Information Systems: new demands, new proposals

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Abstract. The current social changes that result from the advent of new forms of relationship and communication strongly based in networks begin to collapse with the rigid and inflexible academic structures which respond slowly to the new demands. Considering the experience of implementing an undergraduate course in a public university in Brazil, this article raises and discusses innovations and difficulties in achieving an academical proposal whose main focus is to perceive Organizations, Enterprises and Institutions (OEI) not as technocratic model of management but as sociotechnical entities.

Keywords: Education, Information Technology, Innovation

1 Introduction

The rigid and hierarchical structure that still persists in most Organizations, Companies and Institutions (OIEs) in Brazil tends to lead to a technocratic, top-down management, in a model that does not give due importance to aspects inherent to individuals who work in them, such as creativity, sensitivity, autonomy and intelligence. In practicing this model is inadequate to serve a society that is characterized by exponential growth of social networks. These, created, accessed and structured through the web, as horizontal networks are being accessed at any moment, by any person or group of persons, without mechanisms of control. The construction of a new narrative that addresses the processes that operate through a network of relations becomes a necessity, in the light of the perception of a new reality that can not be simplified to be explained by models based on positivist science. Attempts to implement this new narrative confront, however, with the equally rigid academic structure of Brazilian universities, which, in theory, embraces innovative and flexible ideas, but in practice introduces a number of drawbacks that tend to derail the new proposal.

We conjecture about the need for educational efforts to enable the academy to train professionals capable of working through a new modus operandi that takes into account these changes that occur in everyday life of people. At a time when technology tends to increase exponentially the possibilities of sharing the cognitive functions of individuals through the electronic support, the management of people is one of the areas where investment is strengthened more and more in the administration of the OIE (s). The notion of the OIE (s) seen as complex systems that are people - who have a history, family life and especially dreams - demand the training of professionals with interdisciplinary, global, critical, enterprising and

humanities. By understanding the OIE (s) as complex systems, we perceive the need to include in the learning of professional Information Systems thorough knowledge of the new role of human resources in contemporary OIEs.

The contemporary OIE(s) are not seen only as a set of products or their administrative divisions, but as a portfolio of resources and capabilities that can be combined in various ways [2]. And in this context it is the knowledge management of human resources that will ensure strategic and operational gains. In today's professional it becomes necessary to acquire a new worldview that incorporates the unpredictability resulting from the complexity of the world that today is more evident by the development of science and technology. Today the reality is explained by its multiple dimensions and relations since it constitutes a logical system of relationships involving the individual in being able to accept the uncertain, get a sense of unpredictability, knowing that we do not know and accept the contradiction [10]. Being prepared to be immersed in complexity gives the professional ability to connect with the unpredictability of the real.

The graduates of such training should be able to seek computational solutions to complex problems from different areas and be able to deal not only with technical issues related to information processing, but also must interact with a social context that constitutes the intelligence of the OIE. Qualified professionals to support an innovation of this sort need a training to prepare them as citizens aware of their social and professional role in a society in constant transformation and must be able to assume the role of change agents, and therefore be able to bring about change through incorporation of technology in solving everyday problems in the workplace.

In the following sections we highlight some points of the education that we consider important to be met fully these ideas, that is, the formation of professionals aware of their social and professional role in a society in constant transformation focusing the degree in Information Systems.

2 Four essential points to the sociotechnical approach in Information Systems

2.1 Interdisciplinarity

The sociotechnical nature requires interdisciplinary and must be structured on the theoretical-practical articulation to enable graduates to function effectively in the dynamics of contemporary society.

Besides focusing on the skills and abilities related to technological disciplines such as programming, software engineering, database, among other things, this proposal includes disciplines related to sociology, law, information science, management and psychology in order to assist in the formation of a professional with a more realistic and complex information technology in enterprises, organizations and institutions.

The organization of the course through the integration of these disciplines was essential, since the "real world" companies do not behave in a predictable and functional entities but as complex sociotechnical processes which are not restricted to the rational aspect. It is understood that the professional practice in Information Systems necessarily requires an understanding of the importance of treating interpersonal relationship, since it is of paramount importance for the understanding and interpretation of the social context of OIE(s).

Professionals with this understanding are able to act in such organizations as complex bodies where technical devices coexist with behavioral aspects of configuring a network interference. This conception is based only on a curriculum with a high degree of interdisciplinary, requiring the inter-relationship of content of a technological and humanistic nature, and the coexistence of practical and theoretical studies.

It is worth mentioning that interdisciplinarity is not restricted to the coexistence of various disciplines in the curriculum areas. You need a permanent work of patching the contents and teacher understanding of the importance of each content in the relevant profession. For this, the coordinating education plays a key role, and must be prepared to deal with the faculty and student resistance in relation to change their customary practices.

2.2 The extra-classroom activities

In Brazil, the academic activities that have a point of contact with the community, aiming to establish a dialog and exchanging of knowledge between the academic world and its neighborhood are called extension activities. These activities tend to be more practiced in the humanities than in technical areas. In this latter they are often viewed as activity that benefit the community, without being perceived the benefits to the academic and professional training of students.

The retention in the early periods, the difficulty in basic disciplines such as programming, have become chronic problems in computer courses. Many teachers complain about the lack of preparation of students admitted, attributing this fail to the poor quality of secondary education and the existence of social programs allowing the admission of students unprepared. To deal with this situation, in order to use skills and build competences, it is necessary to implement mechanisms that create a bond of students with the University, making them want to stay in the institution and advancing the course.

The university extension, that is, those scholarly activities that promote a permanent contact with non-academic community, is an ally in this sense. The extension of scholarship programs tend to be more democratic than the scientific initiation programs: do not require a high coefficient of efficiency and can be offered to students of earlier periods. In addition, scholarship programs in Brazil usually focus on the student in the classroom and content of the classes. The extension, by contrast, aims at the performance of the student from a direct contact with the neighborhood that surrounds him, through questioning, as we emphasized in [6]: "(...) the questioning promotes the rapprochement between practice and theory, as it causes

the involvement of academic (teacher and student) with their own neighborhood, their surroundings, real people, everyday situations. It is this meeting of academic and his locality that forms the professional citizen. Without it, it is formed the professional. " Thus, the extension can be used as a fixing mechanism, avoiding the search for pre-mature stage, and encouraging, awakening interest in the course. In terms of content, allows the curriculum to bring the issues of neighborhood, which in demanding computing solutions, end up tacking curricular subjects. Conversely, the extension places the student as a trainee in contact with people outside the academic space, which causes the need to deal with unforeseen situations, in colloquial speech, the scarcity of resources, that is, not idealized situations, such as those simulated in the classroom.

2.3 A careful look to local demands

There are difficulties on the part of courses in operation, in maintain the student away from the labor market only to devote himself to studies. Brazilian reality has been pushing the student pre-maturely to the labor market, what can be noted by the drop in grades, increased length of stay in University, loss of interest in theoretical content, and preference for disciplines with no schedule conflict with work. The academic community tends to see the adjustments to this reality, as for example, the option for night shift as a way to decrease the quality of courses. This ends up exacerbating the situation. Teachers tend to complain of lack of dedication on behalf of internships and jobs, but usually do not propose effective actions to justify the dedication and arouse student interest. It is important then that the educational project seeks to reverse this logic. A way to perform this is making the practice in stages and work become subject to discussion and study by academics. Thus, the use of experience in working must enrich the curriculum and establish a permanent bond between the university and the OIE(s). The approach with companies, and the constant reflection on the way of acting in Brazilian society, gives the course a realistic character, committed to the local and Brazilian situation, being thus able to form professionals able to propose changes and innovations.

2.4 Technological mediation as a mechanism to approach the contemporary complexity

The educational project of the course must provide incentives for the use of educational methodologies that enhance technological mediation of the learning process. This approach seeks to expand the space for teaching beyond classrooms, transforming the relations of teaching and learning, and giving a new look to the meaning of didactic content. It also encourages the student's autonomy, putting him as the agent responsible for his own learning. It is important to know that educational practice should go beyond that which is based on broadcast content, and more, we must recognize that the teacher in his actions as mediator of learning must be

responsible for creating ways so that the student may be able to construct his own knowledge.

For this reason, we intend to highlight as basic principle of the transformation of the structure of the classroom the thought of [12] about the pedagogy of autonomy. According to him, it is essential to the teacher learn knowledge that makes possible to the student the effective learning. A careful evaluation of the teaching action is necessary in order to seek the teacher's role as an inducer of reflective education, which transforms the relationship transmitter/receiver that is in the process of traditional education.

In the study by [7] data were collected and analyzed about the daily process of teaching and learning within the classroom. An important finding of this study is that the simplistic setting of this environment, minimizes the complexity of the process of knowledge construction and thus the effectiveness of the learning process of students. Individuals learn by relating and linking, through their senses, the information from the environment they live with the knowledge stored in their memory. In the classroom, usually characterized by the transmission of content, a teacher-pupil ratio unambiguously reduces both the possibility of creation as strengthening of interactions among students. When you do not encourage these interactions, students use partially their brains, organs that lead and connect an infinite number of complex information through their sensors.

According to [9], the individual is endowed with a brain, consisting of more than one hundred billion neurons, which allow extremely complex functions that he is constantly learning in his exposure to the world. A process of acquiring new information is not trivial because it envolves a memory storage system, which consists of neuropsychological and neurobiological processes that occur differently for each individual, since learning is dependent on the cognitive structure of each one. The understanding of the process of student learning and how this process is complex, makes it imperative a responsible and careful treatment of the learning environment. In [7] this urgency is showed by the results obtained by carrying out two surveys in the context of the classroom, through the application of a research technique called Social Network Analysis (SNA) which analyzed the behavior of flows information between students and teachers, and the other consisting of the preparation of a structured interview in which they sought the opinion of students about the process of learning in the classroom, through their verbal and behavioral manifestations. The application of ARS showed that there is need to explore information flows within a classroom, aiming to create strategies for developing links, interactions and cooperation between actors in the process of knowledge construction.

What became more evident when analyzing the results of the interview was the predominant practice of a model in which the student reproduces only the knowledge presented by the teacher. This is a practice that can survive without the technological innovations, since even when the technology is present, what is reproduced is the same model of content delivery. A model in which the teacher is the single source of knowledge, despite the information and communication technology which provides a network for sharing and collaboration for the construction of knowledge.

The constraints arising from lack of dialogue and lack of access to a variety of media, the characteristic problems of the traditional structure of the classroom, cause great damage to the construction of knowledge by the student, and influence

negatively his ability to search and the information processing. The student must be guided to develop his methods of acquisition and processing of data and information from the external environment into meaningful knowledge for him. It is this process that will strengthen his capacity for dialogue, the main form of communication by humans with their peers.

Assuming the already mentioned, that teaching is not to impart knowledge, but rather a structured process based on the understanding that student learning does not happen so trivial, it is concluded that the teacher's role is not simple. In so far not uncovered much of the intricate process of human communication, the teacher's task remains extremely complex. [7] notes that a new understanding of human thought will resort to new ways of dealing with teacher/student relationship, to facilitate and guide the construction of knowledge by students so that they are capable in this process, to be autonomous and interact with others in pursuit of transforming the ocean of information that characterizes today's society in meaningful learning for life. Given the complexity of this notion the teacher needs to launch a new look at his student, other than that which sees him as one more in a class.

To find ways of living that are compatible with the new rules of the globalized world it is fundamental to accept that the vital process in the world today is shared by individuals from all parts of the planet. The Internet, which is much more than a vast compilation of data and a huge encyclopedia, is a new form of communication and network management with endless potential for cooperation. Particularly when it allows not only a particular query unlimited data and knowledge, but also placing online any creative output by anyone and without any restrictions [11]. Information technology and communication should be seen as great allies and constitute a strategic tool to support the changes that are occurring in society. It is through them that are designed hardware features and software that support the collective processes of knowledge construction, created through the network structures that can be given, independently of distance and time. These technologies besides interconnecting in network a set of individuals - also enables the meeting of ideas and resources around shared interests and projects. The collaborative work and the possibility of establishing dialogue are key factors for the enhancement of the capacity of self-organization and structuring of the teaching and learning around the construction of meaningful knowledge.

3. Conclusion

Despite the fragmentation of Brazilian established curriculum where content is distributed and isolated on black boxes, it is necessary to seek to develop in students the ability to master the cycle of problem solving in the context of IT. One way of achieving this goal is to use in the disciplines methodologies based on learning through problem solving, and link content to situations and problems of the university neighborhood, the municipality where the student resides, the workplace, etc, thus, exercising the ability to perceive the application of knowledge to real world problems. This goal is present in this educational proposal at various points: the integration with extension activities, through integration with the labor market, the imposition of

extra-curricular academic activities, and for all the disciplines that are food for the development by the student of a final course project. The methodology of Action Research, and its recent developments in Brazil [1] offer an adequate support to the approach envisaged in the BSI. The methodology PBL (Problem-based Learning) also helps in the realization of intended approach in the classroom. The standard textbooks, tests applied to large number of students, classes too large and the disciplines that are offered in the same way for different courses do not motivate the involvement with the course in which the teacher operates. In this way it is not possible to effect the re-contextualization of content, and the student stays with the feeling that each course ends in a black box of curriculum content and humanities are less important than the technical content. In this respect, we follow [5:47], commenting that the loss of influence in shaping the philosophy of social science, points to the impoverishment of the humanities and the consequent difficulty of interpreting "what goes around the world." The lack of link between humanistic content and technical content introduces the risk that the course becomes a discipline "of the administration of things", which puts it at the service of the capitalist system and the globalized economy.

It is known that there always exists the possibility to pass a mismatch between what is planned and what is implemented. This argument is often a barrier to change, and ends by placing education as one of the most traditional systems and averse to new ways of acting. However, when the change is urgent due to social demand, the gap between what is planned and what is implemented can be avoided by monitoring, evaluation and adaptations. Given that the educational structure makes them shred the process of constructing knowledge, either through existing curricular structure and / or disconnected by the practice of educational proposals, it is necessary for the coordination of the course coordinator in conjunction with the college, establish mechanisms for enabling management to direct and evaluate the process of building knowledge of the student during the implementation of each semester. One of the important mechanisms used to verify the effectiveness and efficiency of the educational proposal is the evaluation of educational program in its two main parts, namely, the evaluation of product and process, which should be implemented in a complementary way by combining qualitative and quantitative methods in different areas: academic, administrative and physical infrastructure and technology.

As opposed to traditional evaluation, which seeks to verify the range of indices considered "successful", the assessment to which we refer is put toward the construction of learning personalized on the actors in the academic system: teachers, students, community. Therefore, it accompanies all stages of the course and requires participation of all actors, and not go through the usual categories of pass/fail, success/failure.

References

1. Thiolent, M.: Metodologia da Pesquisa Ação, Editora Cortez (2005)
2. Mintzberg, Henry; Ahlstrand, Bruce; Lampel, Joseph.: Safari de estratégia. Porto Alegre: Bookman (2000)
3. Currículo de referência da SBC, http://www.sbc.org.br/

4. Projeto pedagógico do curso BSI.: Instituto de Computação da Universidade Federal Fluminense (2009)
5. Santos, M.: Por uma outra globalização - do pensamento único à consciência universal. São Pauto: Record. (2000)
6. Cafezeiro, I. L. ;Lima, R; Reed, J.: Refazendo vínculos: das dicotomias locais à novas conexões acadêmicas. In: Foro Iberoamericano de Comunicación y Divulgación Científica, Campinas. (2009)
7. Lima, R. L. Uma proposta estratégica, didática e operacional para a sua unidade estrutural a sala de aula, Tese de Doutorado, UFRJ, Brasil. (2008)
8. Lima, R.;Cafezeiro; I. L.; Gomes, L.V. B.: The technological mediation as a strategy to innovate the teacher-student interaction. In: International Conference of Education, Research and Innovation, Madri. Proceedings of the International Conference of Education, Research and Innovation, (2010)
9. Lent, R.: Cem bilhões de neurônios: conceitos fundamentais de neurociência*s*. Atheneu. São Paulo. (2005)
10. Morin, E. O método 3: O conhecimento do conhecimento, Editora Sulina. Porto Alegre. Rio Grande do Sul. (1999)
11. Moura, L. Formigas, vagabundos e anarquia: ensaio sobre a vida artificial, arte e sociedade. Ed. AAAL – Alife Art Architecture Lab. Lisboa. (2003)
12. Freire, P. Pedagogia da Autonomia: saberes necessários à prática educativ*a*. Editora Paz e Terra. Rio de Janeiro. (1999)
13. Freire, P. Sobre educação (diálogos), Rio de Janeiro, Paz e Terra. (1984)