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■ *Research Paper*

Soft Systems Methodology and Interdisciplinarity in Management Education

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One negative point of management education is the lack of integration between the disciplines that restrains a systemic view. Moreover, there is not much research about an interdisciplinary approach to management. This paper applies soft systems methodology to develop a scale of interdisciplinarity in order to evaluate management education. We conclude that interdisciplinarity in management education is a social system that requires complex thinking development for management students. The scale addresses three dimensions: curriculum structure, organization and didactics. Copyright © 2015 John Wiley & Sons, Ltd.

Keywords soft systems methodology; interdisciplinarity; management

INTRODUCTION

Although the division of knowledge into disciplines goes back to the time of Aristotle, by the 17th century, Descartes arrived at fundamental truth by breaking down fragments of knowledge and applying the scientific method. Influenced by Taylor, this fragmentation was later applied to the assembly line worker, encouraging specialization and viewing workers as mere factors of production working mechanically and avoiding making decisions. However, globalization and the pattern of business economics that have emerged in the 20th and 21st centuries have shown the limitations of such an approach to management education. Modern high-tech corporations have, in part, abandoned the Taylor–Ford production model or do not any longer consider it the only strategy to solve their management problems. In reality, organizations are a systemic and multidimensional whole in which all aspects are linked and dependent on each other where every aspect influences the others or is influenced by them.

One would expect that students should be introduced to a critical and systemic way of thinking enabling them to professionally explore solutions to complex entrepreneurial problems and avoid approaches based on a single discipline. Yet, higher educational institutions, especially their

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administrators, are not always aware of the changes in business, or if they are aware of this, their programmes are not up to date with the new techniques and methods required by organizations to operate effectively. Given this situation, interdisciplinarity emerges as a possible approach to face these challenges. Interdisciplinarity is a response to the crisis of modern science and the increasing importance of complex thinking that originated in France in the 1960s and 1970s with the Centre for Educational Research and Innovation (CERI), Interdisciplinarity: Problems of Teaching and Research in Universities (OECD, 1972) based on Piaget (1966, 1972); Bousquet (1974); Biosot (1972); Heckhausen (1972); Jantsch (1972) and Berger (1972) and that has occupied a place in academic research to this day. It seeks to integrate knowledge and provide a broader understanding of the reality of a phenomenon. However, closer investigation has proven that interdisciplinary approaches have not been adopted by academia or business schools. Most interdisciplinary work focuses on a humanist education of a theoretical nature and refers to interdisciplinary settings and their contributions to knowledge and humanistic training. When this work relates to management, it consists of occasional reports of courses that include interdisciplinary pedagogical innovations. There is also a lack of general information clarifying how business schools in Brazil and abroad include interdisciplinarity in their educational activities and how they conduct activities that indirectly result in interdisciplinarity. There are no academic papers that define interdisciplinarity in business schools. There is no clear definition of the term when applied to the administration, and this makes studying it difficult.

Therefore, we have applied soft systems methodology (SSM) (Checkland, 1981) to measure quantitatively the interdisciplinary levels in education because, as a methodology, SSM has the capability to deal with complex and problematic situations. Its aim is not to generate a solution to problems, but to explore them with the intent of setting up some actions to address them. The proposed actions are not imposed but constructed through reflection on the problem and the different developments that may emerge in the analysis (Cezarino, 2013). Given the lack of interdisciplinarity in management education, SSM has provided a conceptual tool to link these two and enabled us to introduce a scale applicable to teaching undergraduate courses in business schools.

THEORETICAL FRAMEWORK

Interdisciplinarity in Management Education

Management education is undergoing some significant challenges in the dynamic environment of business. Our search for introducing systems thinking among students is confronted by a resistance to needful structural change in schools and courses. While the objectives of a management course should change substantially, it is still taught in the old way (Daniel, 1998; Lopes, 2002; Nicolini, 2003; Dias, 2012). Interdisciplinarity was one of the proposals in the 1960s by the French school of Lenoir, Larose and Geoffroy (2000), which was followed in Brazil by the work of Fazenda (1991, 1999). Interdisciplinarity is defined as a combination of various disciplines to comprehend an object on the basis of their confluence of diverse points of view. The final objective is to elaborate a synthesis of thought in reference to this object (Pombo, 2012). Schools of management have made some efforts to widen their interdisciplinary teaching, but often, these efforts are the result of the demands of the ministry of education and not from their own desire for change.

A study of Scarmach and Domingues (2008) about the perception of interdisciplinarity in a management course showed that senior students had a perception that their course was more multidisciplinary—and therefore less interdisciplinary—when compared with new students. A possible explanation of this is that students who are closer to graduating have developed greater expectations to receive an interdisciplinary education.

Jeremias *et al.* (2009) give an account of 7 years of attempting to introduce interdisciplinarity at universities in the state of Santa Catarina. The process started with the introduction of an interdisciplinary test. The purpose was to provide an overall test and to analyse teaching effectiveness over a 4-year period of management education at the undergraduate level. The aim was also to

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create a competitive advantage for the institution. A reference text was proposed, teachers developed questions and a test formulated to substitute the assessment of each discipline in the last year of the course. It is important to note that the process was highly criticized by the teachers for they regarded it as yet one extra activity to be carried out. In the second year, the test was transformed into a mandatory assessment of students, and their grades were incorporated into the grades of each discipline. The test was formalized by appointing two teachers responsible for the wording of the questions and their responses. In the third year, a commission was set up, and the test was comprised of five teachers and a coordinator.

Research on interdisciplinarity by Laruccia *et al.* (2011) in distance education in management by 411 teachers in greater São Paulo reveals that teachers have different answers about what interdisciplinarity is, but 68% of them responded that the courses they teach were interdisciplinary. Pacheco *et al.* (2010) and Mendonça (2008) compiled the following list of interdisciplinary practices in higher education (not necessarily in management courses):

- efforts to integrate teachers from different areas in the same research group;
- planning disciplines by teachers from different or the same disciplines;
- creation and participation of content for community extension projects;
- joint classrooms with different disciplines being taught at one time;
- student–teacher access;
- professors of different disciplines collaborating by supervising students in their final-year graduate research;
- discussion groups and events about classical articles in management;
- incentives for collaboration in research;
- international student exchange;
- student competitions; and
- teacher training programmes.

Altheman (2001) also provides an example of an interdisciplinarity project carried out at the University of São Paulo. This was a group project that started at the beginning of the course and was supervised by teachers over its 4-year duration. (Later, it was performed away with by introducing the final-year graduate research). This work included notes referring to the discipline in each year so that at the beginning of the year, the teachers met to discuss their results and difficulties encountered. Another example described by Roda and Zambomi (2004) refers to a university in Pernambuco that encourages teachers to relate all disciplines to social reality and the employment market. Demajorovic and da Silva (2012) state the necessity to reinvent disciplines to be focused on sustainability. When teachers endeavour to fill the vacuum caused by the lack of education on sustainability through alternative class material and interdisciplinary practices, they met with little success. They were confronted with strong resistance to this innovation, for the effort to widen business criteria by incorporating social and environmental dimensions was regarded as a threat to business competitiveness (Demajorovic and da Silva, 2012).

Soft Systems Methodology

Soft systems methodology provides a path for conflict resolution by engaging in a profound reflection of its origins and implications, allowing a systemic approach to its complexity. This methodology provides an answer to the dangerous difference between a complex reality and simplistic linear thinking about how to act when confronted with this complexity. This traditional form of thinking defined problems as *hard*; that is, they can be defined and measured, and their results can be quantified (Cezarino *et al.*, 2006).

Checkland (1981) describes SSM as the operationalization of the infinite circle of experience for purposeful action. He presents it as the best alternative to treat ill-defined, behavioral issues, full of uncertainties and abstractions. It can be applied several times to the same situation until it is sufficiently clarified, and at the same time, this cyclic repetition forms the driving force for change and adaptation. This methodology is specifically appropriate for *soft* problems. SSM provides a model of analysis to raise, in a holistic way, new questions and generate new ideas (Cezarino *et al.*, 2006). It regards the real world as a conflict of relations, and these are explored from the perspective

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of world views. The investigation incorporates different models to intervene in the real world, and the process can be infinitely repeated, allowing choosing new solutions from different points. Actions are chosen when they best resolve the conflicts in the problem situation (Cezarino, 2013).

Cezarino *et al.* (2006) describe the steps of SSM as follows:

(1) Identification of a problem situation or some trouble.
(2) Building a structure and relating it to the process under investigation by providing pictures and taking care not to assume pre-established standards. Attention should be given to the issues that worry people, the role that they play and the types and hierarchy of power.
(3) The main elements of the system are identified as client, actors, desired transformation, organizational world view, owners and environmental constraints.
(4) Design of conceptual models of the ideal situation desired for each of the aforementioned elements.
(5) Shift from the systemic to the real world by comparing the second and fourth steps and making a choice of the appropriate changes needed. This exposes the ability of the organization to adapt and forms the basis of discussion and debate that ought to lead to eventual consensus.
(6) Taking into consideration the culture of the organization, tests are conducted to establish the feasibility of actions to be taken. This is followed by a proposal surrounding which actions should be implemented.

In this work, SSM will be used to deal with interdisciplinarity and to support solutions to address knowledge fragmentation in management education.

APPLYING SSM TO THE PROBLEM OF INTERDISCIPLINARITY

To develop our scale of interdisciplinarity, we have carried out the six steps listed earlier as follows.

Step 1: Understanding the problem situation

Although interdisciplinarity has attracted widespread attention, its development has nevertheless been fragmented. Born in the 1970s and fruit of the student movement in France, it generated a philosophical and epistemological foundation. Starting from the 1980s and more intensely in texts written in the 1990s, Huutoniemi *et al.* (2010), Hukkinen (2008) and Klein (1990) searched for useful instruments for operationalizing interdisciplinary. Finally, this was followed by the Brazilian phenomenological approach, inspired by the French school that treated interdisciplinarity as an individual and unique phenomenon in each context, represented by Fazenda (1991, 1999). Therefore, their practices and techniques were not to be universally standardized but respect the context to which they are applied.

Fazenda (1991) postulates the importance of interdisciplinarity applied to teaching. Other texts think of interdisciplinarity as a socially constructed project that aims to facilitate the discipline of learning by using theoretical knowledge.

Figure 1 illustrates an application of interdisciplinarity to teaching. On a corporate level, complex problems are confronted by organizations, which require disciplinary tools to be taught to the students. Different disciplines are offered to the students without any connection with each other; this characterizes multidisciplinary. Resolving this complex problem requires a third discipline (new knowledge) that emerges in a transdisciplinarity form among the other disciplines studied in the course.

In this case, interdisciplinarity happens naturally as a real problem requires different knowledge sources to be deal with. Transdisciplinarity happens when this newly created knowledge is so consistent it can be considered a new discipline.

When analysing studies of interdisciplinarity projects in Brazilian business schools, these practices are not found in a significant number of courses and are therefore very difficult to compare. Although these findings are interesting from a theoretical point of view, their contribution could be widened by showing how they can be incorporated in management courses. In

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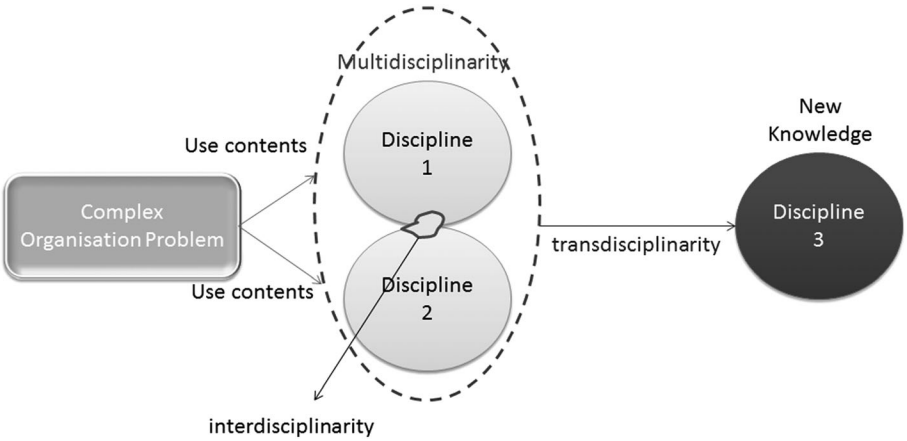

Figure 1 Interdisciplinarity process

the next step, changes in management education in interdisciplinarity are explored.

Step 2: Problem situation explained

An attempt to reform management education will require other forms of organization, but this would lead to further division. However, it is not our endeavour to suppress the division of knowledge within faculties, departments and disciplines, but as Morin (2000) states, one should reform the ability to organize knowledge. In the university, especially in management education, this would be the ability to organize professional knowledge to give students a greater systemic viewpoint. This would transform linear thinking into complex thinking, enabling the student to understand social problems and deal with them. This is what is meant by interdisciplinarity in management education.

However, it is not yet clear what space interdisciplinarity should occupy. This is a complex question, for interdisciplinarity is an attempt to interrelate content in order to generate solutions and new knowledge. It would be inadequate, therefore, to generate a rigid methodology that imposes steps to its application, for it would again generate a fragmented attitude by reducing interdisciplinarity to yet another discipline or project. Therefore, we suggest an expanding and recursive model with four variations of interdisciplinarity (Figure 2). The horizontal axis represents the intensity of the interdisciplinary practices, the degree of commitment to the process and the structures for the maintenance of interdisciplinarity in a system. The vertical axis represents the scope and extent of interdisciplinarity. For example, if the practice of interdisciplinarity is limited only to marketing, its scope is less than if it were applied to all the subjects taught in a degree programme. If interdisciplinarity is practised in all the subjects, this will represent a greater scope than when applied to management subjects such as finance, marketing, management of personnel, operations and production.

Interdisciplinarity is considered as a transition flow from multidisciplinarity to transdiscip linarity. Multidisciplinarity organizes the disciplines within a common denominator, in a single application, even if the disciplines are not related to each other (Berger, 1972; Palmade, 1979). One simple example is a rehabilitation clinic in which psychologists, doctors and other therapists are working with a single application, the patient, but without much interaction between each other. Transdisciplinarity goes to the other extreme: all the diverse disciplines are applied together. An example is a consultancy project for a small business that applies various sorts of management expertise to a single object, in this case the small business and its entire market context. Transdisciplinarity goes beyond the disciplinary border and works with the content

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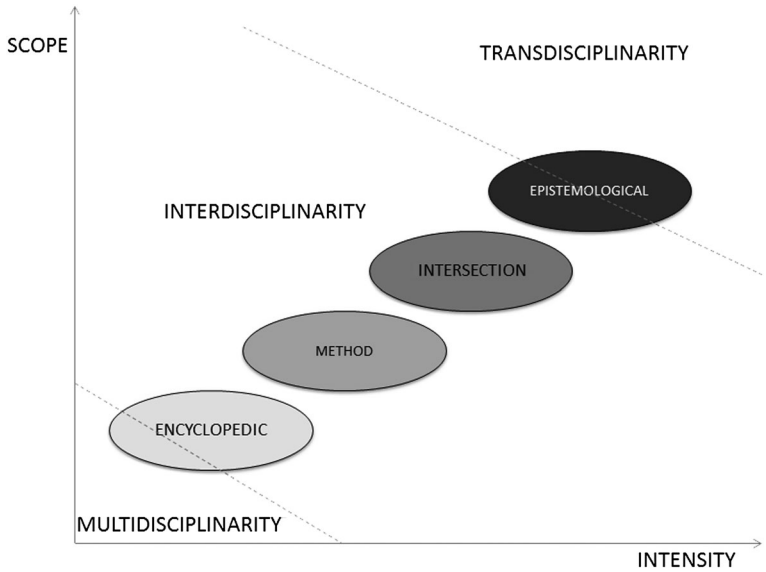

Figure 2 Scope and intensity of interdisciplinarity phases

applied to the contextual reality (Jantsch, 1972; Pombo, 2012).

The first degree of interdisciplinarity is encyclopaedic (Huutoniemi *et al.*, 2010). This type is present when a course offers an opportunity for interdisciplinary planning of the curriculum structure but its delivery in the class remains the same. Such situations take place when interdisciplinarity is used as a competitive edge or when the curriculum is submitted for external evaluation.

The second degree of interdisciplinarity is method interdisciplinarity, and it is the transfer of content or method to another discipline. Examples include the use of statistical knowledge in the content of another discipline or when there is a brief dialogue between two disciplines addressing the same theme. It can also be a non-standardized activity in several course disciplines. It is applied only in some situations and in some specific relationships in the content, for example when extracurricular work is performed and students studying two or more disciplines are evaluated only once, and given a single grade. This classification means that the course offers interdisciplinary teaching, but it is not formally coordinated or controlled. Its interdisciplinarity depends on the initiative of some teachers, and its coordination has not been formalized for the entire course.

The third degree of interdisciplinarity takes place through the intersection of disciplines. It occurs when the educational content is presented in a related manner and the student is able to understand the interrelationship between material that otherwise would have been presented in isolation. It includes continuous and systematic use of teaching techniques that not only consist of the lectures but also of case studies, simulations and teaching through problem-based learning.

The fourth and final degree of interdisciplinarity is epistemological and closest to transdisciplinarity. It represents the expansion and deepening of the third degree (intersection). New issues arise as a result of the new relationships created. To reach this level of interdisciplinarity, the curriculum structure of the course must be constantly restructured, allowing for new disciplines to be incorporated as a response to critical changes in the organizational environment.

Step 3: Root definitions

In this step, we provide competency definitions of human activity as well as definitions of its components. It is like defining a mission,

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which in this case, is introducing interdisciplinarity in undergraduate courses in management.

We have defined the following elements:

Customers

The customers are the students who receive the greatest benefit from the introduction of interdisciplinarity. We do not know the students' perception of the process and its outcomes. In a study by Laruccia *et al.* (2011), students reveal ambiguity in their responses. They show that while the students perceive they are learning more, interdisciplinary demands more of them. Given its scope, the conclusions of this study are limited, but one may gather that even while applying better practices and techniques of education, students do not always appreciate the process in which they are participating.

Actors

The process is directly designed and run by the teachers and course coordinator. It is possible to establish a relationship between programme directors and the rectors of the universities and also allowing the teachers to participate.

Transformation

It is expected that the teaching of management will be fruitful, equipping the students with competence needed in a manager. To attain this, interdisciplinarity must include systems thinking to allow students to connect the material covered in their course.

World view (Weltanschauung)

Different actors have different views of the world. The courses in the university have, as a strategic objective, to gain a competitive advantage in the market and to satisfy their 'clients', while universities seek to increase their scientific publication level. This is not related to the individual objective of the actors but only to the students, who, as already stated, have difficulty appreciating the benefits of learning. Thus, interdisciplinarity turns out to be something beautiful in education but difficult to experience. Coordinators have difficulty convincing teachers about it: they are already overburdened with bureaucratic tasks and the management of their courses. Teachers, on the other hand, are preoccupied with the development of their careers as consultants and academics (when they teach in private universities), or they are preoccupied with their annual publications (when they teach at public universities). The university rector does little to stimulate the process throughout the organizational hierarchy.

Owners

In private universities, the owners are the sponsors of the foundations that finance management education. In public universities, the owner is the society that owns the public good.

Environment

The environment of management education has become increasingly hostile, both in public and private universities. Relevant internal and external factors create turbulence like technological advances, pressures to achieve financial and scientific results on respective rankings and the difficulty to create teaching techniques that narrow the gap between theory and practice.

The root definition of this system can be synthesized on a scale to evaluate epistemological interdisciplinarity in management education.

Step 4: Design of conceptual models

The fourth stage involves the design of models. After understanding the structured and unstructured problem situation and the root definitions, SSM proceeds to create models to resolve the problem under study. The objective of this work is not to resolve how to develop interdisciplinarity in management schools, but to propose a scale to measure its presence in courses. Therefore, our task is to identify the variables in a model apart from the external and internal difficulties found in the course.

Step 4 of SSM goes beyond the traditional perspective and enters the systemic world. It enables understanding relationships between concepts

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only at the theoretical level, without concern for their practicality in the real world. Hypothetically, interdisciplinarity would benefit management education. A paradigm shift would mean teaching based on organizational problems rather than pre-established disciplines. Course content would deal with organizational issues such as outsourcing, internationalization, deindustrialization, motivating high-performance teams and launching new products. Courses would be free to include themes according to the critical organizational local context.

A second phase would include management competencies leading to professional stimulation and compatible teaching techniques (steps 2 and 3). These techniques could include lectures, but they should also involve teamwork, negotiation and communication skills.

Step 4 would result in the following actions. With an increasing closeness between theory and practice, new relevant themes could emerge, allowing the process to turn recursive and circular (Figure 3). This could be covered in a semester, an academic year or throughout an entire course.

Step 5: Comparison between steps 4 and 2

The fifth step of analysis requires a comparison of the conceptual models described in step 4 with the situation described in step 2. In our case, the model was developed to optimize the benefits to management teaching. However, it must be recognized that given the organizational structure that exists in schools and the courses they teach, the proposed model is unviable. For an undergraduate programme to operate without the disciplines, it requires a group of teachers especially dedicated to this task. Moreover, the courses would have to be allocated the number of hours according to the extent of the selected content. Finally, students and the academic administration would have to be convinced about the benefits.

Despite this, it is necessary to take advantage of what the conceptual models elucidate as possible outcomes, even from a theoretical point of view, and relate them to the difficulties in reality. This refers to both internal difficulties (teachers, autonomy, involvement with the faculty) and external ones (changes in consumer behavior, technological innovations, institutional reviews and complexity of the organizational environments), and to funding difficulties, both public and private.

We may consider the introduction of interdisciplinarity as a continuous action, aimed at transforming difficulties. Within this transformation, principles of complex thinking could be an encouragement to adopt interdisciplinarity (Figure 4).

Therefore to understand how management education can incorporate interdisciplinary

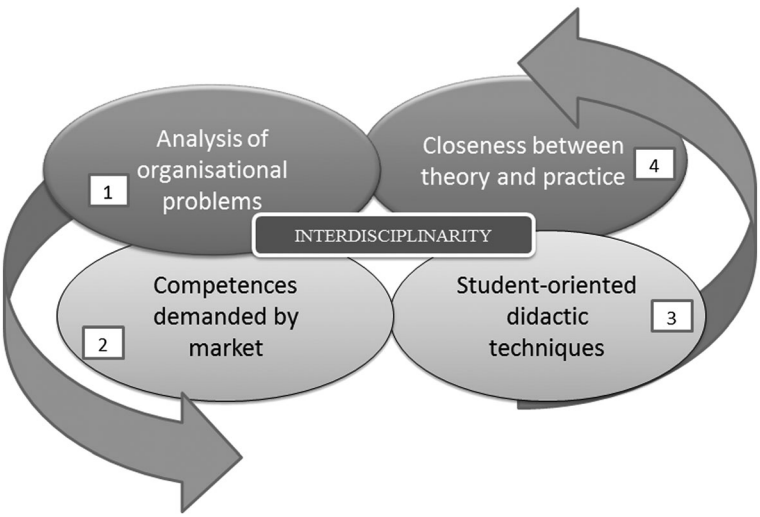

Figure 3 Interdisciplinarity conceptual model

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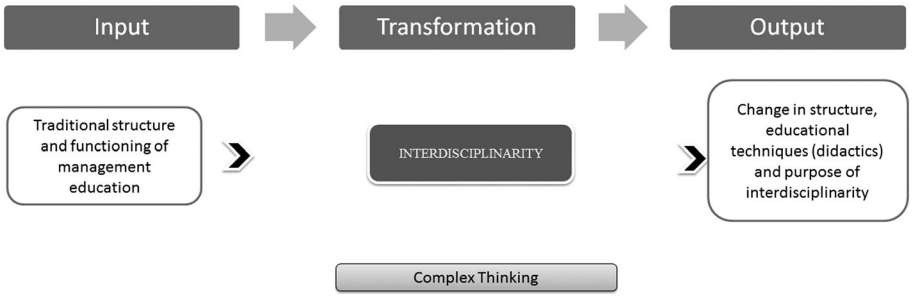

Figure 4 Desired change of interdisciplinarity in management schools

teaching activities, we need a profound and qualitative investigation into the teaching of each course. This should take into account the actors in this process including the academic administration, course coordinators, teachers, students, structures, autonomy, funding sources and conditions in the micro-environment.

But even without that information, it is possible through this investigation, to propose a model to measure the progress of the courses so far. The first phase to do this, it is necessary to establish comparison variables between courses. Returning to the real world, it is clear that there are different forces at work in the conception of interdisciplinarity in the courses. These are the ways the content is presented to students, how coordinators and teachers organize the administrative and pedagogical processes of the course and, finally, how the course structures the disciplines within its curriculum (Figure 5).

Step 6: Feasible Actions

From a practical point of view, several aspects must be dealt with in measuring interdisciplinarity including education and teaching (Fazenda, 1991, 1999); the organization of the course; and the regulatory requirements of Ministry of Education. We have identified an indicator for each of these aspects. The first indicator reflects interdisciplinarity as a technique of teaching that connects concepts and enables students to understand complex organizational problems. These are pedagogical activities developed in the course. The second indicator sees interdisciplinarity as an objective, which requires interaction with the authorities under which it operates in order to gain support to set up production processes, obtain resources and attain necessary skills. Interdisciplinarity is regarded as correlated with the degree of support given. The third indicator uses interdisciplinarity as represented formally in the documentation of the management course. Interdisciplinarity is not a quality of management education but a process of transformation; therein found is the difficulty of measurement.

Step 7: Actions to improve the problem situation

Regarding the teaching dimension, it is not necessary for a course to have a formal interdisciplinary

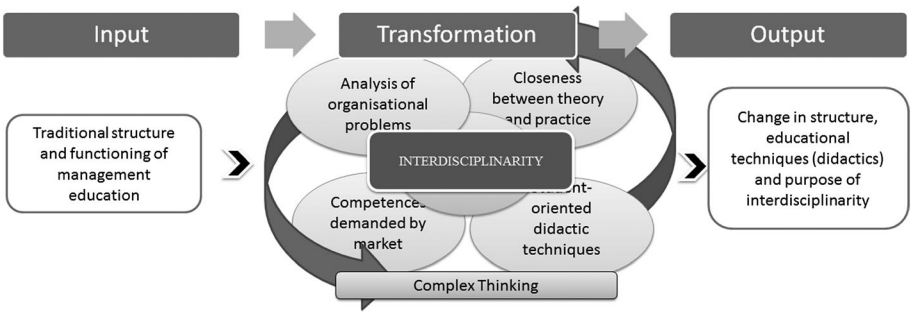

Figure 5 Complete interdisciplinarity conceptual model

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process but rather to present some innovative and varied techniques for dealing with its content. These techniques must relate to organizational problems. The techniques selected as indicators of interdisciplinarity were business simulation, problem-based learning and case studies or other community service that makes students be part of their context applying disciplines content together.

Regarding the curricular structure, the first variable to be measured is curriculum innovation. We intend to capture the degree to which the course was able to relate the various disciplines to the changes in the organizational environment. There is a discipline that can play an interdisciplinary role in the content of the course; sometimes this can be called contemporary themes, management seminars or a similar title. The factor that differentiates it from common disciplines is that it has no specific content assigned to it. The integration of knowledge in research conducted by teachers is also subject to measurement. Lenoir *et al.* (2000) shows that the integration of research and teaching can also facilitate integration from the most basic to the highest level but it will depend on the individual efforts of a professor, not a formal pedagogic project. Management education in this case plays a relevant role in stimulating interdisciplinarity, but the action is somehow inside the traditional disciplines.

Finally, the last dimension refers to variables related to the organization of the course, which ought to spell out how the management course deals with interdisciplinarity and how it uses the available processes and resources to stimulate interdisciplinary teaching. The first of these variables concerns itself with the actors who receive overlapping content in the subjects. This overlap is a negative aspect in teaching and should not be confused with interdisciplinarity. It repeatedly presents the same content but has no application to reality or connection to another discipline. It is a repetition of what has been seen in the classroom. The greater the concern of the actors with this overlap, probably the greater their concern will be about interdisciplinary teaching. The dimension approaches courses that affirm having interdisciplinarity planning in the formalization papers, but, in day-to-day reality, there is nothing.

FINAL CONSIDERATIONS

The objective of this study was to develop a scale of interdisciplinarity for management education using SSM; it was a methodology that has shown an ability to solve soft problems, that is, problems that are ambiguous and difficult to organize. The scale developed focused on organization, curriculum structure and didactic. From the organizational to the didactic dimensions, interdisciplinarity becomes deeper; while organizations use interdisciplinarity to avoid regulation problems, the didactic dimension uses the epistemological version, and local context is involved in students' learning.

Management education is going through a period of change in response to an environment that is also changing and turning competitive. In addition, there is a need for managers who have a systemic vision and are capable of utilizing tools learnt at the university in order to solve organizational problems where they work. Yet, management teaching has not undergone the changes as expected. While the objectives of management education have changed, its teaching has not (Daniel, 1998; Lopes, 2002; Nicolini, 2003; Dias, 2012).

Interdisciplinarity, in turn, has struggled to establish itself because of the difficulty of implementing it. Theoretically, interdisciplinarity provides solutions to the problems of management education, but these have not materialized because of various difficulties. At least, it is possible to know to what extent interdisciplinarity is practised. SSM has helped us clarify the three dimensions that display the degree of interdisciplinarity in management education.

The first dimension, organization, shows the administrative and legal support that the course receives to carry out the appropriate projects. The second dimension, structure, identifies the purpose that generates these projects and some interdisciplinarity methods that are not expanded through traditional disciplines. Finally, didactic, the third dimension, identifies how teaching techniques have been improved or modified to generate interdisciplinarity.

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