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Strategic Orientation Towards Sustainable Innovation: A Case Study in a Brazilian University

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Abstract

The technological development that results from innovation can lead to considerable environmental impact. Yet, companies and other stakeholders have not done enough to develop strategies for minimizing waste management. The present study contributes to research in this area, by empirically examining the link between the management of technological innovation and sustainability. A case study was carried out to examine the extent to which there is strategic orientation towards both technological innovation and sustainability in a large public university in Brazil. The results show the importance of integrating sustainability activities within the organisation's corporate strategy: although the researched organisation had sufficient theoretical knowledge about waste management, the lack of an integrated strategy led to uncoordinated attempts at recycling within the university.

Keywords: technological innovation, waste management, environmental strategy, electronic industry, public university

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Introduction

Within the last few decades, scholars from various streams of literature (e.g., management, environmental sciences, business, amongst others, see Kneipp et all, 2011) have started to examine the tension that exists between developing societies that are both innovative and sustainable. This tension arises because the technological development that results from innovation can lead to considerable environmental impact. Yet, companies and other stakeholders have not done enough to develop strategies for managing waste and minimizing their use of resources. The present study aims to address this issue, by empirically examining the link between the management of innovation and sustainability. More specifically, in the paper, we examine the extent to which there is strategic orientation towards both technological innovation and sustainability in a large public university in Brazil.

Schumpeter (1942) was one of the first to draw attention to the relation between innovation and competitiveness, arguing that in a competitive environment, companies need renewal. This is particularly true for the electronics industry. Firms have enhanced the speed of innovation in order to compete. For instance, electronic firms are launching new product models at an increasingly faster rate. If no appropriate waste management strategies are applied, these innovation processes can have at least two adverse consequences for society (Hart and Milstein, 2003): (1), an increase in resource consumption; and (2), pollution associated with rapid industrialization.

With regard to the first point, the electronic industry is one of those sectors that, when looking at the weight of the products it develops and markets, consumes a disproportioned amount of natural resources, both in the form of raw material and in terms of water and energy.

With regard to the second point, there are, for instance, many problems resulting from the inadequate discard of obsolete electronic equipment (e.g., pollution of rivers and the environment as a whole; health risks resulting from discarded components) that have not been fully addressed by companies and other stakeholders. This is because, according to the current literature (e.g., Orsatto, 2006), it is still not common for these organisations to implement a strategy that simultaneously addresses both innovation and sustainability. In fact, according to the literature (see Orsatto, 2006, amongst others) while innovation strategies have been almost fully integrated within the general corporate strategy of organisations, strategies for sustainability remain undeveloped or insufficiently integrated within the corporate strategy. Amongst others, this is because chief executive officers (CEOs) often have insufficient knowledge about the relation between the implementation of a sustainable strategy and firm performance. As a result, while some organisations, influenced by the same external factors and similar in size and power, adopt an offensive strategy (e.g., beyond compliance leadership, eco-branding, environmental cost leadership strategies, see Orsatto, 2006) with regard to sustainability, some others choose to adopt a defensive position (like merely complying with baseline legislation) (Van Bommel, 2011).

Considering the aforementioned, it is important to do empirical research on the extent to which organisations have a strategic orientation towards both technological innovation and sustainability. This study aims to contribute to research in this area, by examining this topic in the context of a Brazilian public university. More specifically, the study seeks to address the following research question: to what extent does the researched organisation have a strategic orientation towards both technological innovation and sustainability?

Brazil is a suitable context for the purpose of this study, as little empirical research (e.g., Carvalho and Baribieri, 2010; Santos and Rodrigues, 2008, amongst others) has been done on the issue of sustainable innovation, particularly in the public sector. Furthermore, a university is an interesting subject for research in this area. Universities are responsible for the production, teaching and dissemination of knowledge within society. As this knowledge is already available within universities (or at least should be), they are in a unique position to apply the lessons that can be drawn from this knowledge. The remainder of the paper is organized as follows. First, a theoretical background is given of the key aspects and difficulties organisations and other stakeholders face in managing innovations in a sustainable manner. Second, an overview is given of Brazilian legislation related to this issue. Third, the methodology used to generate data from the examined case is described. Fourth, the results of the study are presented. The final section of the paper discusses these results and highlights its theoretical and managerial implications. Directions for further research are given.

Theoretical Grounding

Strategic Orientation Towards both Innovation and Sustainability

The management of innovation has long been recognized as a factor that is critical to the success and continuity of organisations. The second concept studied in this paper, sustainability, has only been recently recognized as a factor influencing organisations. Furthermore, the manner in which it is related to organisational success or failure is less clearly established than innovation.

Insofar as humans have started to establish themselves in permanent communities (the cities), the concentration of people and waste produced by them has increased. In Athens, the first landfills appeared that, consequently, attracted mice, cockroaches and other undesirable insects. The Greeks covered the garbage with layers of earth and created, in 500 BC, what nowadays one calls controlled landfills, but, at that time, the garbage was basically made up of food waste. Jardim et all (1995), defines landfill as an inadequate form of final disposal of solid waste, where the waste is thrown onto the soil, without protection measures to the environment or to public health; it is the most utilized form in Brazilian municipalities.

During the Middle Ages, getting rid of waste continued to be largely the responsibility of each individual citizen. The accumulation of people in the cities had increased and, consequently, also the volume of the waste that contained, besides food waste, big amounts of animal and human excrements. This period of history has been marked by the appearance of serious diseases and epidemics.

With the Industrial Revolution, the consumption of resources increased, and waste, as well. In the XIX century, when bad hygiene conditions were started to be seen as a problem, cities sought alternatives for the final disposal of the waste as well as changes in the personal hygiene of its inhabitants. The municipalities cleaned the streets and sanitary engineers created new technologies to reduce the amount of waste in the cities and the costs required to manage this waste. For example, oils and fats were recycled to be utilized in the manufacturing of soap and candles, while incinerators were used to generate steam for energy and heating.

Although most of the changes were an improved over the existing situation, concerns about the environment did not go beyond the eyes' reach. That is, throwing garbage into the sea or in open spaces far from the cities continued to be acceptable.

With the course of the years, new sources of energy appeared and both production and consumption grew. This increased the generation of domestic and industrial waste, including much more chemical residues and materials as plastic, metals, and glass.

During the wave of consumerism that followed the period of the industrialisation, and still exists today, products that were formerly made to last many years now had a much shorter service life. Instead of repairing, people are nowadays stimulated to throw them away and buy a new model. We are in the age of "discardables". However, there is a difference with the Middle Ages, when societies suffered severe consequences from throwing waste everywhere. Stakeholders within the society, like environmental protection groups, are actively trying to draw attention to the problem and to combat its consequences.

Between the 1960's and 1980's the world has witnessed several environmental disasters, highlighted by the Our Common Future's report (The United Nations World Commission on Environment and Development, 1991). As a result, since the 1960's, much has been discussed about the problems of natural and social orders that afflict the world. Environmental problems started being more and more redefined and identified with the lifestyle and the resource use of the consumer society (Portilho, 2003). Among the various attempts to eliminate or mitigate such problems, a "buzz-word" became increasingly important over time: sustainability.

The concept of sustainability has been widely discussed and applied to almost everything these days (Doppelt, 2008). As a consequence, it can make the term to become a cliché and emptied of its meaning. Its meaning and its interpretation are varied (Lélé, 1991) and therefore it can be interpreted in different ways by various stakeholders (Montibeller-Filho, 2001, p. 27). In one of these interpretations, sustainability is criticised for its manipulative character; i.e., the concept has been used by organisations as "a license to continue as usual, making only cosmetic changes" (Barbieri, 2007, p. 95). Warhust (2002) concurs, arguing that we should go beyond compliance, by creating independent organisations that control the organisations' performance, and creating mechanisms that meet the needs and perspectives of different stakeholders, particularly those belonging to the communities most directly affected by projects and actions of that organisation.

In this sense, Silva, Silva and Enders (2006) observe that environmental management allows organisations to identify key aspects and impacts of their actions with regard to the environment. Furthermore, it helps them to set the priorities and the goals for the continuous improvement of their environmental performance. According to Gallagher, Darnall and Andrews (2001), environmental management deals with "a managerial structure that enables the organisation to visualize its impacts on the environment through a system that facilitates the access, the listing and the quantification of the environmental impacts of the operations of all the organisation". As observed by Elkington (2001, p. 355), "the transition to sustainability will require us to make the shift from emphasis on economic growth (with its focus on quantity) to the development of sustainability (with its focus on the economic, environmental and social quality)."

Therefore, an organisation oriented towards sustainability would be the one that develops continuously, considering

not only economic and social indicators, but also the environment. This approach would allow the organisation to obtain value-creating processes that meet the expectations of its stakeholders, through its financial success and competitiveness, social legitimacy and efficient use of natural resources (Figge and Schaltegger, 2000 apud Perrini and Tencati, 2006).

According to Hart and Milstein (2003), sustainability is a multidimensional concept that cannot be simply analysed in each action of the organisation. For effective value creation in a sustainable manner, it is necessary that the organisation take into account four main points. Firstly, by reducing the material consumption and the level of pollution associated with rapid industrialization. Secondly, by operating with higher levels of transparency and responsiveness in relation to civil society. Thirdly, through the development of new and disruptive technologies that can reduce human markings on the planet. Finally, organisations can drive their actions to the base of the pyramid, allowing for greater wealth creation and distribution.

(1), Reducing the material consumption and the level of pollution associated with rapid industrialization: In order to manufacture its products, some industries, like the electronic industry for instance, consume large amounts of natural resources, both in the form of raw material and in terms of water and energy. Besides that, other concerns include: the huge amount of waste that is generated by the discard of obsolete electronic equipment which cause various problems to the environment, insufficient space for storing waste, existence of landfills, degradation of the natural resources, elevated collection and treatment costs. Awareness at the workplace, at home or in the community can serve as an example that one can recycle and utilize waste again and, thus, protect the environment. Furthermore, recycling can generate jobs and income.

(2), Operating with higher levels of transparency and responsiveness in relation to civil society: The current speed of innovation has not only quickly turned obsolete some products but also it has demanded, by the society, awareness, planning and implementation of management programs of this waste, in the form of investments in collecting industries and recycling, in order to alleviate these problems. In this sense, the by-products generated in the development and marketing of electronic equipment could (and should) be incorporated again in the production cycle in order to minimize (economic, social, environmental) costs. The recycling of such equipment (e.g., many computer components can be recycled) would already offer a significant contribution, because it minimizes the need of extraction of additional natural resources.

(3), Development of new and disruptive technologies that can reduce human markings on the planet: According to Oliveira (1997), the management of solid waste, in an integrated way, is an articulate set of normative, operational, financial and planning actions, based in sanitary, environmental and economic criteria for collecting, treating and disposing the garbage of a city. The classification of the solid waste generated (which includes collection, storage, transport, manipulation, and final destination according to each type of waste generated), in a given activity is the first step to structure an adequate management plan (Sebrae, 2006). Waste sorting, for instance, is a practice that has the aim of correctly separate the waste at its source of generation. Besides being an alternative for recycling the solid waste that would be thrown into (sanitary) landfills, it also stimulates the defence of the environment combatting dissipation, identifying and valuing the possibilities of environmental prevention. It is important that organic waste like fruit and vegetables peels, food waste, toilet paper, broom and ashtray dirt, are separated from the dry garbage, as paper, metals, plastics and glasses and that, as a result, it can receive adequate treatment.

The segregation of recyclable waste is an industrial process that converts the waste into parts, into secondary raw material, into a product similar to the initial one or another. Recycling is saving energy, saving natural resources and bringing back to the productive cycle what is thrown away.

In the recycling process it is important to know about the concept that one has of waste. We should not see it as something dirty, but as something that can be re-used. The first step is to separated it into various ways (e.g., to separate organic from inorganic waste; wet from dry waste; etc.). According to Jardim et all (1995), the collection of urban solid waste and its transport to treatment areas prevent the development of disease-transmitting vectors that find food and shelter in the waste. The transport services, from the generation to the final destination, characterize themselves by the involvement of the citizens, who must adequately pack the solid waste and present them on pre-established days, places and times.

(4), Organisations can drive their actions to the base of the pyramid, allowing for greater wealth creation and distribution: At the conference of the United Nations on the Environment and Development, in 1992, recycling gained strength in the whole world, with the support of environmentalists and, mainly, of many companies that use it in their ecological marketing. The benefits of recycling are difficult to identify by the population in general, hence such marketing strategies are useful.

Brazilian Government Guidance on Waste Management

With regard to waste management, the Brazilian Federal Constitution of 1988, Art. 225th, paragraph 3rd, establishes that: "The acts and activities considered damaging to the environment will lead the violators, natural persons or legal entities, to penal and administrative sanctions, regardless of the obligation of repairing the damages caused". That is, inadequate waste management can lead to fines and to penal and/or administrative sanctions for those actors responsible. The Brazilian National Council of Natural Environment (CONAMA) resolution number 5th/ 1993, article 5th, paragraph 1st, recommends: "In the elaboration of the waste management plan, one must consider the principles that lead to recycling [...] for the treatment and final disposal systems, according to the guidelines established by the competent environment and health bodies".

The Brazilian International Standard for Solid Waste (NBR) number 10,004 classifies waste according to potential risks to the environment and to public health. Other standards are also utilized to complete the classification. They are the following: ANTT 420/2004 (Brazilian National Ground Transport Agency), ABNT (Brazilian Agency of Technical Standards) NBR 10,157; ABNT NBR 10,005:2004; ABNT NBR 10,006:204; ABNT NBR 10,007:2004; ABNT NBR 14,598:200; ABNT NBR 12,808:1993; ABNT NBR 11,174; ABNT NBR 14,725; and ABNT NBR 12,235 Resolutions.

According to the Brazilian Service for Support to Micro and Small Companies (Sebrae, 2006), damages caused to the environment include the following: pollution of hydric bodies, contamination of the groundwater, and damages to health. Managing the consequences of damages to these areas, in most cases, is much more technically complicated and involves much more financial resources than preventing them in the first place.

On diagnosing the situation of solid waste in Brazil, Campus (1991) alerts about the existence of around 4,000 landfills scattered throughout the country, causing a series of environmental, social and public health damages.

The classification of SEBRAE is based on whether the waste is recognised as dangerous or not (according to the concentration of pollutants in their matrices). According to NBR 10004, waste is classified in the following way:

Class I Waste – Dangerous: This is waste with physical, chemical or infect-contagious properties that can bring risks to public health and/or risks to the environment, when the waste is managed in an inadequate way. This waste can have one or more of the following characteristics: flammability, corrosiveness, reactivity, toxicity and pathogenicity. The waste evaluation methods, according to the listed characteristics, are described in detail in NBR 10,004 or in complementary technical standards and are widely accepted and known in Brazil. Some examples of them are: used or contaminated lubricating oils, and fluorescent light bulbs.

Class II Waste – Non-dangerous: waste that has properties that generally do not bring harm to public health and/or to the environment. This class is sub-divided into non-inert (Class A) and inert (Class B).

- Class A: this is non-inert waste that has properties such as: biodegradability, combustibility or water solubility. An example of this is urban waste (generated in toilets, offices and houses).

- Class B: this is waste that has none of its constituents solubilized at concentrations superior to the potable water standards, with the exception of aspect, colour, turbidity, hardness and flavour. According to Kraemer (2005), much of this waste is recyclable. Some examples of this waste are: demolition rubble, stones and sand withdrawn from excavations.

Electronic waste (e-waste) in turn, is one of the types of waste that has increased the most in recent years, due, mainly, to the economic and social need for electronic equipment. In spite of their sales growth, there is no national legislation that establishes their final destination or that makes the manufacturers responsible for recycling them. An exception is CONAMA's resolution (Brazilian National Council of Natural Environment) number 257th, that establishes limits for the use of toxic substances in cells and batteries. This makes the manufacturers responsible for developing systems for the collection and preparation of waste for recycling purposes.

Complete information about the situation of e-waste in Brazil is scarce. According to StEP (Solving the E-Waste Problem) (2009), Brazil produces the biggest amount of e-waste of Latin America, with more than half a kilogram per person per year. The StEP (2009) report mentions that e-waste does not seem to be a priority for the association of Brazilian industries, because, in their viewpoint, an e-waste system with an additional recycling rate would be unpopular due to the fact that the Brazilian tax system already imposes high burdens on producers and consumers.

In 2010, the situation in Brazil has improved with regard to environmental sustainability. Through the law, it extended the responsibility for the destination of solid waste to all the generators, such as industries, construction companies, hospitals, harbours and airports. The types of waste are clas-

sified in Art 13th of the law of National Regulation of Solid Waste (PNRS). This regulation came into force on 2nd August 2010.

The PNRS law is innovative for dealing with the shared environmental responsibility for waste. It establishes the implementation of the waste sorting at institutions, stimulates the separation of waste at domiciles and puts into practice the return logistics method for discarded products (reverse logistics) for the successful management of waste at industries and distributors as it appears in Art 3rd subparagraph XII, Art 8th subparagraph III, Art 19th subparagraph IV and XV, etc., of the PNRS. The industries and/or companies that distribute the product will be responsible for giving the final destination of their waste produced as well as natural persons or legal entities, of public or private law, according to Art 3rd of the PNRS.

The sharing of responsibilities means that each member of the supply chain (e.g., manufacturers, importers, distributors, merchants and even consumers) will participate, together with the holders of the services of urban cleaning and of management of solid waste, in the integral life cycle of the products. The integral life cycle of a product/service includes the following: obtainment of raw materials and inputs, going through the production process, consumption (or utilization of the service), and the final disposal (or release by the client). For example, Art 20th, of the PNRS law, establishes that manufacturers, importers, distributors and merchants must invest in developing, manufacturing and putting products in the market, so that they can be recycled and the manufacturing and use of which may generate the smallest possible amount of solid waste. According to the law, the consumers are obligated to pack in an adequate and differentiated way the solid waste generated as well as to correctly make available the re-utilizable and recyclable materials for collection and/or devolution (PNRS/Art. 28th). PNRS/Art. 49th also prohibits the import of dangerous solid waste and of spoils as well as of solid waste with characteristics that cause damage to the environment and to public and animal health and to the vegetable sanity, although it is for re-utilization or recycling.

It is important to highlight that a partnership between the Ministry of Environment and the Company Commitment for Recycling (CEMPRE) has been established to, amongst others, conduct an inventory of the electronic waste produced in Brazil. The aim of the partnership is to ensure that companies operating in Brazil sign a pact for waste collection and recycling.

Regardless of the approved legislation, the University of São Paulo (USP), a public university organised by the government of São Paulo state, is a pioneer in treating e-waste. Currently, a screening centre operates at USP, receiving electronic equipment in disuse. The centre has employees trained to verify whether the equipment can be re-utilized and donated to non-governmental organisations (NGOs); or disassembled in a way that the materials can be separated, pressed, weighed and sent to companies that make recycling in a sustainable way. The university relies on important partnerships, among them the MIT (Massachusetts Institute of Technology) Sloan School of Management.

Research Design

Research Method

A case study method has been carried out in this research with the aim of analysing empirically the extent to which there is strategic orientation towards both technological innovation and sustainability in a large public university in Brazil. According to Yin (1994), the case study method has the advantage of permitting an in-depth study of one or few objects in their real context, although it has as limitation the fact that its results cannot be extrapolated to other situations.

Unit of Analysis

The unit of analysis of the study is the Centre for Social and Human Sciences (CCSH) within the Federal University of Santa Maria (UFSM). The researched university is the first public national university that was established by the Brazilian government in a city out of a state capital. It was founded in Santa Maria city, Rio Grande do Sul state (South of Brazil), in 1960. Currently, it has around 20 thousand bachelor, master, and PhD students and around 2 thousand professors. It also has around 3 thousand employees. This public university currently offers around 250 bachelor courses, and around 109 post-graduation courses. Besides other post-graduation courses, it offers 44 master courses, and 19 PhD courses in different areas of education. Specifically, the Centre for Social and Human Sciences (CCSH) employs around 70 employees, around 180 professors, and it has around 4,500 students (being around 3,500 bachelor students and around 1 thousand master and PhD students). It is the largest educational centre in the university representing more than 15% of its students and courses.

Research Instrument

To generate data, we have made a semi-structured interview protocol in order to question the professors who manage each of the three departments of the researched centre about the extent to which there is strategic orientation towards both technological innovation (see Table 1) and sustainability (see Table 2) in their respective departments.

In order to reach this objective, we used the four points proposed by Hart and Milstein (2003), as indicators for "orientation towards environmental strategy".

Data Generating

Three managers of the centre (CCSH/UFSM) have been interviewed. The interviews have been conducted in July 2011.

Research Results

Strategic Orientation Towards Technological Innovation

With regard to the question: "Is there any planning for acquiring new electronic equipment?", interviewee 1 said, "no". According to him, there has never been, at the university, any

Strategic orientation towards technological innovation	Question
	Is there any planning for acquiring new electronic equipment?

Table 1 – Strategic orientation towards technological innovation

Strategic orientation towards sustainability with regard to electronic waste (e-waste)	Indicator	Question
	Reduction of the material consumption and the level of pollution associated with rapid industrialization	How many electronic equipment does your department have? What is the electronic waste generated at your department? Do you know what electronic waste there exist in your department, and why electronic waste management is important? What is the destination of electronic waste at your department?
	Operation with higher levels of transparency and responsiveness in relation to civil society	Do you know that electronic waste cause serious damages both to human beings and environment?
	Development of new and disruptive technologies that can reduce human markings on the planet	Do you know any internal/external activity of electronic waste management? In your opinion, what must be done with regard to the electronic waste?
	Driving actions to the base of the pyramid, allowing for greater wealth creation and distribution	If there would be any management program for electronic waste, would you, as a manager of this department, contribute to the recycling of the electronic waste, even without any obligation?

Table 2 – Strategic orientation towards sustainability with regard to electronic waste

planning for it. He says that, when the purchase is made, it is made through an electronic bidding system, which takes into account the lowest price. Simultaneously, according to him, there is still the purchase of electronic equipment by professors who have resources from projects to acquire technology they need for the execution of their research projects. Interviewee 2 also maintains that there is no planning, what occurs is the maximum utilization of the computers that are in his department After the electronic equipment are overused, they are revised and given away to informatics' laboratories to be utilized by students. He also says that they use the maximum of the life cycle of the equipment. In the opinion of interviewee 3, there is not any planning.

Strategic Orientation Towards Sustainability with regard to Electronic Waste

Reducing the material consumption and the level of pollution associated with rapid industrialization: With regard to the question of what electronic waste there exist in their department, interviewees 1 and 2 have answered that there are scraps of personal computers, mouse, keyboards, monitors, printers, which are stored in deposits improvised inside the departments until a destination is given to them. Interviewee 3 has answered that the electronic waste is produced as a result of both the fast technological evolution and increases in the level of investments received by the organisation over the last few years. This has enabled the modernization of informatics' laboratories and rooms, which has caused a significant number of obsolete computers and peripherals. He reaffirms, as the other interviewees, that he does not know what to do with it.

With regard to the destination of electronic waste at the departments, the interviewees have been unanimous in informing that obsolete equipment that can be re-utilized is given to students within the university. The students utilize them at the academic centres and junior companies.

Development of new and disruptive technologies that can reduce human markings on the planet: With regard to their knowledge of internal/external activity of electronic waste management, interviewee 1 has answered that he "did not know any activity", and only had knowledge about the collection of this equipment through the facility department of the university. Interviewee 2 has answered the following: "I do not know anything", also maintaining that "there is not, at the organisation, someone who takes care the electronic waste". For interviewee 3, what exists are isolated campaigns for the collection of electronic waste.

With regard to the question "what must be done with regard to the electronic waste", in the opinion of interviewee 1, a department should be created at the institution which is responsible for the collection of this waste, since the organisation is able to develop high technology and could point out a way out of the problem. According to the interviewee, "someone must take a stand, create a place and orient the chiefs to forward this waste to a correct destination". For interviewee 2, this newly created department should make partnerships with recycle organisations, with the technical support of the university. In particular, this department should work together with departments and researchers focused on environmental issues relation to the subject in question. Interviewee 3 has only said that there must be a specific action for the problem on the part of the university. Driving actions to the base of the pyramid, allowing for greater wealth creation and distribution: With regard to the question "if there would be any management program for electronic waste, would you, as a manager of this department, contribute to the recycling of the electronic waste" interviewee 1 said that, if there was a program, he would be the first to comply with it. Interviewee 2 said that what he does is to store the obsolete equipment in improvised deposits at the department itself. However, if there would be such a program, he would send the equipment to the place. Interviewee 3 has only outlined: "it is all we need".

Conclusion

Discussion

The present paper aimed to carry out an empirical research on the issue of sustainable innovation. In the paper, we have looked for insights on this issue in a large public university in Brazil. The research question proposed in the study was the following: to what extent does the researched organisation have a strategic orientation towards both technological innovation and sustainability?

The results have shown that, on the one hand, the researched university usually has enough resources to adopt new technologies. However, it does not have a strategic orientation towards both technological innovation and sustainability. There is a significant production of electronic waste in the studied centre. Although the managers of the respective departments are aware of this waste, they do not know what to do with it. They highlight that the organisation does not offer a program for the collection and recycling of the electronic waste. Consequently, all they can do is to store this waste in improvised deposits in the respective departments. There is no planning done within the departments, which matches the acquiring of new equipment, with the recycling of the "soon-to-be" obsolete electronic equipment. At the moment, the departments only transfer those electronic equipment in need of small adjustments to informatics laboratories and offices used by students. Those electronic equipment that are reduced to parts are kept in

improvised deposits and remain waiting for collection by the facility management division of the organisation. With regard to the acquisition of new equipment, this process follows the legally mandated form of purchase, which is by means of an electronic bidding system, or through resources from research projects. The interviewees have pointed out the organisation's interest in creating a sustainable alternative for the destination of electronic waste. Amongst others, they have suggested that it could make partnerships with recycling organisations, where the university would participate with technical support, using the knowledge of the departments that work in this area.

Contributions to literature and Managerial Implications

For the literature, this paper has shown the importance of more empirical studies on sustainable innovation. The study indicated that, although the researched organisation had sufficient theoretical knowledge about waste management, it did not have an integrated strategy in place with regard to the management of its technological innovations. Subsequently, decentralized activities were undertaken to deal with electronic waste. These activities were ad-hoc; i.e., not planned or coordinated between departments. As a result, there was little or no recycling of equipment across departments. Such recycling, as part of a larger integrated sustainable innovation strategy, could have reduced the need for purchasing new equipment. This shows the importance of integrating sustainability related activities within the general corporate strategy of the organisation.

For managers of university departments, this paper has shown the importance of drawing upon the knowledge base that exists within the university and allocating the responsibility for electronic waste management to a specialized department. Such a department could, apart from coordinating recycling processes across departments amongst others, also force the suppliers of its electronic equipment to take more responsibility for the waste its products generate (e.g., by demanding "reverse" logistic adoption in its supply contracts).

Further Research

Besides the issues raised in the introduction and theoretical part of the study (e.g., the manner in which environmental strategy is related to organisational success or failure is less clearly established than innovation), another topic that requires further research is the potentially opportunistic behaviour of organisations that falsely claim that they produce innovative or sustainable products. Organisations might make such claims in order to enhance the marketing of their products or improve their image and reputation (Vilha and Quadros, 2006). False claims in this area might encourage consumers to purchase such products, thereby discarding their "obsolete", environmental "unfriendly" products. This can lead to additional waste and additional resource consumption. Further studies could try to: (1), establish indicators for identifying such false claims; (2), identify situations in which such claims are most likely to arise; and (3), examine what types of public (e.g., legislation that gives more responsibility to producers of electronic equipment for the waste that use of their equipment generates) and private (e.g., contracts which demand "reverse" logistic adoption by suppliers) governance mechanisms are best suited to reduce such behaviour.

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