Eco-Innovation in Global Hotel Chains: Designs, Barriers, Incentives and Motivations

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ABSTRACT

This article aims to verify the reality of eco-innovations developed by global hotel chains, highlighting the innovative designs employed by these organizations, the barriers and incentives faced by these companies and motivations to invest in innovations for this purpose. This multiple case study, of qualitative, descriptive and sectional nature used the thematic content analysis, using the NVivo® software to analyze some of the data obtained and supported on the triangulation of information to increase the reliability of the results. The data sources were empirical research, gathered through interviews and questionnaires, and documentary research. We found that the chains under study develop a large number of eco-innovations in their companies, and most of them are end-of-pipe. In the respondents´ view, there are more barriers than incentives for the development of this type of innovation and the development is driven in large part as a mean to gain competitive advantage.

Keywords: Eco-innovation. Global hotel chains. Innovation designs. Barriers and incentives. Motivations.

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1 INTRODUCTION

Climate change and the dissemination of studies that show the negative consequences of overusing the existing resources on the planet (ROCKSTÖM et al., 2009; CPD, 2013; UNEP, 2012) turned sustainability into being a recurring theme in today's society.

According to Kirk (1996), Bohdanowicz (2006a) and Bohdanowicz and Martinac (2003), lodging facilities are part of an industry that generates significant environmental impacts, evidenced by the carbon dioxide emission, chlorofluorocarbon (CFC), high consumption of energy, water, food and high levels of wastage. Sloan, Legrand and Chen (2013) complement the statement of the mentioned authors by highlighting that current lodging facilities have been offering a range of new services such as restaurants, bars, spas; therefore the environmental impact of these projects has been even greater in recent years. Thus, according to the authors, lodging facilities need to establish policies and programs to reduce the impact that the products and services offered by them generate for the planet.

In this new context, hotel chains can be strategic to establish and encourage the environmental character of innovations, also known as eco-innovations, as stressed by Sloan, Legrand and Chen (2013) that these developments have the financial capital to invest in new sustainable technologies and could introduce policies that would impact the environment in large-scale. Bohdanowicz and Martinac (2003, p.2) state that since hotel chains have a presence worldwide, "[...] they have a significant potential of influencing the behavior and practices in the tourism sector, as well as in supporting sectors".

In this context, global hotel chains, since they are inserted in different continents and in different realities, could serve as a good case study, as according to Carillo-Hermosilla, González and Könölla (2009), large multinational organizations are those with greater financial availability to invest in innovation, and they are the companies most likely to use eco-innovations.

There is no precise concept as to what a global hotel chain is. Thus, for this research, we shall define as a global hotel chain those organizations that have a variety of hotel units, whether in system of property ownership, management and/or franchise, located in at least two continents

In the academia there is a great number of studies both Brazilian as international that relate environmental sustainability to hotel chains (VIERA, 2004; VIERA; HOFFMANN; 2006; TOMAZZONI; ZANETTE; LAIDENS, 2009, MALTA; MARIANI, 2013; KIRK; 1996, BOHDANOWICZ; MARTINAC, 2003, TZSCHENTKE; KIRK; LYNCH, 2004; LEGRAND; CHEN; SLOAN, 2005; BOHDANOWICZ, 2006a, 2006b; LEGRAND et. al., 2012; KLEINRICHERT et al., 2012; SLOAN; LEGRAND; CHEN, 2013, JONES; HILLIER; COMFORT, 2014, amongst others), however, few of them emphasize eco-innovation in this segment; this way, this article is important in that it brings a new discussion to this theme.

From this brief contextualization and by highlighting the importance of studies related to innovation with an environmental character amongst lodging facilities, this article's objective is to verify the reality of the eco-innovations developed by global hotel chains, highlighting innovation designs employed by these organizations, the barriers and incentives faced and the motivations to invest in innovations for this purpose.

The article is divided into six sections. This first introduces the topic to the reader, contextualizing the subject and pointing out the objective of the study. The second brings the theoretical basis of the work, where we presented such topics as types of eco-innovation, where we present topics such as types of eco-innovation, barriers and incentives faced by the sector, and motivations to invest in innovations with this purpose. The third part describes the methodological procedures used in the research. In the fourth section we briefly present the objects of study, which in this article are termed only as hotel chain A, hotel chain B and hotel chain C. In chapter five, we analyze the results obtained from different data sources. And finally we present the conclusions of the research.

2 THEORETICAL FRAMEWORK

Eco-innovation is defined by James (1997) as the development of new products and processes that provide value to the customer and the business, from the significant reduction in environmental impact. Anderson (2010) however, following a similar position to that of James (1997), defines it as a kind of innovation capable of generating income, reducing the net environmental impacts, while creating value for organizations.

According to Carillo-Hermosilla, González and Könölla (2009), eco-innovation can be defined in three different designs: (1) the addition of a new component, which is the development of additional components for improving the environmental quality of an existing product or good, minimizing or repairing a negative impact without necessarily changing the process or system. This technology is termed as end-of-pipe; (2) the change in the subsystem,

which aims to reduce negative impacts, creating different goods and services that use fewer resources, thus generating the minimum of waste and pollution, using eco-efficiency; (3) the change in the system, that stands out as a radical change, since it modifies the whole system and its components. The latter is related to radical innovations and is decisive in determining the environmental impact of innovation.

Although eco-innovation has great potential to enhance the competitiveness of organizations, it has experienced an incipient growth. According to Carillo-Hermosilla, González and Könölla (2009), this reality is due to its diffusion in the economy being difficult and slow, because of barriers that act on two levels: external and internal to the organization.

Regarding the external barriers, the authors argue that factors such as trade barriers and the absence of inductors are just some of the circumstances that contribute to this situation. There is still a tendency to use solutions already known and consolidated, leading to the imprisonment in old technologies (lock-in). Therefore, the development of innovation requires a whole system, an environment that favors this initiative (CARRILLO-HERMOSILLA; GONZÁLEZ; KÖNÖLLA, 2009).

Regarding the internal barriers, Carillo-Hermosilla, González and Könölla (2009) explain that they can be grouped into three categories: (1) absence of pressure from some important social actors, such as consumers, politicians, among others; (2) internal factors, such as the lack of financial investments, technological resources or even actual interest; and (3) the lack of compatibility of these innovations with the current production process of the company.

It is worth highlighting however, that these different barriers do not act alone. They are interrelated, interacting and reinforcing one another (CARILLO-HERMOSILLA; GONZÁLEZ; KÖNOLLA, 2009).

Different from Carillo-Hermosilla, González and Könölla (2009) who classifie the barriers to creation and the diffusion of eco-innovations in internal and external, Kemp and Soete (1990) classified them according to the supply and demand of the market. As far as supply is concerned, the authors highlight barriers as the existing technological opportunities, appropriability conditions and instability of the existing demand. As for demand, the mentioned factors are: the lack of knowledge and information on this type of innovation, insecurity in adopting environmental technologies and the producer/user relationship.

Carillo-Hermosilla, González and Könölla (2009) highlight that eco-innovation can only occur, during its trajectory, with the participation of different actors. They are: 1) public policies, which may be inducers or blockers of this type of innovation and are related to environmental policies; 2) suppliers, who can also act as inducers or barriers, collaborating in the adaptation of technology to the production process; 3) the final consumer, whose absence can create a barrier to this type of innovation, albeit there is a growing demand that drives this new segment 4) competitors; 5) industry associations, which can be a major source of innovation information on alternatives to environmental sustainability; 6) environmental NGOs, exerting pressure for the adoption of this type of innovation; 7) civil society, which can be one of the inducers of the process; 8) research centers, which can contribute to the development and diffusion of these innovations; 9) financial institutions, which will invest in the practice of this kind of innovation.

However, innovations with environmental focus will only be successful in the market if the barriers are controlled and if there are adequate incentives for this initiative. It is at this stage that the State's role comes in, establishing policy measures for this purpose. Carillo-Hermosilla, González and Könölla (2009) state that these policies can generate more appropriate conditions for the development of this type of innovation and that these must be implemented by an interactive combination of various types of instruments. According to the authors, the policies for eco-innovation must have the following characteristics: (1) They must be defined in order to achieve long-term goals; (2) they must combine different tools for the same action; (3) they must encourage cooperation between the actors; (4) they must encourage regulatory flexibility; (5) they must be flexible and adapt to the characteristics of the sector in which they operate.

On environmental regulations, one of the steps contemplated in the policies for eco-innovation, Porter and Van Der Linde (1995) highlight that the principles to be followed in these rules are: to create more opportunities for innovation; encourage continuous improvement; and minimize uncertainty. The authors also claim that the environmental laws and regulations must follow three steps: to establish rules that can be achieved in a flexible manner, encourage innovation and enable the management of the system in a coordinated manner.

However, eco-innovations will only be introduced in global hotel chains if these organizations are motivated to take this initiative. Sloan, Legrand and Chen (2013) highlight the factors that motivatelodging resources to invest in this type of innovation, they are: image

improvement and increased market share; acquisition of competitive advantage; intrinsic motivation, as meeting moral values; and increased motivation of employees. Bohdanowicz and Martinac (2003), based on a survey in four major European hotel groups, identified that, in addition to the factors cited by Sloan, Legrand and Chen (2013), two other reasons motivate hoteliers investing in eco-innovation, and they are: guest requests and advice from other professionals in the market.

According to Sloan, Legrand and Chen (2013), the high initial cost, doubts regarding the return on investment, lack of time, the demand for greater management, the limited interest by the lack of knowledge on the theme and internal communication of the environmental policies of hotel chains are the main reasons that prevent the implementation of this practice in many accommodations businesses.

In order to empirically prove the data outlined in the previous paragraph, Legrand et al. (2012) conducted a research of qualitative and quantitative nature in Germany's lodging facilities. According to the survey results, 71% of respondents claimed that the lack of financial resources is the main barrier to invest in initiatives of such purpose. Proceeding, 60% highlighted the low profitability of the investments in sustainability, and 45% point out the complexity of the implementation of these innovations as barriers to its development. Other factors, such as the lack of guidelines (33%), lack of specialized personnel for the implementation (29%), lack of local relevance (13%) and the lack of sustainable awareness (7%) were also detected. Following the same direction of research by Legrand et al. (2012), Bohdanowicz and Martinac's investigation, (2003) in four European hotel chains, also found that financial issues are the major obstacles to investment in eco-innovation

3 METHODOLOGICAL PROCEDURES

This work is characterized as qualitative, descriptive and of cross-sectional perspective, from a multiple case study; since different hotel chains studied we studied. We opted for multiple cases, since they present greater analytical benefits and less risk of theoretical replication (YIN, 2001).

In this work, global hotel chains have been defined as the focus of research, as they have greater financial and organizational resources to invest in eco-innovations, (CARRILLO-HERMOSILLA; GONZÁLEZ; KÖNÖLLA, 2009), and therefore, they could bring a larger universe of data on research topics.

We studied three global hotel chains. However, to maintain the anonymity of these organizations, they have been termed as chain A, B, and C.

During the research we used secondary and primary data. Secondary data were obtained through reports, policies, institutional videos and other documents of the surveyed hotel chains in order to obtain greater knowledge about the eco-innovations established by these organizations.

We also used primary data obtained through interviews and questionnaires. The interview was developed based on a semi-structured protocol aimed at the practitioner or department in charge of matters relating to the sustainability of hotel chains under study. The script was composed of ten questions, distributed between open questions and multiple choice questions. As it was a semi-structured interview, if there was the need to deepen into subject, we used the freedom of informally add more questions to the protocol.

The interview protocol was validated by content validation, which was performed in two stages. The former verified through the existing theoretical framework, the information related to these constructs. It is worth remembering that the framework was the basis for making the interview protocol.

Subsequently, the validation by specialists was done. For this assessment we chose four key people: two experts from the eco-innovation field; a specialist from the field of strategy and innovation in hospitality and a final specialist in the area of sustainability in hospitality. These experts were indicated randomly. All considerations made by these professionals were accepted and with this analysis we defined the final script applied to the hotel chains under study.

The interviews took place between the months of February and March 2014 via Skype® and were recorded with the prior authorization of respondents in an iPhone® handset. The choice to use Skype® came from the actual respondents, due to the lack of time and distance. The interviews lasted from thirty minutes to an hour and forty minutes, with later transcription of the entire content of the interviews in a notebook.

We also applied a structured, self-administered questionnaire, consisting of closed questions. The questionnaire was sent by e-mail, to twelve experts from the fields of innovation, environmental sustainability, strategy and lodging facilities.

These twelve experts were key people, as they represented practitioners with extensive knowledge in their fields. The panel was composed of scholars with a large number of research and publications and/or practitioners with many years of experience.

The questionnaire contained two macro issues identified from eighty indicators obtained through the theoretical basis and interviews directed to the hotel chains under study. Each of the questions were answered with the use of a scale (CHURCHILL, 1979) Likert-type with six points, in which 0 meant the lowest frequency or of least importance and 5 meant the highest frequency or with the greatest importance. It is worth mentioning that the order of questions and indicators followed a random distribution.

With the objective of correcting possible flaws that could lead to interpretation errors in the formulated questions, we conducted a pre-test of the questionnaire with three experts chosen randomly. After the observations of this group, the research tool was improved and sent to the remaining professionals. The questionnaire was self-administered without the need for individual identification. It was applied in October and November 2014 and returned to the researcher by e-mail. The same questionnaire was sent to the hotel chains under study. The document for the hotel chains was also applied between the months of October and November 2014.

After collecting the data, the information was entered into the software NVivo®, version 10, a specialized program in qualitative research that allows the organization and detailed analysis of interviews and further research.

These data were analyzed with a descriptive and qualitative approach, through the analysis of all the detailed information on the previous item. For this activity, we used the thematic content analysis, analysis in which categories are used to organize the data on different topics that can be defined a priori or a posteriori (DELLAGNELO; SILVA, 2005). The categories were chosen a priori, according to the existing theory on the theme.

The questionnaire data, in this context, served only as a base to go further into some of the data analyzes and provide a greater dimension to responses obtained through the interviews, and then analyzed qualitatively through content analysis.

To ensure the validity of the information, the analysis of all data was done through the triangulation technique, a procedure that ensures the accuracy of the information collected. In this particular study, we used the triangulation of data sources, which according to Denzin (1984), is the confrontation of subsidies raised by different sources – in this case, the primary

data (obtained through semi-structured interviews applied to global hotel chains and questionnaires answered by experts and organizations in the study) and secondary data collected through reports, policies, videos and other documents of organizations about their eco-innovations, which were incorporated and treated in NVivo®.

From all the analyzes presented in this item, it was possible to understand the reality about eco-innovations in global hotel chains, highlighting the designs used by these organizations, the barriers and incentives faced and motivations to invest in innovations for this purpose.

4 CASE STUDIES

As previously presented in the methodology of this study, in order to maintain confidentiality, the objects of research namely the surveyed chains will only referred to as chain A, B and C. However, to understand the researched universe, below we give a brief detail of hotel chains.

The hotel chain A is an Asian group with head office in China. It is a leader in luxury hotels with one hundred and thirteen hotel properties spread throughout Asia, North America, Middle East, Oceania and Europe, with more than 34,000 Lodging Units (LUs). Since 2010, the Chain invests in environmental issues, measuring, stipulating resource reduction targets and carrying out benchmarking with other organizations from the sector.

Chain B is a North-American organization with its head office in Canada, operating in the hotel business for over 100 years. Its portfolio includes a hundred and ten ventures throughout the Americas, Asia, Oceania, Middle East, Africa and Europe, accounting for more than 41,500 Lodging Units (LUs). In 1990 the chain created a sustainable program which encouraged its ventures to minimize their impact on the planet. During the last decades, the program has improved and has become a core value for the company.

The hotel chain C is a North-American group with their head office located in the United States operating in the tourist market since 1927. It is a leader the hospitality sector with three thousand eight hundred hotel units scattered across seventy four countries and territories on all continents, accounting more than 678,541 Lodging Units (LUs), thus, becoming one of the largest and most important global hotel groups. With an environmental policy instituted since 2007, the Chain establishes and manages environmental goals and is involved with several initiatives for this purpose, as well as establishing partnerships with organizations that are somehow dedicated to the issue of sustainability.

5 PRESENTATION AND DISCUSSION OF DATA

First, we questioned which eco-innovations are developed by hotel chains being studied. To facilitate the organization of responses, innovations were arranged into four categories: water, energy, waste and other environmentally sustainable innovations. This categorization was defined based on the study of Menezes, Cunha and Cunha (2013).

According to respondents, eco-innovations introduced in their organizations are as follows:

CHAIN	ECO-INNOVATIONS			
	WATER	**ENERGY**	**WASTE**	**OTHER ECO-INNOVATIONS**
A	- Toilet with dual flush valves. - Sewage treatment plants. -Treated water reused for cooling environments, irrigation and toilets. - Rainwater harvesting. - Sensors on taps. - Reduced use of water for cleaning the establishment.	- Common lighting system exchanged for LED. - Lighting with motion sensors in social areas. - Use of low-temperature systems in the laundry. - Use of solar panels for heating water.	- Garbage separation. - Use of organic waste for composting and reuse in gardens. - Waste Management. - Sale of recycled waste.	- Amenities made from natural ingredients. - Packaging of amenities made of biodegradable material and recyclable. - Printing packaging of amenities made using soy ink. - Bottled water use. - Control of the overall consumption by using the Carbon Disclosure Project methodology. - LEED, certification of environmentally sustainable buildings.
B	- Use of efficient showers and taps. - Reuse of laundry and pool water for irrigation of gardens and personal bathroom. - Water bottling in glass.	- Common lighting exchanged for compact fluorescent lighting. - Lighting with motion sensors in social areas. - Energy production from waste. - Use of smart keys (magnetic). - Heat recovery systems. - Common heating systems exchanged for gas heating. - Use of wind turbines.	- Garbage separation. - Use of organic waste for composting and reuse in gardens. - Recycling of paper, cardboard, aluminum and glass. - Using anaerobic digestion which turns organic waste into energy. - Conversion of the oil used in F&B in biodiesel. - Recycling stations. - Freddy, system that completely eliminates food wastage.	- Use of biodegradable plastics containers. - Bottled water use. - Eco-meeting. - Use and sharing of the Sustainability Data Management System and Sustainable Enterprise Reporting and Management (SERAM). - Guests awareness programs on the use of natural resources. - LEED, certification of environmentally sustainable buildings.

C	- Showers with water savers. - Toilet with dual flush valves. - Rainwater harvesting. - Aquanomic for decreasing the quantity and temperature of water required in the laundry. - Chemical treatment of water through the 3-D Trasar. - Treated water reused for irrigation and toilets. - Submetering water system. - High efficiency plumbing.	- Common lighting exchanged for fluorescent lighting. - Lighting with motion sensors in social areas. - Use of renewable sources such as solar and wind power. - Use of smart keys (magnetic). - Smart elevators.	- Recycling of toner, glass, plastic, cardboard, paper, scrap metal, fluorescent lamps and batteries. - Composting of organic waste. - Cooking oil transformation into biodiesel. - Recycling and reuse of bar soaps not used by customers.	- Packaging of amenities made of recycled material. - Green-uniform made from recycled plastic bottles. - Reflective roof tiles. - Environmental Effects Assessment Panel (EEAP), auditing tool for resource reduction targets. - Electric car. - Green Hotels Global, environmental management software that monitors and controls the use of natural resources. - LEED, certification of environmentally sustainable buildings.

Table 1 – Innovation for Environmental Sustainability developed by the chains under study
Source: Elaborated by the author.

Based on Table 1, we can verify all the innovations highlighted by the hotel chains under study during interviews. When crossing the answers rose in these meetings with the programs and sustainability reports and the corporate videos of the chains in the study, we verified that none of the innovations highlighted in these secondary sources were left out of the conversation with the professionals. However, the interviews raised several innovations that were not present in these other materials.

By categorizing the innovations mentioned in Table 1 to the innovation designs for environmental sustainability highlighted by Carrillo-Hermosilla, González and Könölla (2009), we verified the following:

CHAIN / DESIGN	A	B	C
END-OF-PIPE	- Sensors on taps. - Toilet with dual flush valves. - LED lighting. - Lighting with motion sensors in social areas. - Solar panels for heating water. - Low-temperature systems in the laundry. - Amenities made from natural ingredients. - Packaging of amenities made of biodegradable material and recyclable.	- Use of efficient showers and taps. - Compact fluorescent lighting. - Lighting with motion sensors in social areas. - Smart keys. - Wind turbines. - Heat recovery systems. - Gas heating. - Electric car charging station. - Biodegradable plastic containers. - Sustainability Data Management System for managing resources.	- Showers with water savers. - Toilet with dual flush valves. - Lighting with motion sensors in social areas. - Fluorescent lighting. - Solar panels. - Wind turbines. - Smart keys (magnetic). - Aquanomic for decreasing the quantity and temperature of water required in the laundry. - Packaging of amenities made of recyclable material. - 3-D Trasar for chemical treatment of water.

	- Printing packaging of amenities made using soy ink. - Bottled water use. - Carbon Disclosure Project methodology for consumption control. - LEED, certification of environmentally sustainable buildings.	- Sustainable Enterprise Reporting and Management (SERAM) for resource management. - Water bottling in glass. - Garbage separation. - Use of LEED, certification of environmentally sustainable buildings. - Guests awareness programs on the use of natural resources.	- Sub metering water system. - Electric car. - Green Hotels Global. - Use of LEED, certification of environmentally sustainable buildings. - Smart elevators. - Green uniforms. - Reflective roof tiles. - High efficiency plumbing. - Environmental Effects Assessment Panel (EEAP), auditing tool for resource reduction targets.
SUBSYSTEM (ECO-EFFICIENCY)	- Sewage treatment plants. - Treated water reused for cooling environments, irrigation and toilets. - Rainwater harvesting. - Reduced use of water for cleaning the establishment. - Waste management. - Sale of recycled waste. - Use of organic waste for composting and reuse in gardens.	- Sewage treatment plants. - Freddy, system that completely eliminates food wastage. - Reuse of laundry and pool water for irrigation of gardens and personal bathroom. - Recycling of paper, cardboard, aluminum and glass. - Using anaerobic digestion which turns organic waste into energy. - Use of organic waste for composting and reuse in gardens. - Conversion of the oil used in F&B in biodiesel. - Eco-meeting.	- Rainwater harvesting. - Treated water reuse for irrigation toilets. - Recycling of toner, glass, plastic, cardboard, paper, scrap metal, fluorescent lamps and batteries. - Recycling and reuse of bar soaps not used by customers. - Cooking oil transformation into biodiesel. - Composting of organic waste.
SYSTEM	**NONE**	**NONE**	**NONE**

Table 2 – Innovation Design for Environmental Sustainability developed by the chains under
Source: Elaborated by the author.

When dealing on the three different designs of eco-innovation, based on Table 2 we can say that, large part of the chains' innovations is end-of-pipe, one in which there is the addition of a new component that improves the environmental quality of a product, minimizing or repairing a negative impact. Initiatives such as the introduction of toilets with dual flush valves to reduce water consumption and garbage separation, highlighted by chain A and C, illustrate well this kind of innovation.

However, what caught our attention the most in the responses of the hotel chains was that, when evaluating the innovations highlighted by these organizations, none of them was characterized as a system innovation, that radical transformation that modifies an entire

industry and its components. According to Carrillo-Hermosilla, González and Könölla (2009), system innovations bring greater benefits to the environment.

Thus, it is clear that the innovations developed and used by the hotel chains in the study are only specific innovations and often with a palliative aspect, even by generating a reduction in the consumption of environmental resources, they do not generate a radical change in the sector. For a change of system, it would be necessary to rethink the entire current hospitality model, today based on a traditional lodging pattern and dependent on consumption of different resources in order to provide convenience to guests.

Another objective of this research was to verify which barriers and incentives to eco-innovations are found in the hotel chains being studied.

On the barriers faced by the chains under study, according to respondents, they are:

BARRIERS	CHAINS		
	A	B	C
EXTERNALS	NONE	- Difficulty to obtain some technologies on the market - Lack of incentive	- Lack of clear and appropriate regulation - Lack of general interest
INTERNALS	- Difficulty in showing the return on investment to investors - Lack of financial resources	- Lack of investment - Lack of interest from investors	- Lack of financial resources - Lack of control of all decisions for working mostly with the franchise system - Lack of pressure from guests

Table 3 – Barriers faced by the chains being studied
Source: Elaborated by the author.

According to the interviews applied to objects of study, among external barriers, the chains highlighted items such as difficulty to obtain some technologies on the market, lack of incentive, lack of interest and lack of clear and appropriate regulation. It is worth highlighting that chain A did not identify any external obstacle that would hinder the development of environment-related innovations. It is also important noting that, that in the questionnaires for these same organizations two other significant barriers to this kind of innovation were raised: consumers and suppliers. The latter was also identified as a barrier by experts in the field, becoming a similar indicator for these two groups.

At the same time that "Suppliers" was indicated by the hotel chains and by experts as a significant barrier to eco-innovation in the hotel industry, they are important for inducing such innovations since they develop and disseminate a number of sustainable innovations adopted by companies (CARRILLO-HERMOSILLA; GONZÁLEZ; KÖNÖLLA, 2009).

Regarding the internal barriers, "Lack of resources" was the most prominent barrier during interviews. This is in line with other research related to the same issue, as for Legrand et al. (2012), from an investigation into the lodging facilities in Germany, we verified that 71% of the surveyed hoteliers see the lack of financial resources as the main barrier to invest in this type of innovation, being the indicator mostly pointed out in the questioning. As for Bohdanowicz and Martinac (2003), from a survey conducted in four major European hotel chains they also identified the high investment costs in innovation for environmental sustainability are barriers to this type of initiative.

During the interviews, other barriers were also listed such as: difficulty to show the return on investment to investors, lack of investment, lack of interest, lack of control of all decisions for working mostly with the franchise system and lack of guest pressure. It is noticeable, that through these answers, that the financial issue is still the most relevant in relation to organizations, since some of the barriers highlighted in this paragraph are directly related to this point.

On the lack of control of all decisions for working mostly with the franchise system, Chain C explained that most of the decisions are made by its franchisees and not the chain. Without that full control of the headquarters on issues focused on sustainability, there is a difficulty for these organizations to establish and disseminate innovations for environmental sustainability in all its units.

Questionnaires applied to the hotel chains under study raised other relevant internal barrier: "Size of the company". However, while the hotel chains understand that this is a barrier to innovation for environmental sustainability, Carillo-Hermosilla, González and Könölla (2009) and Sloan, Legrand and Chen (2013) state that large organizations are those with greater financial availability to invest in innovation, and these are the companies more likely to use innovation for environmental sustainability. Bohdanowicz (2006b) complements the other authors by highlighting that large hotel chains are those that are at the forefront when it comes to issues of environmental sustainability in the hotel industry.

Experts in the field have the same positioning of the authors cited above, because, by means of questionnaires, we verified that this group understands that "Size of the company" is a less barrier amongst internal factors of the organization. Therefore, just as "Suppliers", in external barriers, this indicator has a dual role in the innovation process, since it can be both an internal barrier for the development of eco-innovations – statement based on the positioning of the hotel chains –, as it also is a positive factor for the development of such innovations positioning advocated by the authors and experts in the field.

On incentives for investment in innovation for environmental sustainability, the responses were as follows:

INCENTIVES	HOTEL CHAINS		
	CHAIN A	CHAIN B	CHAIN C
EXTERNAL	- Local legislation which benefits environmentally sustainable initiatives	- Funding for environmental innovations available from funding institutions - Hotel market awards for sustainable initiatives	- Partnership with organizations dedicated to environmental issues
INTERNAL	NONE	- Premiação para as unidades que geram resultados positivos por meio de iniciativas ambientais	- Engagement with the future of the planet and future generations

Table 4 - Incentives faced by chains being studied
Source: Elaborated by the author.

The interviews showed that with regard to external incentive, local legislation which benefits environmentally sustainable initiatives, hotel market awards for sustainable initiatives and partnerships with organizations dedicated to environmental issues are the items highlighted by these organizations.

On legislation that benefit environmentally sustainable initiatives, this response has ratified the positioning by Carrillo-Hermosilla; González and Könölla, 2009, since the authors claim that the State is responsible for the developing of legislation related to the topic. When crossing this item to the theory, the authors from this field as Carrillo-Hermosilla; González and Könölla, (2009) and Weber and Hemmelskamp (2010) agree that there are a growing number of countries that are concerned with environmental issues and offered a dedicated legislation for this purpose.

However, at the same time "Legislation" is understood by the hotel chains under study as an external incentive for investment in innovation for environmental sustainability, in the questionnaires applied to these same organizations, it was marked as the most important item for this kind of innovation, generating certain contradiction on this issue. Thus, we suggest future studies on the subject to better understand the relationship of the importance of legislation on innovations for environmental sustainability in lodging facilities.

With regard to internal incentives items such as the awards for the units that generate positive results through environmental initiatives and engagement with the future of the planet and future generations are highlighted. But what drew the most attention was that Chain A identified no internal incentive that encourages the chain to develop environment-related innovations. To reverse this situation, organized awards could be organized through which units of the chain to present greater percentage decrease in the consumption of natural resources or those to implement the most effective and unique eco-innovations would gain a reward, as is already done in Chain B.

The issue showed that there is still, from the point of view of respondents, more barriers than incentives for developing innovation environmentally focused. In fact, there are now several funds both from public funding agencies as private initiatives funding projects and research related to innovations for environmental sustainability (CARRILLO-HERMOSILLA; GONZÁLEZ; KÖNÖLLA, 2009). Perhaps, we lack greater further promotion of these initiatives within the lodging market. In addition, actors like the government, suppliers and final consumer should establish themselves more concretely as important drivers of the innovation process, either through public policies that give more incentives for environmental initiatives, a situation that has been pointed out Chain A, or either through the provision of goods and/or services that require less consumption of resources, or even by demanding from the very chains more sustainable processes and with more significant environmental results. In relation to "Suppliers", as noted earlier, it ends up acting as a double agent within the innovation process in the hosting industry.

As for motivations to invest in innovation for environmental sustainability, the responses were:

MOTIVATIONS	INTERVIEW		
	CHAIN A	CHAIN B	CHAIN C
Potential cost savings	✓	✓	✓
Image Improvement and increase in market share	✓	✓	✓
Acquisition of competitive advantage	✓	✓	✓
Intrinsic motivation		✓	✓
Increased motivation of employees		✓	✓
Guest request		✓	✓
Advice from other market professionals			
Others		✓	

Table 5 - Reasons to invest in innovation for environmental sustainability
Source: Elaborated by the author.

All respondents admitted that investment in innovation for environmental sustainability was motivated, inter alia, as a competitive advantage. However, by paying greater attention to other indicators such as "Potential cost savings" and "Image improvement and increased market share", we found that these factors can also generate competitive advantage for the organization and may be part of a strategy with a competitive approach. In the Others alternative, Chain B, highlighted "To satisfy investors, guests, community and co-workers", which can be related to a competitive advantage, which according to Harrison and Enz (2005), the relationship with stakeholders can be a source of competitive advantage.

The data collected in the interview are reaffirmed in the questionnaires intended for the hotel chains. In the last question, where we discuss what is the importance of indicators related to eco-innovation for the competitiveness of enterprises linked to hosting, "Cost savings", "Image improvement and increased market share" and "Improvement in relations with guests", among others, were the most important items in the opinion of respondents, with 100% of them having marked it as highly relevant.

6 CONCLUSIONS

This qualitative multiple case study sought to verify the reality of eco-innovations developed by global hotel chains, highlighting innovations design being employed by these organizations, the barriers and incentives faced and the motivations to invest in innovations with this purpose.

Based on survey data, we found that the chains under study develop a large number of eco-innovations in their enterprises, most of which have an end-of-pipe character.

With respect to the barriers faced, organizations highlight the following: difficulty to obtain some of the technologies available in the market, lack of incentive, lack of clear and appropriate regulation, general lack of interest, suppliers, buyers, difficulty to show the return on investment to investors, lack of financial resources, lack of investment, lack of guest pressure, the company's size and lack of control of all decisions for working mostly with the franchise system. Among the incentives we identified; local legislation, funding for environmental innovations, partnerships with other organizations, hotel market awards and engagement with the future of the planet and future generations. From this objective we conclude that, in the view of respondents, there are still more barriers than incentives for the development of innovations environmentally focused and that much of it is related to the financial issue and the lack of interest.

Regarding the motivation to invest in eco-innovation, all respondents admitted that the investment in this type of innovation was motivated, among other reasons, as a competitive advantage. However, a more careful look into other indicators such as "Cost savings" and "Image improvement and increased market share", we found that these factors can also generate competitive advantage for the organization and may be part of a strategy with competitive approach; therefore the competitive advantage gained from this type of innovation is an important motivation for the chains under study.

This article represented a way of contributing to the development of scientific research on lodging facilities, by showing the particularities of eco-innovations developed in global hotel chains. However, some of the results collected in this study corroborate data already found in other studies related to environmental sustainability in lodging facilities such as studies by Carrillo-Hermosilla; González and Könölla (2009), Legrand et al. (2012) and Bohdanowicz and Martinac, (2003) that deal with the barriers and motivations to invest in eco-innovations, reaffirming the existing studies on the topic.

In the course of this work, some questions emerged that could be exploited in other scientific studies. In this context, it is possible to list some possibilities of research on eco-innovations within the hosting industry, such as; why are there still, in the view of hoteliers, fewer incentives compared to the number of barriers to the development of eco-innovations; and why lodging facilities are still tied to the current system without concern for sustainable innovations of rupture (systemic innovations).

It is worth mentioning that this is a qualitative research, therefore the results found in this study may not have a statistical generalization. In this case, the generalization is of analytical character only. Furthermore, this research is part of a larger study that seeks to analyze the relationship between eco-innovations and the competitive strategies of hotel chains. It is therefore a first step that is already showing significant results with in relation to this theme.

CONTRIBUTIONS BY THE AUTHORS

Vanessa de Oliveira Menezes was responsible for field research, analysis and drafting of the text;

Sieglinde Kindl da Cunha was responsible for bibliographic and methodological end of the work review.

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