UNDERSTANDING UNIVERSITY MANAGEMENT USING SYSTEM DYNAMICS SIMULATIONS, A REVIEW BASED ON RESEARCH EXPERIENCES

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ABSTRACT

University management implies a great variety of decisions that need to be made in order to maintain financially affordable programs that successfully meet the educational demand and thus achieving a generally understood goal which is that the University works as a self-sustainable system. The Systems Thinking research group (GPS) has developed a variety of projects which main purpose was to use System Dynamics modeling to support University management at Universidad Autónoma de Bucaramanga. A detailed revision of these projects is presented to distinguish common objectives, methods and strategies, organizational learning experiences and along with them, a variety of uses of System dynamics tools that are to be discussed leading towards an extensive reflection about organizational complexities beyond management strategies.

Keywords: System Dynamics, Computer-based Simulations, University Management, Organizational Learning, Systems Thinking.

1. INTRODUCTION

Universities face challenges related to academic affairs, scientific knowledge development, programs quality, market tendencies among others, which make necessary to maintain a continuous learning cycle to check, assess, modify, redesign and restructure policies and procedures in order to meet the national accreditation standards and at the same time to be financially self-sustained. Decision making always involve some level of risk which is always accompanied by high levels of uncertainty. System Dynamics has contributed to support strategic management since the 60's developing research focused on the use of "learning laboratories" where organization members are able to experiment through simulations without facing the risks of real implementation. "System dynamics is a rigorous modeling method that enables us to build formal computer simulations of complex systems and use them to design more effective policies and organizations", (Sterman 2000).

Our Research Group[1] had been studying System Dynamics methodologies to better understand organizational issues, to explore more effective ways to manage multiple and

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relevant variables and therefore support the complex decision making at a private University in Colombia. Parallel to this purpose, there was a continual interest on developing organizational learning experiences supported by Microworlds which design was meant to promote a systemic view from which it was possible to create causal hypotheses about the organizational structure underlying dynamic behaviors. As a result of these two initial group interests, a variety of research projects were developed in the last ten years. This paper presents the outcomes of a detailed revision of the main research projects focusing on the underlying intentions supporting the different ways to use system dynamics simulations to support organizational learning when dealing with University management strategies.

2. A QUICK GLANCE AT THE RESEARCH PROJECTS

Due to similarities found on the type of documents and the contents developed, a first categorization, based on the purpose of the research, the modeling and simulation uses and the organizational learning experiences, was defined. It is important to clarify that this classification was not necessarily based on a chronological order; instead it was the kind of contribution that each work provides to the Academic and to the System Dynamics community what generated the need to make distinctions among them. The first category included articles written as a result of the studies in System dynamics and the interests related to organizational complexity: "Microworlds: systemic tools towards a innovative strategy for university management" (Cabrera 1997), "A critical revision of Organizational Learning using Systems Dynamics" (Sotaquirá 1996). These articles share a concern toward a systemic comprehension of the way System Dynamics tools are used to facilitate learning among the organization members when facing management related decisions. Back in those first years of research in the group, there was a growing local community interested in studying favorable conditions to encourage learning experiences in organizations as well as developing systemic practices to not just provide innovative and technological solutions to face management challenges, but also to propose genuine ways to approach the problem of University management from a Systems Dynamics perspective. Microworlds, defined by Peter Senge as computer-based microcosms of reality (1990), in which one learns by experimentation, were a visible mechanism intended to facilitate the participation of the organization staff in management related decisions.

The second category included projects developed mainly by undergraduate students on their thesis: Several System Dynamics models or microworlds to support decision making, institutional planning and organizational learning of University departments, both undergraduate and postgraduate programs and other academic and administrative units, like the Research Office for example (Tapias, Torres 1997; Báez, 1999; Báez, Cabrera, Sotaquirá, Rueda 1998; Cabrera, Sarmiento, Serrano 1999, Cabrera, Correa, Peña 1999). As a result of the revision of these projects a common emphasis on building simulation models and appropriate interfaces to interact with the model, was found. The purposes varied with each project but they all share an objective related to a systemic application of system dynamics tools to support organizational learning experiences. The modeling process was focused on the analysis of all the possible variables that could affect the subject matter in each case. The complexity of these models was measured by the amount of selected variables and their diverse nature. Therefore, the user was dealing with a considerable amount of variables represented in causal diagrams that facilitate the comprehension of the relationships among the most significant ones, all those which affected the whole system the most with a slight change. Great part of the research developed on these projects was focused on the identification of feedback cycles that guided the modelers to create multiple scenarios that would ensure the organization to make accurate decisions reducing the uncertainty level. At the same time, the initiative of developing organizational experiences

was still supporting and guiding the modeling and Microworld design phases. The interest regarding a need to bring together the organization members for active participation was the main purpose of the design of Organizational Learning workshops where they could collectively analyze, assess and design policies and strategies related to available resources management.

During the revision phase it was necessary to define a third category which included thesis and articles written and developed on the basis of an inquiry related to the diverse perceptions of "university" evidenced when facilitating dialogs and discussions during the organizational learning workshops experiences. These inquiries inspired other questions about the ends that supported each perception of the University and that also provided significance to every management decision. Therefore it was apparent that there was a fundamental correlation between management issues and the multiple ends that the organization intent to pursue. Interpretive variety explains how the focal point of the organizational learning experiences needed to aim at the discussion of the ends perceived and understood by the organization members rather than a mere analysis and projection of strategies dealing with available resources (Fuenmayor 2001). At this point, University Management was not only considered a search for the best strategies to manage means to meet an specific end but there was a necessity to guide the organizational discussions toward the disclosure of a multiplicity of existing ends in order to design more coherent strategies and policies leading to them (Gélvez 2005). How was the System Dynamics methodology going to face the new challenge? How could System Dynamics deal with interpretive variety? What fundamental changes needed to be done on the modeling phases? What could be general guidelines for Microworld design to foster an organizational learning that takes into account the multiplicity of ends? The group of articles and projects that intended to answer these questions included: "An evaluation of the possibilities of Systems Dynamics tools for the organizational ends discussion at the University" (Gelvez 2002), "U1, A microworld for University Management (Gélvez 2002), "Microworlds to support the organizational change and decision making processes. A case study with System Dynamics in the University accreditation process" (Gélvez 2002)

3. SYSTEM DYNAMICS USES AND UNIVERSITY MANAGEMENT, A LOOK BACK AND THE FORTHCOMING

As it was presented above, System dynamics simulations have been mainly used as computer-based tools that facilitate management issues directly related to policies assessment and projections which main goal was to support decision making at the University. Mathematical models accuracy reduces the uncertainty of dynamic behaviours always present in organizations when new needs, plans and polices are about to take place. When opening a new academic program, hiring professors, providing the staff professional development opportunities, and in general when possibilities of change and innovation arise, University management ought to focus not only on the means and resources needed to achieve such goals but also, research from the third category group of projects has exposed that there need to be a constant inquiry pertaining to the coherence between the strategies to fulfil the committed plans and the University ends.

In broad terms System dynamics has been limited to handle complexity levels related to variable management and diverse scenario alternatives, which leave aside the intention of unfolding perceptions of University that reflect the societal role that educative institutions should embrace. Other Systems thinking approaches such as The Soft Systems Methodology have considered the influence of worldviews in organizational decisions which has enlighten the road for further studies to comprehend how a system can be

described by different individuals precisely because of the variety of worldviews (Checkland 2000). The third category of projects encourage University managers, System Dynamics and Systems Thinking researchers to take a look beyond the usefulness of means to achieve a particular end that belongs to an individual and opens possibilities to nurture a critical view[2] among the organizational leaders and active members to understand other level complexities that transcend organizational performance and effectiveness as the main goals and rather redirect their attention on social responsibility and awareness. Moreover, the diverse experiences explored through the studies evidenced a tendency to realize that organizational complexity has to do with human action and thus is fundamentally associated to interpretive variety which unity character needs to be revealed, more than management of means responding to the "how". These insights constitute a theoretical framework from which the University management phenomena must be observed to provide interpretive variety its essential role on the decision making process.

From the organizational point of view, flaws on organizational performance, proactive ineffective strategies that result in just reactive solutions, personal interests interfering with organizational goals, poor performance measurement strategies among others have been the "given" reasons for mismanagement and failing organizational learning practices. This review presents a perspective from which those reasons are not only insufficient but also "non-senses" considering the lack of an organizational and social contexts that provides significance to the human actions in the University. A "Systems Dynamics transcendent", as it has been called from the third category projects is intended to uncover these contexts which constitute the ground that makes it possible to distinguish meanings to the University ends in order to overcome constant counterproductive results and to create conditions where the essential ends are not misunderstood and are less likely to be reduced to business performance goals.

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[2] This view would be "critical" because it has to unfold the variety of meanings about the social role of the University which remained invisible during these research and organizational learning experiences. In this way the third category of projects can be related to "Critical System Thinking" (Fuenmayor 1990).

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