INCORPORATION OF MANAGEMENT CONTROL IN THE ANALYSIS OF UNIVERSITY ENVIRONMENTAL MANAGEMENT

Jennifer L. Gómez, Liliana D. Monroy

Public Accounting Distance Program, Military University Nueva Granada, Colombia

Abstract

The studies consulted at national and international level analyze and characterize the background, challenges and environmental management practices developed in different university campuses. In this regard, it is identified that there is a lack of studies on the Management Control Systems (MCS) existent in the environmental actions carried out by the universities.

However, management control is the process by which managers ensure that resources are effective and efficient to achieve the objectives of the organization (Anthony, 1965; Quoted in Straub & Zecher, 2013), this paper shows management control as a potential tool that can be used in the analysis of university environmental management to achieve a committed management with organizational sustainability.

To this end, the proposals of the most relevant MCS models in the academic literature will be analyzed, such as: a) Simons' levers of the control framework (1995), b) Otley's performance management framework (1999), c) Ferreira and Otley's performance management systems framework (2009), d) Broadbent and Laughlin's performance management system (2009), and e) Malmi and Brown's the Management Control Systems package (2008).

As a result of the research, the characterization of the contributions and limitations of these systems will be obtained, so that the feedback provided can be used in the process of continuous improvement of the university environmental management.

Keywords: *Sustainable campuses, Organizational environmental management, Management Control Systems, Sustainability*

1. INTRODUCTION

The number of organizations interested in controlling the impacts of their activities, products and services on the environment has increased, this organizations have taken as a starting point the development of environmental policies and objectives (ICONTEC 2004). In this sense, organizational practices oriented towards an environmental management committed to the continuous improvement of organizational environmental performance have increased. These practices range from the modification of the materials in the products, the implementation of processes to reduce the use of resources and environmental pollution, to the planning and execution of programs oriented towards the transformation of values, and the beliefs of the organization members (Linnenluecke, Russell and Griffiths 2009)

The implementation of an Environmental Management System (EMS) under ISO 14001 is the most important environmental management practice (Bolzan & Pol 2009), this standard specifies the requirements for an EMS that allows to an organization to develop and implement a policy and objectives that consider legal requirements and information about environmental elements (ICONTEC 2004).

However, Taylor, Sulaiman & Sheahan (2001) showed that for most companies the main benefits of obtaining ISO 14001 certification are: a) the increase in competitiveness, and b) improvement in the image of the organization, while the improvement of environmental performance is quoted as the least important benefit to maintain this certification. This situation is extremely worrying because an EMS must contribute to the continuous improvement of organizational environmental management and performance.

Thus, it is extremely important to promote the use of EMS as guarantors of the continuous improvement of organizational environmental performance, rather than as instruments of competitiveness and social legitimacy. For this reason, in this paper it proposes to include management control in the analysis of organizational environmental management because it contributes to the effective and efficient use of resources for the achievement of organizational environmental objectives (Anthony 1965; Straub & Zecher 2013).

Likewise, the topic of university environmental management will be specifically analyzed, considering that not only the major industries play a decisive role in the current environmental problems, but also the service companies and specifically the universities in the development of their activities have a considerable impact on the environment (Flor, Pereira & Astudillo 2014). The universities "generate an impact directly and indirectly on the environment and can be considered small cities, because of their size, population and the many activities that in their interior, they develop that can affect the environment" (Cohen 1986, quoted by Rivas 2011, p. 152).

In the case of the Environmental Management Control Systems (EMCS), the academic literature is disorganized, without consensus on the part of the academics (Guenther, Endrikat & Guenther 2016, Lueg & Radlach 2016), adapting the classic models of Management Control Systems (MCS) to the environmental component.

The majority of authors adapt the MCS to the environmental component based on the requirements of ISO 14001: 2015. Likewise, it is considered that there are different types of dimensions that constitute an EMCS. Guenther et al. (2016) identify the dimension of time, scope and focus on control, considered it as delimitation dimensions; while Gond et al. (2012) identify as structural dimensions, the following: technical, organizational and cognitive.

To facilitate the design model EMCS at universities, it is necessary: to identify their current position (Shriberg 2002), classify their type of position: environmental leaders, environmental activists, accidental greens, or environmental dinosaurs (Herremans & Allwright 2000); and identify the steps for measuring the sustainability in universities. Morover, it is considered that the success factors to achieve participation in the EMS are communication, empowerment, dialogue, the availability of time, the increase of adaptation, among others (Disterheft et al., 2014).

On the other hand, the elements for the formulation and implementation of an EMCS in Universities are proposed, these include a diagnosis of the current state of the university and the formulation of the system based on guiding questions such as: What am I going to do ?, Why am I going to do it? ?, How will I do it ?, What do I need to do it ?, and What is the desired result?; adapting the elements of the MCS and EMCS proposals to the university context.

Then, the paper analyses the management control and its relationship with environmental management, on that basis, a proposal of elements for the implementation of an Environmental Management Control System in Universities (EMCS-U) will be presented, after that it develop the topic about sustainable campuses and environmental management in universities, along with aspects of motivations, participation and problems in the implementation of the EMCS-U.

2. MANAGEMENT CONTROL AND ORGANIZATIONAL ENVIRONMENTAL ACTIONS

The emergence of Management Control Systems (MCS) as an academic concept can be traced back to few people and universities. Specifically, the Harvard Business School (HBS) has a prominent position in the field of management control, in fact, Ross Walker and Robert Anthony, two (2) of the main protagonists of management control are of this school. These authors take up the trend initiated by Thomas Sanders, who was the first to appoint control in an accounting course in 1921-1922, and they continued the ideas of Earle Burchell, who made the first reference to budget control in an accounting course between 1922 and 1923. In particular, Ross Walker started the transformation of classical accounting towards control (Straub & Zecher 2013).

Walker showed that the term control not only refers to the limitation of human behavior but also embraces an adequate supply for the success of the operation. So, HBS between 1941 and 1945 sought to "improve the analytical skills of students to optimize the management of available scarce resources", this was called Management Control (Straub & Zecher 2013).

The most relevant MCS models in the academic literature, according to Straub and Zecher (2013) are: a) Simons' levers of the control framework (1995), b) Otley's performance management framework (1999), c) Ferreira and Otley's performance management systems framework (2009), d) Broadbent and Laughlin's performance management system (2009), and e) Malmi and Brown's the Management Control Systems package (2008). Table 1 shows the elements that are part of these models.

Model	**Elements**
Simons' levers of control framework	Beliefs systems. Interactive control systems. Boundary Systems. Diagnostic control systems.
Otley's performance management (PM) framework	Goals. Strategies and plans. Performance levels. Rewards. Information flows (feedback and feedforward).
Ferreira and Otley's performance management systems (PMS) framework	Vision and mission. Key factors of success. Strategies and plans. Organizational structure. Performance measures. Goal setting. Performance evaluation. Rewards system. Feedback and feedforward of information flows. Type of use of performance management systems. Change in performance management systems. Strength and coherence of the links.
Broadbent and Laughlin's performance management system (PMS)	Two different types of performance management systems: 'transactional' and 'relational'.
Malmi and Brown's the Management Control Systems (MCS) package	Planning. Cybernetic controls. Rewards and compensation systems. Administrative controls. Cultural controls

Table 1. Models of Management Control System

Source: Own elaboration based on Straub & Zecher (2013)

Comparing these five (5) MCS models, they have points in common, in fact, the Malmi and Brown (2008) model can be considered as an integrator proposal, because it encompasses the totality of elements present in the most important MCS models in the literature, figure 1 shows the missing elements in each one of the other models with respect to Malmi and Brown (2008)'s proposal.

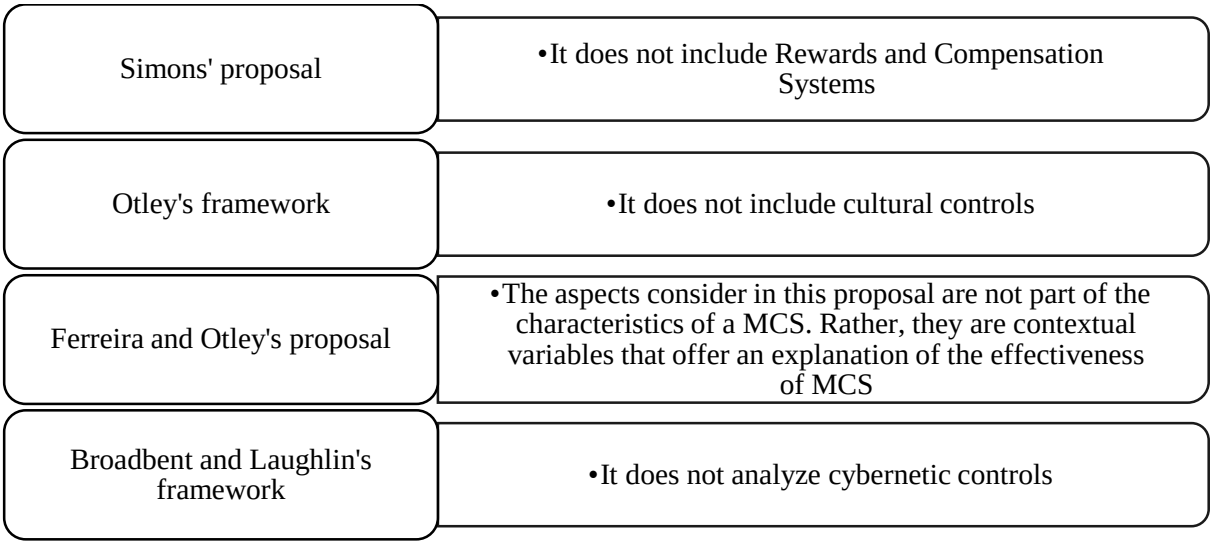


Figure 1. Comparison of the most important MCS models respect Malmi and Brown (2018)'proposal

Source: Own elaboration

With the Malmi and Brown model (2008) as a point of reference, the elements that have to be included in an integral MCS model are:

a) Planning: it demands a setting of objectives, monitoring and coordination of functions, which influence the behavior of the members of the organization towards the fulfillment of the organizational interests

b) Cybernetic controls: They include budgets, financial systems, non-financial and hybrid measures,

c) Rewards and compensations systems: They are oriented to motivate the individual or groups of employees, these systems are designed to align the individual interests with those of the organization,

d) Administrative controls: They refer to the design and maintenance of the structure of an organization (controls related to the design of the organization, structure, procedures and policies), and

e) Cultural controls: They work through a set of values, beliefs and social norms

In this paper, the integral MCS model identified above (which is derived from the Malmi and Brown's proposal) is integrated with the environmental aspects and its relevance in the Universities, based on ISO 14001: 2015, and this integration between MCS and environmental is called as Environment Management Control Systems (EMCS)

The EMCS facilitate the monitoring of the environmental management (EM) of an organization. Wong et al. (2015) define EM as the adoption of measures and the promotion of behaviors that reduce the environmental impact of organizational activities.

Guenther et al. (2016) mentions that the EMCS offer the opportunity to relate environmental problems with organizational strategy, aligning processes and activities towards the environmental strategy and strengthening the Environmental Management System (EMS), which is often segregated in relation to the other organizational management systems, except for those cases in which the environmental impacts are significant and become relevant the environmental issues because regulations.

The incorporation of the environmental component in the organizational strategy contributes to a competitive advantage. Esty and Simmons (2011) establish that the implementation of an environmental strategy brings: competitive advantages, the reduction of the organizational risks, the reduction of costs, the growth of the income, the stimulus to the innovation, and the improvement of the corporate

reputation. For these reason, in the chapter four this paper analyses the topic of sustainable campuses and university environmental management.

On the other hand, in this paper is proposed that the construction of the EMCS is linked to the MCS models through the five systems: a) strategic, b) action, c) factors of success, d) interaction and e) cultural, these systems will be explained in the proposal of key elements in the formulation and the implementation of University Environmental Management Control System (EMCS-U).

3. PROPOSAL OF KEY ELEMENTS IN THE FORMULATION AND IMPLEMENTATION OF EMCS-U

Considering the Management Control, the environmental organizational actions and their link with the EMCS, as measures of adoption and promotion of behaviors that reduce the environmental impact in an organization. It is possible to define the Environmental Management Control System in Universities (EMCS-U), as the system that facilitates decision making by top management and influence the behavior and execution of activities by employees, professors and students in relation to the strategy and environmental objectives of the university.

The formulation of guiding questions for the EMCS-U allows to develop a diagnosis about current state of the university and an analysis the possibilities of implementing an EMCS-U; that diagnosis is made both to the university institution in general and to the decision makers, and it includes the follow guiding questions: What will I do ?, Why will I do ?, How will I do ?, What do I need to do ?, and What is the desired result?. It is expected that with the contents proposed in table 2, it is able to possible to approach the answer of these questions.

Proposed system	**Questions**	**Elements of the proposed system**	**Implications and considerations of the proposed system**
System of strategic concepts. **What will I do it? And why will I do it?**	Is there an environmental or sustainability discourse incorporated in the mission, vision or values of the university? Within the future scenario are environmental or sustainable objectives for the campus raised?	Mission, vision, objectives, future scenario.	It should consider elements of context such as: economic sector, trends, geographical location and regulations. It requires the setting of values that maintain the commitment to sustainability.
Systems of action **How will I do it?**	Is it possible to identify a mechanism to improve sustainability current practices? How much material per capita does the university consume? What are the policies of the university that promote waste management, recycling, purchasing, energy use and construction?	Codes of conduct, action plans, methods.	It has both strategic and tactical scope, allows the fulfillment of short and long-term objectives. It must strive to eliminate negative environmental impacts and must be directed towards the environmental commitment of the institution.
Systems of success factors, evaluation and monitoring	Have variables been defined to achieve the objectives related to environment and sustainability?	Measures that inform the fulfillment of objectives, methods and processes.	It must allow the establishment of information flows and strategies with related actors.

Proposed system	**Questions**	**Elements of the proposed system**	**Implications and considerations of the proposed system**
What do I need to do?	Have methods for learning in environmental management been generated? Are variables monitored around continuous improvement in terms of campus sustainability?	Qualitative and quantitative environmental management variables	Sustainability objectives are compared with the results obtained, these must be related to cultural aspects, efficiency and sustainability of the programs
Interaction systems **What is the desired result?**	Does the university have participation practices that involve students and other members of the community in environmental or sustainable proposals? Are responsibilities distributed to different members of the university corresponding to different positions and functions?	Mixed groups with responsibilities and reward systems. Decisions and programs established jointly.	The groups are made up of people with different status (professors, coordinators, students) and responsibilities are given to all involved.
Cultural system What is the desired result?	What is the impact of the graduates in the sector in which they work? What practices does the university assume to involve its community in an environmental culture? Does the university finance activities with the aim of building a culture of sustainability?	Symbols, ethical codes and common language regarding the sustainability of the campus. Awareness oriented to the understanding of environmental impacts.	Motivation influences implementation and maintenance of the EMCS-U. A university culture will give a differentiating factor to the institution. Universities require creative alternatives to integrate members.

Table 2. Diagnostic questions to Universities and description of EMCS-U proposed model

Source: Own elaboration

Table 2 provides a scheme that includes the systems, the questions and elements that can be used by different universities to develop a diagnosis of their current situation in the dimensions of green organizational culture, environmental situation of the campus and degree of awareness of the actors. The scheme proposed in table 2 is a tool created and suggested by the authors of this paper to apply in the evaluation of the configuration of an EMS in universities.

4. SUSTAINABLE CAMPUS AND UNIVERSITY ENVIRONMENTAL MANAGEMENT

As can be seen in table 2, in EMCS-U proposed model, the components related to people and culture are an important aspect to consider in the configuration of an EMS in universities because if people are the first to appropriate the importance of applying measures that have positive impacts on the environment, the model proposed will be more easily adopted; In fact, both managers, professors, administrators and students committed to a management towards sustainability may propose alternatives that supply the lack of resources or ignorance, while, a university that has facilities, financial or

technological resources, but does not involve your community, will not achieve the sustainability of his campus

In the international context there are different approaches to the topic of sustainable campuses and university environmental management, in which: the current state of the application of sustainability practices is described (Vagnoni & Cavicchi 2015; Alba 2007; Ortiz, Sanchez & Lara 2007, Sammalisto & Arvidsson 2005, Herremans & Allwright 2000, Ortiz, Ayala & Guadarrama 2007), the relationship between environmental management practices and the greening of the organizational culture is analysed (Ceulemans et al., 2015), an approximation to the main antecedents on EMS in universities is developed (Medellín & Nieto 2007).

The main studies in the national context about university environmental management have been focused on: comparing changes and trends in university environmental management based on the criteria used by the GreenMetric ranking (Molano 2015), reviewing the progress of the implementation of the EMS in Higher Education Institutions and contrast it with the practices of entities that are points of reference in other countries (Flor, Pereira & Astudillo 2014), analysing the needs and the shortcomings of the EMS and generating proposals for educational centers (Camacho 2007), examining the environmental policies and commitments aimed at minimising and disseminating a culture of sustainability among its members (Benayas & Alba 2007), developing an environmental diagnosis of the most significant aspects of the EMS present in universities (Ruiz 2007).

In the studies previously mentioned both nationally and internationally, the authors have analyzed and characterized the background, challenges and current environmental management practices developed in different university campuses. However, in none of the studies has incorporate the management control systems in the analysis of the university environmental management. Therefore, it is a major challenge for Colombia to include Management Control in the analysis of university environmental management, which would allow the identification of the organizational aspects that are necessary to cover to achieve an implementation of the EMS - under the guidelines of ISO 14001 - committed to sustainability and continuous improvement environmental performance of universities. In the next chapter, the paper will mention the motivations, positions, participation and problems in the implementation of the EMCS within the Universities.

4.1. Motivations and postures

It is important to review the position in which the managers and decision makers of the universities are located and the motivations of environmental measures implementation, these aspects can be detected from the attitude, awareness, actions and performance of managers and decision makers. There are four position types in which the institutional actors could be: environmental leaders, environmental activists, accidental greens or environmental dinosaurs (See Table 3)

Institutional Actors	**Attitude**	**Consciousness**	**Actions**	**Performance**
Environmental leaders	They feel that environmental problems affect the university	They can identify the environmental problems	They develop programs according to the identified problems	They prevent environmental problems because they have financial resources, time and skills for that. They have environmental objectives in short and long-term.
Environmental Activists	They feel that environmental problems affect the university	They are not sure which the problems are until these appear	They are active in the development of an effective EMCS-U	They determine which programs to implement, have access to knowledge and skills but do not have the time or resources

Institutional Actors	Attitude	Consciousness	Actions	Performance
Accidental Greens	They do not consider EMCS-U as a necessary tool	They are not aware of the problems that affect the university	They may have some guides prepared but they have not considered a preventive program.	They do not provide the institution with resources to deal with environmental issues
Environmental Dinosaurs	They feel that environmental issues have no relationship with the institution	They are not aware of the environmental problems and do not see an EMCS as necessary	They have not considered the actions that should be carried out	They are not preventing environmental problems, they have not considered the time or resources necessary in an EMCS

Table 3. Environmental positions of institutional actors

Source: Own elaboration based on Herremans & Allwright (2000)

4.2. Participation as a fundamental measure of commitment

There are different participation activities that allow an adequate implementation of the environmental management control systems in universities, such as: a) the creation of joint work teams of different subdivisions of the university that can be dedicated in a considerable measure to the application of environmental programs, b) the continuous application of awareness campaigns carried out through posters and brochures; c) the execution of "green weeks" or events in which activities related to the environment are carried out, these can include practical components such as workshops or field trips; d) inclusion of environmental literacy courses and environmental volunteer programs, in which people can take actions that transform their environment (Benayas, Alba & Sánchez 2002).

These participation practices can be oriented to work from personal ethics in the case of students and from the strategic institutional positioning for managers (Llosa, Madrigal, and Díaz, 2009). Table 4 shows some factors that can be decisive for the promotion of the participation of the university community.

Communication	Empowerment	Dialogue
Time availability	Increase in acceptance	Network management
Identification with the objectives	Start on time	Optimism
Free attitude of judgments	Stimulate positive attitudes	Positive image of the university
Persistence	Strategy with a goal	Competition
Building capacity	Tangible goals	Trust
Collaboration	Connect with what matters to people	

Table 4. Success factors to achieve participation in environmental management systems

Source: Own elaboration based on Disterheft et al. (2014)

Another relevant proposals relationed with participation are: a) the inclusion of a demonstrative facet for the members of the university community through strategies of educational effectiveness, these

interventions can have a direct effect that is disseminated through the conscious people who transfer the management models to other areas, and b) extracurricular interventions that connect the university and students directly with the current problems, in this way, students define their interests, create relationships around environmental care and build their personalities when they choose freely and dedicate their time to certain activities (Benayas et al., 2002).

4.3. Problems in the implementation of the EMCS

There are some limitations when the EMCS are implemented in universities, which it classifies in four problematic axes: resources, attitudinal, institutional and external context (See Table 5)

Problem axis	Associated problems	Influential factors
Resources	Lack of funding	Money and resources are allocated to higher priority goals and objectives
	Lack of time	Professors responsible for the environmental issue must fulfill other responsibilities.
	Little access to data and information	Working with volunteers who have little time.
	Technical problems	
	Lack of a workplace or office designated for the environmental topic	
	Lack of trained personnel	
Attitudinal problems	Lack of awareness, interest and connection	Lack of interest of professors, administrators and students. Some, they just do not want to change.
	Resistance to change	Lack of leadership
	Machismo	Women have less credibility and for that reason they need more time, energy and resources to implement the strategies
Institutional problems	Mentality oriented to the generation of financial utility	The institutions are very conservative and little open to new paradigms
	Lack of interdisciplinary research	Bureaucracy can complicate communication and information flows
	Lack of performance indicators	The universities are managed as if they were a traditional private business, the rectors have more qualities of managers than academic leaders
	Lack of policies to promote sustainability on campus	Lack of integration of economic, environmental and social visions to analyze a same problem.
	Lack of definitions and standardized concepts	The indicators refer mainly to money, and the measures that contemplate other variables are not as developed or considered
External problems, context	Rigorous regulations	The regulations are voluntary, but these should be proposed as binding to force institutions to commit to sustainable development

Table 5. Problems that prevent the implementation of sustainability strategies in higher education institutions

Source: Own elaboration based on Velazquez et al. (2005)

5. CONCLUSIONS

In recent years, the incorporation of management control to address the environmental strategy in organizations and it is used to provide information in decision making and ensure the achievement of environmental objectives. However, in the studies related to sustainable campuses and university environmental management both nationally and internationally, the authors have analyzed and characterized the background, challenges and current environmental management practices developed in different university campuses. However, none of the studies have addressed the Management Control Systems present in the environmental actions carried out by the universities.

The challenges associate with formulation of the Environmental Management Control Systems in Universities are: a) the integration of a culture and dynamic environmental awareness aligned with the financial, technological and human resources, and b) the active role of manager and decision maker, which are responsible of the implementation of EMCS-U, in addition these people must: be aware of the problems present in the university, as well as of the alternatives that can be developed, and have time disposition that allows them to carry out the labours of promotion, awareness and management of the EMCS.

ACKNOWLEDGMENTS

Result of the project INV-DIS-2574, financed by the Research Vice-Rectory of the Universidad Militar Nueva Granada. Validity 2018

REFERENCES

1. Alba, D 2007. "*Análisis de los procesos de gestión y educación para la sostenibilidad en las universidades públicas españolas. en J. Sureda y L. Cano (Coords.). Tendencias de la Investigación en Educación Ambiental al desarrollo socioeducativo y comunitario. Madrid: Naturaleza y parques nacionales. Serie Educación Ambiental. Organismo Autónomo Parques Nacionales"*. Ministerio de Medio Ambiente, pp. 197-215.
2. Benayas, J, Alba, D, Sánchez, S 2002. "La ambientalización de los campus universitarios: El caso de la Universidad Autónoma de Madrid". *Revista Cientifica Y Técnica de Ecologia Y Medio*, vol.12, no.3, pp.1-8.
3. Benayas, J & Alba, D 2007. "La Universidad como referente social del cambio hacia un futuro sostenible". En: Memorias del IV Seminario Internacional Universidad y Ambiente: Gestión ambiental institucional y ordenamiento de los campus universitarios. *Digiprint Editores*. Bogotá, D.C. 25 -26 de Octubre, pp. 59-76.
4. Bolzan, C & Pol, E 2009. "Sistema de Gestión Ambiental y comportamiento ecológico: una discusión teórica de sus relaciones posibles". *En: Aletheia, (29), Universidad Luterana do Brasil*, pp.103-116.
5. Broadbent, J & Laughlin R 2009. "Performance management systems: A conceptual model". *Management Accounting Research*, vol.20, pp.283-295.
6. Camacho, C 2007, "El Sistema de Gestión Ambiental en el Politécnico Grancolombiano. Un Modelo Universitario" En: Memorias del IV Seminario Internacional Universidad y Ambiente: Gestión ambiental institucional y ordenamiento de los campus universitarios. *Digiprint Editores*. Bogotá, D.C. 25 - 26 Octubre. pp. 149-158.
7. Ceulemans, K., Molderez, I. & Van Liedekerke, L 2015, "Sustainability reporting in higher education: a comprehensive review of the recent literature and paths for further research". *Journal of Cleaner Production.*vol.106, pp.127-143.

8. Disterheft, A, Caeiro, S, Azeiteiro, U. M, & Leal, W 2014, "Sustainable universities e a study of critical success factors for participatory approaches". *Journal of Cleaner Production*, vol.106. pp.11-21.
9. Esty, DC & Simmons, PJ 2011, *The green to gold business playbook: how to implement sustainability practices for bottom-line results in every business function.* New Jersey, Estados Unidos: Wiley.
10. Ferreira, A & Otley, D 2009. The design and use of performance management systems: An extended framework for analysis. *Management Accounting Research*, vol.20. no.4, pp.263–282.
11. Flor, V., Pereira, H., & Astudillo, A 2014. "Hacia un modelo de gestión ambiental en instituciones de educación superior". *Ingenium*, vol. 8 no.22, pp.53-63.
12. Gómez, JL 2013, "Cultura organizacional para una gestión ambiental comprometida con la sustentabilidad: una aproximación teórica". PhD thesis. Universidad Nacional de Colombia.
13. Gond, JP, Grubnic, S, Herzig, C, & Moon, J 2012, "Configuring management control systems: Theorizing the integration of strategy and sustainability. *Management Accounting Research*, vol.23 no.3, pp.205-223.
14. Guenther, E, Endrikat, J, & Guenther, TW 2016, "Environmental management control systems: a conceptualization and a review of the empirical evidence" *Journal of Cleaner Production*, vol.136, pp.147-171.
15. Herremans, I & Allwright, D 2000, "Environmental management systems at North American universities". *International Journal of Sustainability in Higher Education*. Vol. 1.no. 2, pp.168 - 181.
16. ICONTEC - Instituto Colombiano de Normas Técnicas y Certificación 2004. Norma Técnica Colombiana NTC ISO 14001, p.28.
17. Linnenluecke, MK, Russell, SV & Griffiths, A 2009, "Subcultures and sustainability practices: The impact on Understanding Corporate Sustainability". En: *Business Strategy and the environment*, vol.18, no.7, pp. 432-452.
18. Llosa, ZB, Madrigal, HJ, & Díaz, MLM 2009. "Gestión ambiental en universidades públicas costarricenses: el ejemplo de «UNA-Campu sostenible". *Revista Posgrado y Sociedad Sistema de Estudios de Posgrado Universidad Estatal a Distancia* Costa Rica, vol.9, no.2, pp.81-124.
19. Lueg, R & Radlach, R 2016, "Managing sustainable development with management control systems: A literature review". *European Management Journal*, vol.*34*, no.2, pp.158-171.
20. Malmi, T., & Brown, DA 2008, "Management control systems as a package: opportunities, challenges and research directions". *Management Accounting Research*, vol.19, no.4, pp.287-300.
21. Medellín, P & Nieto, L 2007, "El sistema de manejo ambiental de la Universidad Autónoma de San Luís Potosí, México". En: Memorias del IV Seminario Internacional Universidad y Ambiente: Gestión ambiental institucional y ordenamiento de los campus universitarios. *Digiprint Editores.* Bogotá, D.C. 25 -26 Octubre. pp. 95-110.
22. Molano, S. 2015, "Hacia un comportamiento verde universitario: un estudio de caso sobre la sostenibilidad en el campus de la Sede Bogotá. PhD thesis . Universidad Nacional de Colombia.
23. Ortiz, B. Ayala, I. & Guadarrama, S 2007, "Gestión ambiental universitaria: Hacia un campus sustentable. Universidad Iberoamericana. Puebla, México. En: Memorias del IV Seminario Internacional Universidad y Ambiente: Gestión ambiental institucional y ordenamiento de los campus universitarios". *Digiprint Editores.* Bogotá, D.C. 25 - 26 de Octubre. pp. 91-94.

24. Ortiz, M, Sanchez, E & Lara, J 2007, "La gestión ambiental en la Universidad Autónoma del Estado de Morelos, México". En: Memorias del IV Seminario Internacional Universidad y Ambiente: Gestión ambiental institucional y ordenamiento de los campus universitarios. *Digiprint Editores.* Bogotá, D.C. 25 -26 Octubre. pp. 77- 90.
25. Otley, D 1999, "Performance management: a framework for management control systems research". *Management Accounting Research*, vol.10, pp.363-382.
26. Rivas, MI. 2011, "Modelo de sistema de gestión ambiental para formar universidades ambientalmente sostenibles en Colombia". *Gestiòn y Ambiente*, vol.14 no.1, pp.151-162.
27. Ruiz, L 2007, "Experiencias en la Gestión Ambiental Institucional y el Ordenamiento del Campus en el Instituto Superior de Tecnologías y Ciencias Aplicadas (INSTEC). En: Memorias del IV Seminario Internacional Universidad y Ambiente: Gestión ambiental institucional y ordenamiento de los campus universitarios. *Digiprint Editores*. Bogotá, D.C. 25 -26 de Octubre. pp. 111-126.
28. Sammalisto, K & Arvidsson, K 2005, "Environmental management in Swedish higher education". *International Journal of Sustainability in Higher Education*, vol. 6, no.1, pp.18- 35.
29. Shriberg, M 2002, "Theory Institutional assessment tools for sustainability in higher education". *International Journal of Sustainability in Higher education*, vol.3, no.3, pp.254-270.
30. Simons, RL 1995. "Levers of control: how managers use innovative control systems to drive strategic renewal". *Harvard Business School Press Books*. Boston, Estados Unidos.
31. Straub, E & Zecher, C 2013, "Management control systems: a review". J*ournal of Management Control*. Vol.23, p. 233-268.
32. Taylor, DW, Sulaiman M & Sheahan, M 2001, "Auditing of Environmental Management Systems: A Legitimacy Theory Perspective". *Managerial Auditing Journal*, vol. 16, no.7, pp. 411- 422.
33. Vagnoni E & Cavicchi, C 2015, "An exploratory study of sustainable development at Italian universities". *International Journal of Sustainability in Higher Education*, vol.16, no.2, pp. 217-236.
34. Velazquez, L, Munguia, N, & Sanchez, M 2005. "Deterring sustainability in higher education institutions. An appraisal of the factors which influence higher education institutions". *International Journal of Sustainability*, vol.6, no.4, pp.383-391.
35. Wong, CW, Lai, K, Lun, YHV & Cheng, TCE 2015. "Environmental Management". En The Supply Chain Perspective, *Springer*, pp. 1-27.