quality and price for customers. It generates socio-environmental benefits because efficient sanitation treatment service is essential for human, social and environmental well-being. It maximizes the efficiency of water use by recycling and treating it with sanitation and recycling waste (namely, filtering the sand) to be reused for other purposes. In this way, its business model is defined as sustainable in environmental and economic terms [77]. Its value proposition is based on recycling and reuse, having changed its business model to accommodate this value proposition [60].

Company G uses a sustainable product innovation strategy, as defined by Menezes and Dapper [11], to reduce costs and improve the quality of pre-cooked meals [43]. The degree of novelty introduced in the product is incremental, making adjustments to the products in terms of innovation and sustainability according to the needs and desires of customers. This search for innovation is proactive, considering that it is essential to remain competitive in the market in which the company operates. This company has sustainable practices such as recycling and the reduction of plastics in the packaging of its products, having replaced plastic packaging with paper. However, it does not reuse waste. As the preparation of meals consumes a lot of energy, they have solar panels for a more efficient energy consumption [17]. Company G has a well-defined business model based on economic and environmental sustainability principles, having changed its business model based on these principles [34]. A consequence of the change in its business model was the choice of environmentally certified suppliers for its raw materials ([43,44,65]).

Since company H is dedicated to the construction and maintenance of infrastructure, it uses a sustainable strategy based on process innovation. In this way, it adopts incremental innovation strategies, seeking more efficient and sustainable construction processes, reducing the costs of the construction and installation processes of infrastructure and improving the price-quality ratio. It has sustainable practices that it applies to leftover waste from works, namely recycling and reuse of leftover products in other works, maximizes energy efficiency with the use of solar energy and water efficiency with the availability of smart taps, and is concerned with reducing carbon dioxide emissions. However, company H does not have a value proposition, and perhaps because of this, they also did not change their business model based on sustainability principles.

Company I is dedicated to the sale of building materials. It bases its sustainable innovation strategy at the product level by looking for building materials that incorporate recyclable and more sustainable materials [26], meeting customer needs in order to remain competitive [35]. In this way, they have a proactive strategy in their search for materials, holding regular meetings with customers to assess their needs and with suppliers to learn about new products, as defended by [14]. In this way, the value proposition of company I is based on its proximity to customers and suppliers. It has sustainable practices such



as recycling leftover building materials, despite not yet incorporating practices related to energy and water efficiency. This company's business model was not changed to incorporate sustainable practices, perhaps because such practices are still reduced and because their value proposition is not based on the principles of sustainability.

During this case study carried out with nine companies with different characteristics, it was found that companies have concerns about environmental issues, and five of the companies already incorporate sustainable practices in their business model. These concerns regarding sustainability are transversal to all companies, whether small or large, primary or tertiary sector of activity. The implementation of sustainable practices occurs, mostly, not by legal impositions (reactive strategy), but by the companies themselves (proactive strategy). Companies believe that a business model based on sustainable practices considerably increases their value chain, as argued by Klewitz, Zeyen and Hansen [18] and Frondel, Ritter, Schmidt and Vance [19].

Regarding strategic positioning for sustainable innovation, we concluded that companies innovate at the manufacturing process level, producing more with less [4] and at the product level, modifying their products to make them more sustainable and green [11,17]. Most companies adopt a defensive sustainability strategy. Some companies adopt sustainable innovation practices that are strategically incorporated into their business [33], such as recycling (plastic, metal, wood), waste transformation (machine oil into soap and reuse of oils from other activities), eco-efficiency and the establishment of partnerships to boost the efficiency of these sustainable practices. In companies that adopt waste transformation, there is economic and social value creation for these companies as a result of reuse [53].

On the other hand, companies have also been striving to develop more sustainable products and services, i.e., less polluting (less packaging), with cleaner raw materials and with greater energy efficiency, as advocated by Humphreys, Wong and Chan [52]. To this end, they seek solutions that maximize energy efficiency (energy savings with more economical industrial machinery), water efficiency (wastewater treatment and piped water consumption) and reduction of carbon dioxide emissions (use of recycled products). Regarding the value proposition, based on economic, social and environmental criteria [60], we conclude that companies are concerned about joining these different criteria in order to create value, not only by restricting themselves to the economic criterion, but also by demonstrating social (e.g., donation of reused oil to social solidarity institutions) and, above all, environmental (waste transformation, recycling, among others) concerns.

The adoption of sustainable practices can change production processes, human resources and applied technology [65] and, as such, the business model and supply chain. We conclude that most companies have changed their business model as a consequence of product and production process innovations in terms of sustainability. In their supply chain, companies select suppliers with more sustainable and efficient practices [73].

Finally, we further conclude that sustainable innovation that firms implement in their business models tend to improve economic performance and increase market competitiveness, as argued by Zapata-Cantu and González [3], Veiga [5] and Chen and Liu [17].

## 6. Theoretical and Practical Implications

This study presents a set of theoretical and practical implications. Theoretically, it provides companies' board and managers with guidelines for the implementation of sustainable innovation practices in companies and elucidates their impact on economic and financial performance. On the other hand, these guidelines can motivate companies to adopt sustainable practices and incorporate them into the business model, breaking through organizational resistance to sustainable innovation. In practical terms, sustainable innovation in terms of products, production processes and marketing, among others, allows companies to provide differentiated products and services, increasing their competitive advantages [9]. In this way, marketing professionals, company managers and the state must promote targeted and intensive marketing campaigns to promote green and sustainable

products, elucidating that although green products are more expensive than the rest, they have a longer shelf life and can often be reused or recycled.

On the other hand, governments should encourage the adoption of more sustainable practices, subsidizing their implementation and granting tax benefits to companies that adopt them. Incentives for recycling and reusing leftover waste from the industry, with zero waste, for incorporation back into the production line itself or to support social purposes or consumption by other companies.

It is also essential that governments support R&D to provide technological advances and knowledge transfer of sustainable innovations. Finally, governments should strive to increase sustainability literacy levels, introducing this topic into educational programs from an early age and promoting lifelong learning programs, particularly for business managers and new entrepreneurs.

## 7. Limitations and Future Research

A limitation of this study is that given the small number of companies involved in the study and their heterogeneity in terms of characteristics and eco-innovations, the results cannot be generalized. The particularities of each sector must also be analysed individually since certain markets are highly regulated given their environmental impact along their productive chain, as, for instance, imputation rates for carbon dioxide emissions vary from market to market.

For future lines of research, we propose the development of a study involving a larger number of companies to obtain more in-depth and robust results. It would also be pertinent to evaluate the impact of the adoption of sustainable practices in companies' economic and financial performance and to assess the impact of public policies at the sustainability level in the companies' business models and value chains.

## 8. Conclusions

This study suggests that companies have environmental concerns that translate into the implementation of sustainable strategies and practices and that they incorporate them into their business models. These sustainable initiatives are carried out proactively by companies in favour of differentiation and greater competitiveness, not just as a result of the application of legislation on sustainability. Thus, having incorporated sustainability into their value proposition, companies add more value to their business models, allowing them to improve their performance compared to competitors.

With regard to sustainable innovation, this study also shows that companies innovate at the level of the manufacturing process, introducing more efficient production methods that allow saving resources but also innovating at the level of the product or service, changing them in order to make them more efficient, differentiated, more sustainable, and green.

This study is original because it simultaneously analyses the relationship between innovation, sustainability and economic performance, allowing inferences on a set of practical and theoretical implications regarding the adoption of sustainable innovation practices in the business models of companies.

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