

Print ISSN: 0120-4645 / E-ISSN: 2256-5078 / Short name: cuad.adm. / Pages: 77-95
Universidad del Valle / Facultad de Ciencias de la Administración / Universidad del Valle / Cali - Colombia

The use of interactive and diagnostic control systems in the management of an undergraduate course

El uso de sistemas de control interactivo y diagnóstico en la gestión de un curso de grado

L'utilisation de systèmes de contrôle interactif et diagnostique dans la gestion d'un cours
de premier cycle universitaire

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Research article, PUBLINDEX-COLCIENCIAS classification
Submitted: 4/05/2016
Reviewed: 5/12/2016
Accepted: 3/04/2017
Core topic: Administration and Organizations
JEL classification: I20, C93, M15

Abstract

Due to the complexity in defining the use of information systems in an interactive and/or diagnostic manner, this study aims at verifying which management control systems may be used in an interactive and diagnostic form in an administration course of a higher education institution located in Santa Catarina, Brazil. As for the research method, it was carried out over three stages: individual in-depth interviewing, documentary research and the applying of a questionnaire to the advisory board of the course: Structuring Faculty Core - SFC. The results indicate that the systems "generation of ideas" and "project management" should be implemented at least as a diagnostic systems. For the systems "faculty performance management", "scientific research management" and "academics' performance in disciplines", interactive implementation is recommended. The systems of "budgeting" and "academic system" do not generate significant rejection if not present and they do not add value if present. Finally, the systems "academics' performance in the Integrated Mock Test on Managerial Knowledge" and "course extension performance" add value if put in practice; however, if implementing them is not possible, it does not generate significant rejection. The contributions of this study concern defining a methodology to support organizations in defining the configuration of information systems, whether interactive or diagnostic, aimed at optimizing the costs of implementing information systems, but also at ve-

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rifying the opinion of a group of people who participate in the administration of the institution and contribute to the legitimacy of decisions.

Keywords: Control systems, Interactive control, Diagnostic control, Course management.

Resumen

Debido a la complejidad en la definición del uso de los sistemas de información de manera interactiva y/o diagnóstica, este estudio tiene como objetivo verificar qué sistemas de control de gestión pueden ser utilizados de forma interactiva y diagnóstica en un curso de administración de una institución de educación superior ubicada en Santa Catarina, Brasil. En cuanto al método de investigación, lo realizamos en tres etapas: entrevista individual en profundidad, investigación documental y aplicación de un cuestionario al consejo consultivo del curso: Núcleo Docente Estructurante - NDE. Los resultados indican que los sistemas "generación de ideas" y "gestión de proyectos" deben ser implementados al menos como diagnóstico. Para los sistemas de "gestión del rendimiento de la facultad", "gestión de la investigación científica" y "rendimiento académico en las disciplinas", se recomienda la implementación interactiva. Los sistemas "presupuesto" y "sistema académico" no generan rechazo significativo si no están presentes y no agregan valor si están presentes. Por último, los sistemas "desempeño académico en la prueba simulada integrada de conocimiento de la gestión" y "rendimiento de la extensión del curso" añaden valor si se practica, sin embargo, si su implementación no es posible, no genera un rechazo significativo. Las aportaciones de este estudio se refieren a la definición de una metodología de apoyo a las organizaciones en la definición de la configuración de los sistemas de información, ya sean interactivos o diagnósticos, orientados a optimizar los costes de implementación de sistemas de información, pero también a la opinión de un colectivo de personas en la gestión de la institución y contribuyen a la legitimidad de las decisiones

Palabras clave: Sistemas de control, Control interactivo, Control diagnóstico, Gestión del Curso.

Résumé

En raison de la complexité de la définition de l'utilisation des systèmes d'information de manière interactive et / ou diagnostique cette étude vise à vérifier quels systèmes de contrôle de gestion peuvent être utilisés sous forme interactive et diagnostique dans un cours d'administration d'un établissement d'enseignement supérieur situé à Sainte Catherine, au Brésil. En ce qui concerne la méthode de recherche, nous l'avons réalisée sur trois étapes: entretien individuelle approfondie, recherche documentaire et application d'un questionnaire au Conseil Consultatif du cours: Structuring Faculty Core SFC. Les résultats indiquent que les systèmes de "la production des idées" et "la gestion de projet" devraient être mis en œuvre au moins comme un diagnostic. Pour les systèmes de "la gestion de la performance du corps pro-

fessoral", "la gestion de la recherche scientifique" et "la performance académique dans les disciplines", la mise en œuvre interactive est recommandée. Les systèmes de "budget" et du "système académique" ne produisent pas de rejet important s'il n'est pas présent et n'ajoutent pas de valeur si présents. Finalement, les performances académiques des systèmes dans le "test de simulation intégré des connaissances de gestion" et "le cours d'extension de performances" ajoutent de la valeur s'il est pratiqué, mais si leur mise en œuvre n'est pas possible, cela ne génère pas de rejet important.

Mots clés: Systèmes de contrôle, Contrôle interactif, Contrôle diagnostique, Gestion des cours.

1. Introduction

The business environment has undergone changes that provoke constant renewal within organizations' management models. Currently, higher education institutions are immersed in an environment close to the business world, with pressures stemming from government and market regulations, which have impacted institutional design.

In addition, universities face difficulties stemming from the expansion of higher education and intervention from governmental regulations. Moreover, higher education institutions are inserted in an increasingly competitive environment with high economic variation, requiring the use of management control systems aligned with strategic objectives, which determine action plans and organizational monitoring (Alperstedt, Martignano and Fiates, 2006).

Thus, the need to improve the competitive efficiency of Higher Education Institutions – HEI, requires them to incorporate the concepts and practices of business management into university management (Meyer and Meyer Junior, 2013). The success of HEIs is influenced by a number of factors (customers, suppliers, workers) that also make part of the organizational environment of companies in other sectors. Therefore, it is necessary to identify in which environment the HEI is inserted to align its strategies and management controls.

Specifically, the undergraduate degree on business administration has been impacted by governmental regulations, offer of higher education generating competition, demand for academics, and demand for quality teach-

ing, long-distance education, institutional assessment and constant monitoring by the Ministry of Education. To adjust to the pressures of the educational environment, HEIs and the coordination of undergraduate courses in management should use management systems of control as a strategic support mechanism (Dent, 1990; Simons, 1990; Bisbe and Malagueno, 2009; Chenhall, Kallunki and Silvola, 2011; Chenhall and Moers, 2015).

However, the use of information from management control systems may vary depending on the organizational model. According to Simons (1991) a management system of control may be used in an interactive and/or diagnostic mode varying according to the organizational context, structure and objectives (Simons, 1995; Bisbe and Malagueno, 2009; Chenhall *et al.*, 2011; Chenhall and Moers, 2015). Thus, for the proper management of an undergraduate course there must be coordination between strategic objectives and control systems used to monitor the effectiveness of actions.

Studies on the alignment of management strategies of an undergraduate course within a higher education institution are important. In the year 2010, the government demanded from HEIs the creation of the Structuring Faculty Core (SFC), a managerial body responsible for implementing strategic initiatives in undergraduate courses, which can be considered as a system of management control.

In view of the above, we need to approach the usage of management control systems in an interactive or diagnostic mode, foreseeing the managers' perception of an undergraduate course and that of the SFC's members as a differential to promote strategic initiatives in HEIs.

For this purpose, we formulated the following research question: what management systems of control can be used in an interactive or diagnostic mode in order to offer new strategic initiatives for an undergraduate degree in business administration? The study aims to verify which management control systems may be used in interactive and diagnostic form in an administration course at a higher education institution located in Santa Catarina, Brazil.

The study is justified by the need to align the practices of management control systems in contemporary environments. Given that the dimensions of management control systems change, further studies that depict emerging issues are needed. There is a pressing need for studies that adapt management systems of control to contemporary environments characterized by competition, quality in services, and interactivity with society and constant compliance with governmental regulations.

Chenhall (2003) comments on the need for research on organizations providing services, entities that have become increasingly important to the economy. In addition, there is no consistency in the studies that examined management control systems' practices in regard to financial measures, social controls, personnel controls, interaction mechanisms, administrative controls and interpersonal controls.

Fagundes, Soler, Lavarda and Lavarda (2011) point out the need for researching on the management of administration undergraduate courses, verifying factors of improvement in the results of the course's management and determining strategic initiatives. Langfield-Smith (1997) acknowledges the limitation on of management control systems' performance in strategic initiatives, thus providing a considerable opportunity for future research. For Alperstedt *et al.*, (2006) the management of a complex organization such as a university requires paying attention to several factors at times uncontrollable due to the numerous interactions that exist, hence requiring managerial control systems that can act in interactive and diagnostic mode on the improvement of strategic initiatives.

2. Theoretical framework

2.1. Strategic orientation and attention to management controls

The use of a management system is essential for strategic planning in the various organizational fields, including higher education institutions. In addition, the competitive environment has made it difficult to achieve

strategic objectives, so the adequate performance of management systems minimizes uncertainties and ensures the achievement of organizational goals (Brown and Eisenhardt, 1995; Anthony and Govindarajan, 2008).

Organizational performance is the result of combining its management model, strategies and structure (Langfield-Smith, 1997; Marginson, 2002; Gerdin and Greve, 2004). It is important to understand how managers draw on management systems for strategic purposes. For Naranjo-Gil and Hartmann (2007) implementing strategies is a consequence of the way in which control systems are used and how interactions between the various institutional bodies occur.

The correct use of management control systems can provide adequate information for organizational decision making and contribute to implementing strategies (Anthony and Govindarajan, 2008). The use of a Management Control System - MCS is essential in order to elaborate adequate plans that provides managers with information that leads to the achievement of the previously established objectives (Otley, 1994; Anthony and Govindarajan, 2008).

Several studies have highlighted the relevance of attributes regarding the use of management control systems in organizational creative support (Simons, 1995; Ahrens and Chapman, 2004; Bisbe and Malagueno, 2009). In this regard, Simons (1990, 1991, and 1995) argues that management control systems may be classified into three categories. Therefore, there are belief and frontier systems used to frame the strategic domain; and the feedback and measurement systems used to design and implement strategies. The usage style of the feedback and measurement system is separated by two approaches.

The first one, termed as the Diagnostic Control System, has been used to monitor and to achieve specific objectives through reviewing the performance of critical variables or key factors of success. The second approach, termed as the Interactive Control System, has been used to expand opportunities and to seek organizational learning (Simons, 1995; Bisbe and Malagueno, 2009; Chenhall *et al.*, 2011; Chenhall and Moers, 2015).

Thus, studies suggest that success adopting strategies requires a combination of autonomy, coordination, and decentralization of organizational members (Bouwens and Abernethy, 2000), and also a control system that allows and stimulates labor relations between different hierarchical levels (Abernethy and Lillis, 1995; Simons, 1995; Bisbe and Malagueno, 2009; Chenhall *et al.*, 2011; Chenhall and Moers, 2015).

Abernethy and Brownell (1999) comment that the interactive use of management systems is related to high rates of strategic change. The choice of individual control systems, selected for interactive use, is associated with the innovative management of a company, and with the need to implement products/services that are influenced by actual management systems (Bisbe and Malagueno, 2009).

The interest on interactive management systems of control is not surprising given its conceptual novelty regarding its role of encouraging innovative organizational behavior (Simons, 1995; Bisbe and Malagueno, 2009). Interactive systems are formal systems of information used by managers to gain personal involvement in the decisions of subordinates, as well as to discuss strategic uncertainties and to promote dialogue and debate (Bisbe and Malagueno, 2009). According to Chenhall and Moers (2015), the practices of interactive use of management systems need to be of simple understanding because they are used by different hierarchical levels.

On the other hand, Henri (2006) infers that a control system used in diagnostic form exercises negative pressure on strategic initiatives. The management's choice of using a system in an interactive rather than in a diagnostic mode represents an element of strategic choice (Child, 1972). Particularly, the diagnostic use of monitoring practices on organizational results is quite useful and efficient to correct deviations from previously established standards (Chenhall and Moers, 2015).

Chenhall *et al.*, (2011) emphasize that the diagnostic usage of controls are associated with organizations of greater propensity to learning, which is undoubtedly also consistent with the perspective of innovation. How-

ever, the authors did not find support to back the association between innovation and the interaction of an innovative culture in the formal managerial control.

Thus, the use of some management control systems in interactive and others in diagnostic mode causes managers to signal the focus of attention and learning, generating action plans and strategic initiatives (Simons, 1991). Diagnostic use guides management in the implementation of past and present strategies. They are designed to point out flaws and errors regarding the development of action plans. Thus, there must be interaction between the management control systems used in an interactive and diagnostic manner, contributing to the development of innovation initiatives that are transformative for achieving success and better performance (Simons, 1995; Bisbe and Malagueno, 2009).

However, in order to succeed and take advantage of strategic opportunities by implementing management control systems in an interactive mode, constant engagement of organizational members (managers) is required (Simons, 1991). In addition, managers, based on a strategic sense, are responsible for deciding which organizational processes should be formalized and implemented interactively and diagnostically. However, the replacement of those in charge of management can generate new strategic visions for the organization, and systems that were previously interactive might be used in a diagnostic way and vice versa.

Interactive systems of control are used to guide the informal strategic process, forcing the involvement of staff in organizational issues. It has been used to promote interchange between top management and other hierarchical levels, and as a mechanism of interaction and permanent dialogue between the members of the organization (Abernethy & Brownell, 1999; Simons, 1990).

Interactive systems of control are measurement systems used to draw attention to information that is constantly changing, and to those considered important for the strategic objectives. In contrast to diagnostic control, what characterizes interactive controls is the managers' level of involvement. Thus, managers need to pay due frequent attention

and be personally involved in the interactive systems of control.

In addition, interactive control systems signal the need for all members of the organization to pay constant attention to organizational processes. Through interactive systems of control managers communicate with the entire organization, taking into account strategic uncertainties (Bisbe and Otley, 2004).

Chenhall and Moers (2015) examined how the design and use of formal management control systems, which incorporated traditional practices, have evolved to support critical innovation for organizational survival. The authors found that more complex systems are implemented in interactive processes between the different hierarchical levels, allowing employees to deal directly with contingencies in their work. In addition, although formal controls provide specific practices that define the parameters for innovation and efficiency, the interactive and diagnostic controls suggest different ways to use the practices of managerial systems of control.

The study by Fagundes *et al.*, (2011) addressed aspects of the managerial structure of the administration course at a private non-profit college from the standpoint of contingency theory. They conducted a case study with in-depth interviews to the course manager. They used the contingent environment variable and the factors of measurement of such variable: division of labor, specialization, standardization, decision-making, centralization and environment. They concluded that there are no formal indicators, but rather the intention to implement a system of indicators. In addition they only identified operating systems for the secretariat and treasury, and verified the non-existence of a system of managerial information with other systems of information.

In general, the system for project management is used to monitor different blocks of activities. The budgeting system encompasses annual profit plans and budgets to underpin operational strategies and long-term financial plans. The revenue budget details the subset of information contained in the budget plans, which focused exclusively on brand revenue. The intelligence system gathers in-

formation on the social, political and technical environments of the business. Finally, the human development system includes long-range strategic goals for human resources, career management, advice and planning for succession (Simons, 1991).

2.2. Management of higher education

The factor that determined the changing of the institutional context of Brazilian higher education was the policy of higher education expansion, which in recent years became deliberate. Oftentimes, the same service has been offered in the same geographical space creating competition, low prices, as well as infrastructure, market strategies and differentiated teaching methodologies (Alperstedt *et al.*, 2006). In the private sector of higher education several efforts and initiatives are identified, especially for the greater efficiency of these organizations (Meyer and Meyer Junior, 2013).

The service provided by higher education institutions is essentially intellectual and, therefore, its results are intangible, so the control and measuring of organizational performance ends up being challenging for university managers (Meyer and Meyer Junior, 2013).

Internally, many institutions face dependency on tuition fees, poor faculty qualifications, school dropouts, incipient research, and high concentration of night courses, overcrowded classrooms, and proliferation of low operational costs courses. Particularly in the case of community colleges, the arguments are apparently common to other organizations, and bear particular importance in view of their relationships with the State and Society.

In envisioning this perception in a community college, which is the context of this study, Dal Magro, Utzig, Lavarda (2014), Beuren and Teixeira (2014) indicate that a managerial control system provides the basis for decisions at the strategic and operational levels within the organizational environment of a Teaching Institution. Strategic planning is elaborated comprehensively, but the manager of each course is responsible for establishing their own goals and objectives based

on managerial instruments. They conclude that the planning is elaborated in an interactive and participative way with the involvement and engagement of different sectors of the university.

Mintzberg, (2007) cautioned that strategic planning would not be an adequate mechanism for the academic context due to the special characteristics and complexity of such sector. However, in the absence of its own techniques, institutions are using adaptations and experimentations of business models. In defense of the use of business models for the management of higher education institutions, Henri (2006) comments that the management control system applied in higher education institutions must involve all stakeholders, and its adequacy requires collaboration between IT staff, faculty, students, and society among other actors involved. The adoption of flexible forms by the management originated a complexity in which multiple competences and functions coexist with the collaboration of a number of collegiate bodies of the educational institution (Alperstedt *et al.*, 2006).

In this connection, the National Commission for the Evaluation of Higher Education (CONAES, 2010), by means of Resolution 01 of June 17, 2010, created the Structuring Faculty Core - SFC consisting of a group of professors with the academic assignments of monitoring the process of conception, consolidation and continuous updating of the course's pedagogical project with the view of assisting the management and strategies of undergraduate courses of higher education institutions.

3. Research methodology

Regarding the purpose of this investigation, the research design is characterized as descriptive. As for the means of investigation, documentary research and field research, with a qualitative and quantitative method for data analysis are employed. The unit of study is a business administration course of a higher education institution located in Santa Catarina, Brazil.

We carried out the data collection in three stages. The first one with the manager of the administration course by means of an indi-

vidual in-depth interview in the month of September 2014. We conducted the interview by a semi-structured script to check mainly the course's strategies to remain attractive to the admission of academics and their insertion in the labor market. We verified which of the main systems of control are relevant in the manager's perception to support the operationalization of the course's strategies.

The second stage was executed through documentary research in the Pedagogical Project of the Course (PPC) to verify the strategy and what information systems are capable of giving support to the administration course's management. Therefore, we relate and validate the statement of the manager of the administration course in the selection of the main systems of managerial controls and strategies previously established.

Finally, in the third stage of the data collection we carried out a quantitative research on the Structuring Faculty Core of the Course - SFC being studied. Therefore, we ratify that the systems of control listed by the course's management must be interactive or diagnostic. According to Simons (1991), management control systems can be interactive or diagnostic, and in the configuration of the systems it is justified that the opinion of the SFC be verified. In university institutions, implementing the changes is conditioned to the legitimacy on the part of its audience, increasing their institutional character, since managers depend on the acceptance of their actions to guarantee the continuity of management (Alperstedt, *et al.*, 2006).

According to the Pedagogical Policy Project of the Course - PPC, the "Structuring Faculty Core - SFC of the Administration Course has the role of continuously advising the process of updating, execution and appraisal of the Course's Pedagogical Project proposing actions to improve the quality of teaching, being an interactive feature with the course's management.

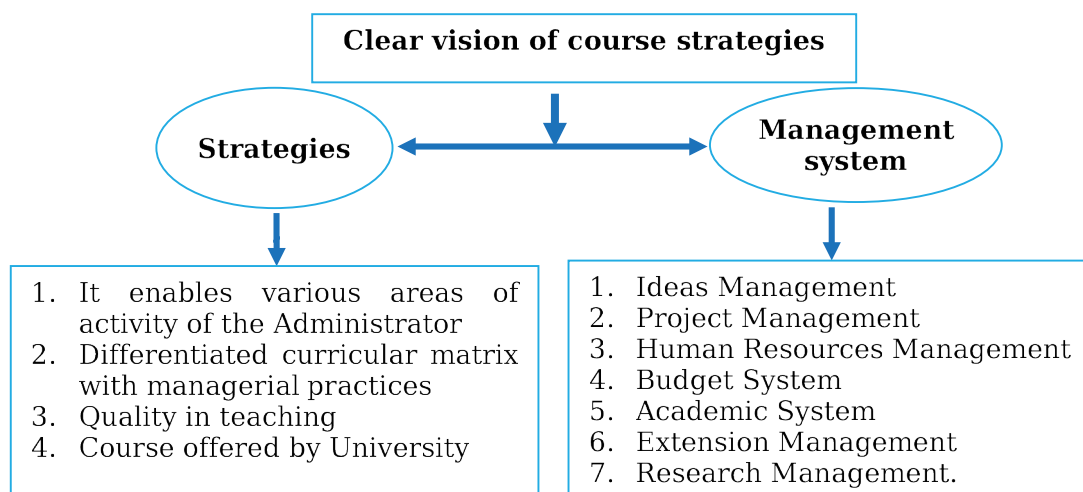
In order for each member of the SFC to assess the hypothetical situations of the respective information systems with quality, without there being differences in the definition of interactive or diagnostic systems, we presented the concepts by Simons (1994): the

interactive information system occurs when organizational behaviors are constantly addressed by the highest levels of management; it requires frequent and regular attention; they are discussed in meetings between superiors and subordinates; there is a continuous challenge, debate and action plans. The diagnostic information system, in turn, occurs in cases in which there are behaviors that deviate from normality, i.e., managers only receive the information for follow-up.

Then they were led to reflect on and record the utility of each system spontaneously by means of an open question. We applied quantitative research, obtaining the evaluation from all six "6" components of the SFC on the Administration course.

In order to verify whether the systems should be interactive or diagnostic, we conducted a quantitative research according to Tontini and Silveira (2007), who use the model approach by Kano (Kano, *et al.*, 1984), verifying what the expected performance is in case of the system being interactive, diagnostic or whether the information system is not shared with the SFC.

The Kano model provides a perspective of nonlinearity appraisal between the attribute's performance and the respondents' perceived performance, classifying attributes as basic, performance, excitement, neutral and reverse with the attribute in this study being defined as management control systems. Interactive or diagnostic systems of control can be classified as basic. If they are not present or are insufficient, it generates rejection from the members of the SFC. However, its presence is not acknowledged as relevant. As for the systems' of performance, the better the performance, the greater the perception of contribution to the course; and the lower the performance, the greater the perception of value disaggregation towards the course. Excitement systems, when they are underperforming or not available, do not disaggregate value to the course in the SFC's opinion, but their presence positively influences the user's perception of the service. There may also be neutral management control systems that are not perceived by users; and the reverse ones, which if present, can disaggregate value to the course from the standpoint of the SFC.

Figure 1. Course management's overview on their market positioning

Source: Author own elaboration.

4. Analysis of results

4.1. Undergraduate course guidelines according to the PPC and the course management

The PPC - Pedagogical Policy Project of the Course establishes that the managerial orientations that direct the university's activities are bound to the guidelines of the Institutional Development Plan, especially in terms its contribution to institutional planning. Thus, the administration course's manager's role and the SFC team members' must be aligned with the institutional assumptions, guiding the professional forming of those enrolled and the consolidating of the Pedagogical Project of the Administration Course with the institutional one. These interactions were the impetus to seek to identify the perception of the course's manager and the team members of the SFC on the aspects related to the management system and its relationship with institutional strategies.

Regarding the definition of organizational plans, the course's manager mentions that "at course level, the Institutional Pedagogical Plan - PPC and at institutional level the Institutional Development Plan is used - IDP. Thus, for the development of the PPC, the IDP is necessary as a basis, as a guideline". With regard to the action plans we can infer that "We created action plans based on the de-

mands of academics. Thus, the action plans are put into practice within the needs of the faculty and students of the course. However, these needs are not always applicable, since the course is guided by a larger project. The possibilities are filtered and turned into actions by the SFC itself and course management". The exposed by the course's manager is confirmed by the Pedagogical Policy Project of the Course - PPC and by the guidelines that emanate from its Institutional Development Plan - IDP, considering the intentions of the Pedagogical Project of the Course - PPC. In addition, the PPC establishes that the administration course seeks to translate the IDP into the perspectives of actions applied in the Didactic-Pedagogical Organization, quality in teaching, and physical structure constituted for the course offering.

According to the manager's statement one can infer Figure 1 according to the strategies of the course.

The course has a clear strategy. Firstly because it is part of an institution that conforms to the IDP and PPC "the vision of the University is to be recognized as a Community University of excellence in professional training and citizen ethics, in the production of scientific and technological knowledge with socio-environmental commitment". Secondly because the course's manager defines that the current strategy "is based on the discussion with SFC members and the fac-

ulty, who bring a perception of the current requirements of the market for the insertion of the Professional graduates in administration by the Institution". In addition, the Institution has macro strategies with a prism for the market. "The HEI is conducting the strategic planning for the next 10 years listening to the region's faculty, academics, community and entrepreneurs. Based on the data collected, decisions are taken to meet the demands of the market".

After presenting the facts that refer to the broad strategic vision of the course and the institution itself, we demonstrate the aspects related to the market in which the course is inserted according to the vision of the manager of the undergraduate administration course; it being characterized as competitive, since "there is a strong competition between higher education institutions, including those that offer undergraduate courses on administration".

Simons (1991) proposes that the competitiveness of organizations depends on the interaction between the adoption of management systems and clearly defining strategies. Thus, it is possible to infer that the coordination of the undergraduate administration course has clear strategies and adopts management systems that seek to help achieve the core objectives. The vision proposed by this study expands the findings by Simons (1991) inherent to the management of an undergraduate course in a context related to competitiveness, strategy and management controls applicable to the HEI. And it complements Beuren and Teixeira (2014) who verified the need for better alignment between strategy, performance and control of higher education institutions.

The strategies that make the course more competitive (figure 1) as defined by the manager are: the first one is that the administration course "enables the professional to work in the various areas of administration, being prepared to act directly in the labor market through a curricular matrix aligned with managerial practices".

Quality in teaching is also a strategy adopted by the undergraduate course in which "the student chooses the course for its vision of quality and preparation for the job market, according to the disciplines offered in the

curricular matrix". An important strategy of competitiveness is that "the HEI's undergraduate course in business administration is legitimized by society for being offered at a university".

Lastly, the duration of the course is equal to that established by the market and in accordance with curricular guidelines, where an eventual increase in the duration of the undergraduate course might collaborate with increasing of academics fleeing to other institutions. One of the weaknesses of the course is the fact that "all competitors have lower prices, with other aspects needed to remain competitive in addition to scholarships offered to underprivileged academics".

Next, we established the main systems of control listed by the course's management and confirmed by the pedagogical project - PPC (Table 1).

Table 1. Main control systems listed by course management

Items	Management control systems
S1	Generation of ideas
S2	Execution of activities follow up (project management)
S3	Professor performance
S4	Budget
S5	Academics' performance in the mock SICAD tests
S6	Academics' performance in disciplines
S7	Academic system
S8	Extension
S9	Scientific research

Source: Author's own elaboration.

In order to evaluate each system, we contrasted the manager's vision with the pedagogical plan of the course and its theoretical basis (Table 2).

In view of the results obtained from the literature on management control systems, it is possible to observe that they are not approached comprehensively and specifically; some systems being widely used by higher education institutions. The result corroborates those of Meyer and Meyer Junior (2013), in which the authors' approach to manage-

Table 2. PPC Information Systems versus Controlling Systems

Information systems	Course Manager Overview	Pedagogical Plan of the Course- PPC	Theoretical Basis
Idea management	"For the elaboration of the strategic planning we listen to the faculty, academics, community and entrepreneurs of the region".	"The SFC [...] still accepts the contribution from invited members, which is described in a separate regulation, and from teachers who are members of the Board of Administration". "The SFC analyzes the strengths and weaknesses presented in the course's evaluation by the students and the faculty, and inserts new proposals for improvements in order to improve the actions".	Simons (1991) "the intelligence system gathers information on the social, political and technical environments of the business".
Project management	"The plan of action is developed within the needs, it is put into practice depending on the demands of the faculty and students. Needs are filtered and converted into actions by the SFC and the course management".	"The Structuring Faculty Core (SFC) of the Administration Course has the role of advising, in a continuous manner, the process of updating, executing and evaluating the Pedagogical Project of the Course, proposing actions to improve the quality of teaching".	Simons (1991) "the project management system is used to monitor the distinct blocks of activities".
Faculty performance management	"The students evaluate the institution by the criteria of teaching quality, helpfulness of the teacher in the classroom, content taught, the lecture's knowledge, among others. Semiannual meetings are held with class representatives to discuss the performance of lectures"	"Permanent analysis of the Institutional Evaluation is carried out each semester [...] The SFC analyzes the strengths and weaknesses presented in the course evaluation by the students and the faculty, and inserts new proposals for improvements".	"The human development system included long term strategic goals for human resources (Simons, 1991).
Budget System	"We have received a budget worksheet ready from the HEI to perform expense control with office supplies, technical travel, teacher participation in events, book acquisition".	"The Budgeting system is used to rationalize the use of resources".	Simons (1991) "The budget system encompassed annual profit plans and budgets to underpin operational strategies and long-term financial plans".
Academics' Performance	"In the Integrated Mock Trial of Management Knowledge - SICAD, conducted through an interdisciplinary semester test with all students of the course, may be observed whether students are learning and what is being taught in the classroom". In the disciplines: "one can use journaling notes to observe performance".	"Performing the SICAD (Integrated Mock Tests of Management Knowledge) for all the academics contemplating all the disciplines contained in the National Student Performance Test - ENADE". "The most used ICTs by teachers in the teaching and learning process are [...] (among them) the Online Academic System".	Weißberger and Angelkort (2011), Chenhall (2003), Ittner and Larcker (2001) and Simons (1991) "systems should not be based solely on financial objectives, but should cover non-financial aspects".
Academic System	"How many students are enrolled? How many students from one semester to another did not enroll because..."	"Summoning of the academics to make use of disciplines, complementary activities and updating of the data in the university's online academic system".	Chenhall (2003) "the systems must include non-financial information related to the clients, in this case, the academics".
Course Extension Performance	"The goal is by Academic Unit and this goal is dispersed in the various courses".	"To encourage teaching, research and extension processes, in compliance with the institutional policies of the University's IDP".	Davila (2000) and Chenhall (2003) "control systems should include information on personal and social controls with a wide range of decision support mechanisms".
Scientific research performance of the course	"The extension is managed by academic unit and goals are not controlled by each course".		

Source: Author's own elaboration.

ment control systems of business origin do not specifically cover all systems for managing a course. Business approaches will give only generic and non-specific information on methods for university management. Thus, the results of this study will bring a more specific view on the business methodology that may be adapted to university systems that aim to improve the management of a degree's course.

The next step of the research is to outline the management control systems used to determine the achievement of strategic institutional objectives. The undergraduate degree in business administration uses the idea of a management system *"for the elaboration of the strategic planning for faculty, academics, community and entrepreneurs of the region where they are heard"*. The ideas are used to update the curriculum of the course due to the existing gaps. *"The PPC - Pedagogical Plan of the Course was created based on academics' demands"*. The importance of the idea of a management system is also addressed by the PPC, where in the field of the course's management there is *"democracy, participation, transparency and decentralization"*. In addition, *"the contributions of several parties are accepted, in view of the technical, methodological and operational development of the undergraduate course in administration"*.

The project management system is determined by the *"action plan that occurs within the needs, and put into practice depending on the demands of the faculty and students of the course. In addition, their needs are filtered and converted into actions by the SFC and the course's management"*. According to the PPC *"the project management system is used to propose actions to improve all the aspects of teaching, and the field of the university's management of the course; it aims at ensuring quality, consistency and efficiency in the processes and actions for making institutional decisions"*.

The professor performance management system is used as follows: *"the students make the institutional assessment by the criteria of teaching quality, helpfulness of the teacher in the classroom, the content taught, professor's knowledge, among others. In addition, semiannual meetings are held with class rep-*

resentatives to discuss the performance of professors". Corroborating with the Course Manager, the PPC comments about *"the use of institutional assessment with the proposal to strengthen professor training in the aspect related to teaching methodology, strengthened activities that show the relationship between theory and practice, and to strengthen the use of different forms of evaluation of learning"*. In addition, the human resources management system aims at enhancing and empowering professionals, fairness, equity, harmony and discipline in work relations.

Regarding the budgeting system, the coordinator commented that *"few things are managed by the course, we received a budget booklet ready from the HEI to execute expense control on office supplies, technical travel, professor participation in events, book acquisition"*. In addition, the course manager receives a spreadsheet for the following year's budget forecast based on the previous year's worksheet. Once elaborated, it is sent to the financial brand of the institution for evaluation. The release of the budgeted resources is made in proportion to the course's revenue, number of scholarships and administrative hours of professionals working in the course. Likewise, PPC points out that the budgeting system is used to rationalize the use of resources.

For the academic system, the course has qualitative information about students who are gaining prominence in the market. SICAD grades and class journals are also used for academic evaluation. In addition, some important indicators were highlighted by the course's manager: *"the number of students enrolled, students who did not renew their enrollment from one semester to the next, students with medical certificates and maternity leave"*. In the PPC it is defined that *"the academic system is used to provide improvements in the course, with the National Student Performance Examination - ENADE and the observations of the academics considered as the diagnosis"*. In addition, it aims at the quality of teaching, proposing modifications to the curricular matrix of the course, arrangements regarding the course's evaluations' results and the measures to solve the problems singled out, setting standards of guidance, coordination and execution of

Table 3. Functional and dysfunctional questions for information systems

How do you feel as a member of the SFC if the information system?		<i>I do not like it and do not accept it</i>	<i>I do not like it, but it is acceptable</i>	<i>It partially meets expectations</i>	<i>It meets expectations</i>	<i>A little more than the expectations</i>	<i>It far exceeds expectations</i>
Functional question	Idea Generation is Interactive	1	2	3	4	5	6
Functional question	Idea Generation is diagnostic	1	2	3	4	5	6
Dysfunctional question	Idea Generation is not available to the SFC	1	2	3	4	5	6

Source: Author's own elaboration.

teaching, which should ensure implementing of activities related to topics that are part of the course.

The extension management system is carried out by academic unit and the goals are not controlled by each course. Finally, on the management of research, the manager states that the *“goal is per academic unit, being dispersed throughout the various courses”*. In addition, the rate of scientific publication of professors is collected by the curriculum Lattes. Both extension and research management systems are relevant because they are highlighted in the PPC *“in a constant search for the inseparability between teaching, research and extension”*. Thus, the extension management system and research system aim to encourage the process in compliance with institutional policies. The activities in the scope of research and extension are oriented to actions of excellence in citizen integral formation, pedagogical methods and conceptions flexibility, balance in the academic dimensions and insertion of the course in the community.

In view of the above, the management systems used to coordinate the administration course's activities and actions of the institution under study are based on the inferences of the Business Administration Course Manager and the Institutional Pedagogical Plan

- PPC of the course disclosed on the institution's website.

4.2. Information system configurations according to the SFC by means of the Kano Model

For each information system we generated hypothetical situations of existence and non-existence, according to Tontini and Silveira (2007), to verify the level of satisfaction expected with the presence of the respective systems and the expected dissatisfaction. We used a Likert scale according to Table 3.

We can observe that each member of the SFC responded three times (interactive, diagnostic, and not available to the SFC) to questions related to each managerial system of control. Table 3 shows an example of how we applied the questionnaire related to the system of idea generation. It should be noted that in the same way that the questionnaire is applied to this system, it is applied to the other systems (Project management, professor performance, budget, academics' performance in the mock SICAD tests, and academics performance in the disciplines, academic system, extension and scientific research). The responses were then recoded and the functional questions were as given in equation 1.

Table 4. Expected Performance by the SFC for the Information Systems

CÓD	Systems	FQ	FQ	DQ
		Interactive	Diagnostic	Not available
S1	Idea Generation	0.67	0.17	-0.50
S2	Project management	0.33	0.33	-0.33
S3	Faculty performance management	0.50	-0.17	-0.50
S4	Budget System	-0.17	-1.00	0.67
S5	Academics' performance in the mock SICAD tests	0.50	-0.50	0.33
S6	Academics' performance in disciplines	-0.17	-1.33	-0.83
S7	Academic system (enrollment admission/drop-out)	0.00	-0.33	0.17
S8	Course Extension Performance	0.33	-0.50	0.83
S9	Scientific research performance of the course	1.50	-0.33	-0.17

Source: Author's own elaboration.

$FQ_k = FQ_k - 4$ for $k = 1$ to K where K is the number of attributes (Equation 1)

Number 4 on the Likert scale means "it meets expectations". Systems with positive performance exceed expectations and systems with negative performance do not meet the expectations of the SFC. As for the responses of the dysfunctional question, they were recoded according to equation 2.

$DQ_k = DQ_k - 2$ for $k = 1$ to K where K is the number of attributes (Equation 2)

Number 2 means "I do not like it but it is acceptable" on the Likert scale. The systems with negative performance are relevant regarding their absence, since on average it has a non-acceptance performance by the SFC. The responses recoded are set out in Table 4. The indexes represent the values of the functional question of whether the system is interactive (FQ - interactive), diagnostic (DQ - diagnostic) or if the system is not available to the SFC (DQ - not available).

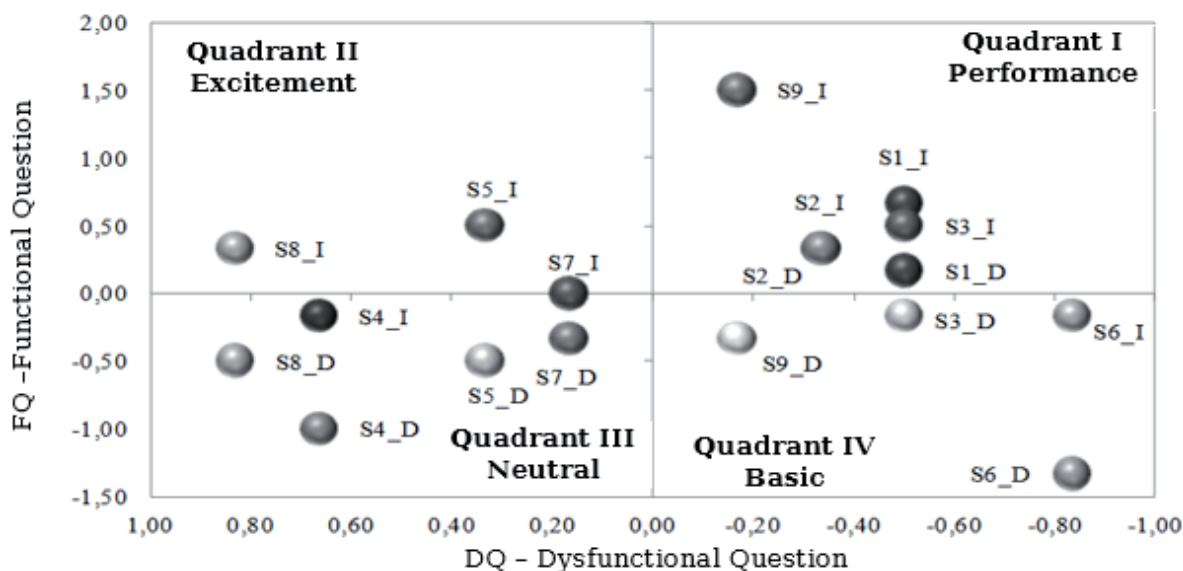
To visualize the results we plotted them in Figure 2. The x-axis is relative to dysfunctionality, not being made available to the SFC, and in the y-axis we plotted the values for functionality of the information systems as interactive and diagnostic respectively.

According to their location on the chart, we classified the information systems in table 5.

The information systems were divided into five groups with the same classification according to the model proposed by Tontini and Silveira (2007). The first group consists of systems classified as performance as well as interactive and diagnostic systems. System S1 - "idea generation" and S2 - "project management" in case they're not being shared with the SFC generate significant rejection. However, since they are performance as much as interactive or diagnostic, as a result of the limitation of the course and SFC resources, they must be implanted at least as a diagnostic.

According to a SFC member's testimony regarding the Ideas Management System "the structuring faculty core - SFC, through its members is knowledgeable and capable of accompanying the system of idea generating". The idea management system has the purpose of "tracking the generation of ideas [...] of proposing improvements for the course". As for those involved in the process of generating ideas, with the "involvement of professors and students in the process [...] everyone can feel part of the course's growth". As for the process of filtering "ideas should focus especially on those that add value to the teaching-learning process for the academics to perform well in the labor market. Caution should be taken with ideas or activities capable of dispersing the teaching and learning process, then an important step is to filter out the ideas and turn them into actions".

Figure 2. Classification of information systems



Source: Author own elaboration.

Table 5. Classification of information systems

CÓD	Systems	GR	Interactive Classification	Diagnostic Classification
S1	Idea Generation	1	O	O
S2	Project management		O	O
S3	Faculty performance management	2	O	M
S9	Scientific research performance of the course		O	M
S6	Academics' performance in disciplines	3	M	M
S4	Budget	4	N	N
S7	Academic system (enrollment admission/drop-out)		N	N
S5	Academics' performance in the mock SICAD tests	5	A	N
S8	Course Extension Performance		A	N

Source: Author's own elaboration.

It is through the project management system that ideas become reality. "After the process of filtering "the SFC should keep track of the project management system" in order to "keep track of action plans' performance to assess the [...] planned and that it was actually implemented". "To the extent that the SFC realizes that some actions have not been implemented, it may review the planning and/or take measures to achieve the expected re-

sults". The monitoring of the "execution must occur with respect to the execution time, budget (of human and financial resources) and the activity's quality". Regarding the priorities of actions we should "pay attention to dispersion and prioritization of the execution of activities, because it is not uncommon to control various activities without focus and without feasibility of execution".

The second group is made up of systems classified as one-dimensional if interactive and mandatory as diagnostic. The system S3 - "professors Performance" and S9 - "scientific research performance" if not shared with the SFC does not generate significant rejection. We recommend it be implemented as interactive, because it does not meet the expectations of the SFC as a diagnosis.

The Management System for Faculty Performance primarily serves *"to analyze the quality of teaching"*. *"Through its members, the SFC should follow the professors' performance system" "to verify whether the indicator of professor performance is within the predicted by the course"*. *"Insofar as the SFC knows the faculty performance in the classroom, it may suggest to the course's manager actions to improve performance"*.

Assisting the course manager in making decisions and designating professors to research lines within their respective disciplines aims at optimizing the teaching process". Note that the management of the course's performance was cited when the course coordination should take the lead in talking to professors whose performance is unsatisfactory. Henceforth, *"the SFC should propose suggestions to contribute to the evolution of problematic professors"*. *"However, caution should be taken on the current assessment system because it does not measure the professor's competence, given that very few students actually respond to the assessment. Another factor is that these few students who respond may still be those who do not like the actual professor and/or the subject of the discipline"*.

And the scientific research of the course is relevant *"because it can stimulate professors and students to participate in groups" of research "or to create new groups that support the university's mission [...] whose mission is to educate through teaching, research and extension [...] and be acknowledged as a university [...] of excellence in professional training and citizen ethics, in the production of scientific and technological knowledge with socio-environmental commitment"*. *"Furthermore, the SFC should stimulate and strengthen the development of research at the various levels of its scope as a strategic means to guarantee its consolidation as a university"*. *"Supporting of scientific research should set example for*

other professors and assist to coordinate the developing of the minimum conditions necessary to achieve scientific research objectives, so that it can even help in the qualification of professors and students". It is of great relevance because *"the following-up of the SFC in the scientific research developed by the course portrays or enables to reflect on the subject researched"*. *The SFC has the function of knowing whether scientific research bears a connection to the disciplines taught in the course in order to stimulate the participation of professors and students in academic production, which begins with the monograph, and then goes on to writing of articles"*.

The system S6 - "academics' performance in their disciplines" is the only one in the group classified mandatorily as interactive and diagnostic. As absence generates significant rejection, we recommend it be implemented as interactive because it presents a performance level superior to the diagnostic *"so that the SFC has a systemic view of the course and identifies strengths and weaknesses, facilitating it when group actions to propose improvements, should take place"*. *"Insofar as the SFC knows the academics' performance in their disciplines" it may check when there is "disparity between what is being achieved in the disciplines, and the SICAD can verify that something needs to be reviewed and improved"*. *"The performance of the academics provides an analysis of how activities developed in the classroom are by the different professors"*. However, we need to observe the academic performance system where it is necessary to *"keep track of the effectiveness of the assessment system" to verify that "it reflects the student's learning. Firstly, it is necessary to accompany the evaluation criteria and methodologies practiced by different professors"*.

The fourth group is constituted by systems classified as neutral, and may be ignored in the SFC's discussions. The systems S4 - "Budget" and S7 - "academic system" do not generate significant rejection if they are not present and do not add value if present.

As for the budgeting system, it is *"to better organize and plan the activities for the course"*, *"optimizing scarce resources in the pursuit of the course's objectives"*; and the academic system, *"whose purpose is to fol-*

low-up causes and indexes of school entrance and evasion so that actions may be taken when manageable statistical trends are detected”.

Finally, the fifth group of systems made up of those classified as excitement as interactive, and neutral as diagnostic. It does not generate significant rejection if not discussed in meetings with the SFC, however the systems S5 - “performance of academics in the mock SICAD test”, S8 - “course extension performance” if implemented as “interactive”, they add value in the opinion of the SFC.

Regarding the system of academics’ performance in the mock SICAD tests, the SFC *“must follow the academics’ performance on the mock SICAD tests” “because to the extent that the performance falls short of the expectations of the course and the MEC (Ministry of Education), one can create strategies of improvement and leveling of students for this purpose”.* The academic performance system of the mock SICAD test *“has the purpose of appraising students’ performance in regards to the programmatic contents provided by the curricular guidelines of undergraduate courses, the development of the skills and abilities needed to deepen general and professional training, and the students’ level of updating with respect to the Brazilian and worldwide reality, integrating the SINAES together with the institutional assessment and the assessment of undergraduate courses”.* With these parameters, it is easier for the SFC to plan improvements for the course by identifying its strengths and weaknesses. *“To the extent that performance is below the course and MEC’s expectations, strategies may be created to improve and level students for this purpose”.* In the opinion of a member of the SFC, one must *“verify whether the teaching-learning process is being effective in the direction of developing the skills and competences of academics as provided by course planning (PPC)”.* *“In this regard, it is incumbent for the SFC to define the best practices of approach to contents, as well as its updating and synchronizing with the demands of the ENAD”.*

As for the extension of the course, according to a member of the SFC, one must *“take the lead of the extension so that it is consistent with the course. Extension is a practice of approaching the course with the market. When the SFC does not approach and interact, there*

is no way for other professors to adhere to the practice” to “encourage the practicing of academic activities in interaction with society”. Given the importance of extension, the HEI *“imposes certain actions that must be developed by the courses. The tripod that sustains higher education institutions is constituted, in an indissoluble way, by teaching, research and extension”.*

5. Conclusions and recommendations

The objective of this paper is to verify which managerial systems of control can be used in an interactive and diagnostic mode in an administration course from a higher education institution located in Santa Catarina, Brazil. We carried out the data collection in three stages. The first stage was an in-depth individual interview with the course’s manager. And then, their testimony was related to what appears in the pedagogical plan of the course under study. After defining the main management control systems that might help the course to achieve its objectives, we conducted a quantitative research with the technique adapted from the Kano model according to Tontini and Silveira (2007) with the Structuring Faculty Core - SFC of the course to define the configuration of the systems, either interactive or diagnostic.

As for the management control systems defined in the first stages of the research, the S1 - Idea Generation aims to manage the ideas and events originated from the academic community, primarily by faculty, students, employees and society. The S2 - Project management, function is to manage the execution mainly related to the tripod time, cost and financial and human resources. The S3 - Faculty performance management has the objective of increasing the quality of teaching, the core priority of the educational institution. S4 - Budgeting system, optimizes the financial resources available. S5- Academics’ performance in the mock SICAD tests and S6 - Academics’ performance in their disciplines, aims to help the teaching-learning process with a vision of the professional success of the academic, and improving the quality of the environment in function of their abilities and competences, and, in this way, it contributes to the legitimacy of the educational institution as an educational training entity. S7

- academic system, manages the flow of inputs and outputs among other academic indicators in the course. Finally, the S8 - Performance of course extension and S9 - Course's scientific research performance, manages the actions of research and extension.

As for the classification according to the model adapted from Kano (Tontini Silvera, 2007), the first group of systems were classified as performance as well as interactive and diagnostic. The systems S1 - "idea generation" and S2 - "project management" generate significant rejection if they are not shared with the SFC. However, as they are performance as much as interactive or diagnostic in function of the course's limitation and SFC resources, they must be implemented at least as a diagnostic.

The second group of systems were classified as performance if it is interactive and basic as diagnostic. The S3 - "faculty performance" and S9 - "scientific research performance" if they are not shared with the SFC they do not generate significant rejection. We recommend for it to be implemented as interactive, because as diagnostic they do not meet the expectations of the SFC. The systems S6 - "academics' performance in the disciplines" is the only one of the group classified as basic, which is interactive and diagnostic. As absence generates significant rejection, we recommend to implement it as interactive because it presents a performance level superior to the diagnostic.

The systems S4 - "Budget" and S7 - "academic system" do not generate significant rejection if not present and they do not add value if present. And the fifth group of systems was classified excitement as interactive and neutral as diagnostic. They do not generate significant rejection if not addressed in meetings with the SFC, however the systems S5 - "academics' performance in the mock SICAD test" S8 - "performance of the course extension" if they are implemented as "interactive" they add value in the opinion of the SFC.

The results indicate that Simmons's concept (1991, 1995 and 2000) applied to business environments, can be replicated in an educational institution with the perspective of aiding course managers as business management units with their financial and non-fi-

nancial indicators goals; to act and react to the pressures of an environment typical to this type of organization. The results corroborate Beuren and Teixeira (2014) when verifying the structure and functioning of management control systems in the opinion of managers responsible for strategic actions in a teaching institution.

The results contradict the evidence by Mintzberg (2007), Meyer and Meyer Junior (2013) on the non-utility of the strategic dimension and business models, such as that of Simons (1991) used and adaptable to the scope of higher education institutions. In addition, the Kano model applied according to Tontini and Silveira (2007) appeared useful in configuring managerial systems of control, whether interactive or diagnostic in the view of the advisory council - SFC, since this Educational Institution's premise is the fair behavior in discussions and decisions regarding the orientation of the institution under study's course.

We conclude that efficiency in the use of the management control systems of a HEI for undergraduate courses should be based on the dynamic and differentiated performance of interactive and diagnostic systems. Therefore, formal management systems should be applied partially for interactive use and others for diagnostic use, and there must be constant adaptation according to the premise of organizational managers and suggestions of the SFC members. These arguments corroborate the assertions by Simons, (1995), Bisbe and Malagueno (2009), Chenhall *et al.*, (2011) and Chenhall and Moers (2015).

As a limitation of the study, it is possible that the configuration decisions of management systems are volatile, according to the institutional moment, strategic alignment in the institution and composition of the group of people in the management of the course, or even different discernment after scripted use of management control systems, because according to Simons (1991), Abernethy and Brownell (1999), organizations tend to define certain control systems as interactive based on the focus of attention in organizational learning and for the generation of new strategic initiatives. Another limitation that provides for future research is the design of the systems regarding the definition

of financial indicators for each non-financial management control system, as well as their respective performance standards, the rate at which they are updated, their automation and integration degree in the platform of information technology in the academic platform of the institution.

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Dal Magro, C. B., Picolo, J.D., & Lavarda, C. E. F. (2017). The use of interactive and diagnostic control systems in the management of an undergraduate course. *Cuadernos de Administración*, 33(57), 77-95. DOI: 10.25100/cdea.v33i57.4536

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