Knowledge Management Model for the Integration of ICT into the Curriculum of a Bilingual School in Cartagena, Colombia

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Abstract
This paper presents the design of a knowledge management model to promote ICT integration into the curriculum of a bilingual school in Cartagena, Colombia. It followed a mixed research methodology, combining documentary and descriptive research. The steps followed in the methodology were: 1) PEST Analysis - Use of ICT in Colombia. 2) Design of the Knowledge Management Model.
3) Validation of the model. The implementation of the model will allow the school to strengthen its teaching – learning processes, the school staff will develop skills in using ICT, it will promote acquisition of technological forefront relevant resources and it will create competitive advantages for the school, confirming the importance of implementing knowledge management in organizations.

**Keywords**: Strategic Management, Knowledge Management, Information and Communication Technologies, Curriculum, Competitive advantage

### 1 Introduction

Information and Communication Technologies (ICT) are a vital factor in the transformation of the global economy and the rapid changes that are taking place in society. In the last decade, new ICT tools have produced a profound change in the way individuals communicate and interact in different scenarios. They also have the potential to transform the nature of education as to where and how the learning process occurs, as well as to introduce changes in the roles of teachers and students [1]. On the other hand, education has also evolved a lot in the last decades; being more and more concerned about inserting media in their processes [2].

All of the above is causing a mismatch or imbalance of the educational systems that have existed until now. Schools, as educational institutions are characterized by the slow introduction of changes within their structures. In the context of information societies this peculiarity constitutes an authentic maladaptation to the training needs and organizational demands, due to an environment in continuous movement and transformation. The school network, in broad lines, does not have the necessary technology, yet and continues to develop, in many classrooms and centers, a model of traditional cultural transmission, typical of the nineteenth-century traditional school. The structures of the formation must evolve in turn from the conception destined to instruct for an industrial society to teach in and for an information and knowledge society [3].

In this way, ICTs are an essential element in new contexts and spaces of interaction between individuals. These new spaces and social scenarios have diverse features that create the need for analysis and reflection about their characteristics. Within this new society, the educational spaces are also in constant transformation, the new educational instances have been reflected in virtual learning centers. However, these new scenarios require a reflection on the use and incorporation of technologies; current educational contexts should be committed to a critical integration, in which the what, why and what for their incorporation and use is defined [4].
Therefore, educational institutions must assume a leadership role in the transformation of education, or be left behind in the path of incessant technological change. For its part, in order for education to fully exploit the benefits of ICTs in the learning process, it is essential that teachers know how to use these tools. In this sense, educational institutions should lead training programs in regard to new pedagogical methods and new learning tools, as stated by Khvilon & Patru [1].

In order to achieve the critical use of technologies and to reconfigure these new educational scenarios, the teacher and all the actors involved in these processes require training and continuous improvement, where technologies are another means, not the ultimate goal, generating different methodologies, transforming the organizational structures and generating motivational dynamics, the shift towards a critical, didactic and pedagogical use of technologies [4]. In relation to this Aguaded & Tello [5] state that the teaching profession is experiencing important changes in recent years, motivated among others, by the integration of ICT in the teaching practice, leading to raise new educational, methodological and management challenges and that new teaching-learning environments are appearing in educational centers; constituting teacher training in a key element.

From this perspective, schools see in knowledge management: 1) A strategy that will allow them to achieve the objective of developing in their teachers computer skills for the integration of ICT into the curriculum; understanding computer competence as “the set of skills acquired in the computer field that enable the subject to interact with the computer in such a way that it is capable of, in addition to recognize and identify its parts, covering personal, academic and / or professional objectives by using specific software to manage information, communication and problem solving” [6]. And 2) A process in which there is an intentional development of a competence of the people and the organization, as an innovation supported by an interactive process of learning in which those individuals involved increase their competence while they occupy themselves of innovation, which will allow them to create competitive advantages.

Cabero (2007) suggests some measures that can facilitate the insertion and incorporation of ICT in the curriculum, among them: 1) that they are present in the centers themselves, and that they are not in a testimonial form but are incorporated within the nearby physical environments of teaching; and 2) that specific centers be created which produce learning objects that are made available to all students and teachers [2].

There are many theorists of Educational Informatics who have dealt with the concepts of design and curriculum development. However, they do not tend to apply these concepts to their proposals and daily practices with ICT [7]. Jacobs proposes a cycle of five options for curricular integration, starting with designs based on discipline and parallel designs, to continue with those multidisciplinary,
interdisciplinary and integrated ones [8] [9]. For his part, Fogarty begins from the model proposed by Jacobs and proposes a model consisting of three areas of curricular integration: Integration within a discipline, integration through disciplines, and integration into the mind of the learner. All three necessary areas to fully integrate the curriculum [10] [11].

By combining the proposal of Jacobs and Fogarty, the notion of knowledge management is a response, both theoretical and practical to the needs of the knowledge era and the explosion of information. Knowledge management is understood as the technique that uses the information and knowledge that is provided, produced and inherent to an organization or institution, to improve its performance [12]. In this way, knowledge management is a concept applied in organizations that involves the development of the necessary skills within them to share and use it among its members, as well as to assess and assimilate it if it is outside of these. It has the purpose of transferring knowledge from the place where it is produced to where it is going to be used [13].

Many authors have talked about knowledge management, defining it as: 1) The process that continuously ensures the development and application of all kinds of relevant knowledge of a company in order to improve its problem-solving capacity and thus contribute to the sustainability of their competitive advantages [14]. 2) The acquisition and use of resources to create an environment in which information is accessible to individuals and in which individuals acquire, share and use that information to develop their own knowledge and are encouraged and enabled to apply their knowledge in benefit of the organization [15].

Therefore, an efficient appropriation and management of ICT, in light of the new vision of learning processes, requires an integrated approach that helps to guide educational policies, the organization of the institution, resource materials and actors involved [16]. A knowledge management model responds to this requirement.

2 Methodology

To carry out this research, a mixed research methodology was followed, combining documentary and descriptive research. The stages that were followed are: 1) PEST analysis of the use of ICT in Colombia. 2) Design of the Knowledge Management Model. 3) Validation of the model.

3 Results and Discussion

3.1 PEST analysis of the use of ICT in Colombia

A PEST analysis studies Political, Economic, Socio-cultural and Technological factors of the macro-environment of an organization. The results of the PEST
Analysis of the use of ICT in Colombia from 2008 to 2015 is shown in Table 1:

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<th>Factor</th>
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<td><strong>P</strong></td>
<td>Colombian government is aware of the prevailing need for knowledge management in the field of ICT in the country, in order to achieve their integration not only to education but to the daily life of Colombians. That is why, since a few years ago, the government has been working on different programs that allow Colombia to reach the standards of other countries in terms of use of ICT, connectivity and massive Internet. The most relevant ICT policies in Colombia are: 1) Plan Vive Digital Colombia. 2) National Science, Technology and Innovation Policy. 3) National ICT Plan. 4) MINTIC. 5) Compartel Program. 6) Computer Program to Educate. 7) Ministry of National Education. 8) Total Connection-National Educational Network [17].</td>
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<td><strong>E</strong></td>
<td>The economic outlook of the ICT sector in Colombia is closely related to the dynamics of GDP (Gross Domestic Product). For the ICT sector, Transport, Storage and Communications branch is identified, from which the economic activity of mail and telecommunications emerges, which is finally the criterion that measures the contribution of the ICT sector to GDP. Mail and Telecommunications covers activities related to national postal, telephone and radio and television services, which are identified according to the International Standard Industrial Classification of all economic activities that are an international reference given by the United Nations (UN) and adapted for Colombia by the National Administrative Department of Statistics (DANE). The ICT sector presents an increase of 32% in the added value of the Colombian economy from 2009 to 2013. In 2014 - 3T, the Mail and Telecommunications activity contributes 0.12 to Colombia's economic growth of 4.2 [18].</td>
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<td><strong>S</strong></td>
<td>ICT user in Colombia has shown a growing interest in its appropriation, evidenced by the positive evolution of ICT expense and services such as SMS and the connection to social networks. To turn this tendency into an opportunity, it is necessary to reduce the access deficit in Colombia. This shows that the globalization of the Internet access service requires permeating the social strata belonging to the base of the pyramid in this country. The insertion of these citizens into the information society requires special policies which aim to remove the barriers faced by sectors with lower purchasing power. Faced with this challenge, the ICT regulator in Colombia has as a central axis of its work the generation of regulatory frameworks consistent with the new reality of convergence, in such a way that barriers to competition are removed and investment is encouraged, so that users can access more and better services.</td>
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<td><strong>T</strong></td>
<td>Colombia has universal coverage (100%) in terms of access by both fixed and mobile telecommunications networks. The good development of the wholesale data transport market, with a view to the recognition of data services and access to the Internet as enhancers of the ICT sector development and, in particular, to the challenge of increasing access to broadband Internet, requires a large measure of the future deployment of the national fiber optic backbone to areas of the country that do not have this type of infrastructure yet, as well as the deployment of 4G high-speed mobile technologies. The phenomenon of stagnation of traditional telecommunications services (fixed and mobile voice, radio and television) contrasts with the behavior of Internet access services, since the latter are the link that will leverage the growth of the ICT sector in Colombia. The capacity of broadband growth in Colombia may be slow down because the lower the strata of the population, the lower the level of subscription to telecommunication networks. The market for content and applications is in an incipient state and it can become a sectorial dynamic in itself, so that its promotion will surely trigger new sources of income and opportunities [19].</td>
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Table 1: PEST Analysis of the use of ICT in Colombia 2008-2015.

### 3.2 Proposed Model

As a result of this work, a Strategic Knowledge Management Model for the integration of ICT into the curriculum in a bilingual school in Cartagena, Colombia has been designed. It is a model consisting of five phases as shown in Figure 1.
Table 2 describes each phase of the model.

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<td>1 – Organizational Knowledge Capture - Strategic Management and Planning</td>
<td>This first phase of the model aims to capture knowledge of the organization through the following tasks: 1) Form an ICT committee: task led by the principal of the school. The members will be: the school principal, the principal’s assistant, the Administrative Director, 1 internal adviser and trainer, role played by the Head of the ICT Academic Department; 1 external trainer; 1 ICT support advisor, role played by the Head of Systems; the librarian; 3 representatives of teachers, one per section (Pre-school, Primary and Secondary), 1 student representative; 1 parents’ representative, chosen by the Parents Association. 2) Make a diagnosis of the current situation of the use of ICT in the school through a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis and the Sullivan Matrix, both carried out by the ICT committee.</td>
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<td>2- Knowledge Base Creation - Staff Professional Development Management</td>
<td>This second phase of the model aims to create a knowledge base through the following actions: 1) Survey of teachers to determine their level of competence in the use of ICT. 2) Survey of teachers to determine the level of use of ICT in their teaching processes. 3) Classification of teachers into three groups: Basic, Intermediate and Advanced; according to the result of the surveys. 4) Determination of training needs for each group of teachers. 5) Preparation of a training plan for each group of teachers. In this phase knowledge is tacit.</td>
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<td>3- Knowledge Externalization - Curricular Development Management</td>
<td>In this third phase knowledge is transferred among the members of the staff (coaching is implemented), new ideas are built and transformed through innovating practices using ICT integrated to the curriculum. The tasks performed are: 1) Preparation of an individual training plan for the integration of ICT in curricular development. 2) Survey of students to determine the level of use of ICT in their learning processes. 3) Preparation of a coaching plan among the staff members. 4) Study of best practices of use of ICT in education. In this phase knowledge is tacit.</td>
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<td>4 - Knowledge Association - ICT Resources and Infrastructure Management</td>
<td>This fourth phase of the model aims to make an association between the knowledge of ICT experts and staff members’ knowledge. Knowledge is explicit. The following tasks are carried out: 1) Preparation of an inventory of ICT resources in the school. 2) Analysis of trends in the use of ICT in education today. 3) Analysis of the technology available in the country or that can be acquired. 4) Preparation of a plan to acquire ICT resources.</td>
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<td>5- Knowledge Strengthening - Self-Assessment and Continuous Improvement Management</td>
<td>The aim of this phase is to assess the process of integrating ICT into the school curriculum by an analysis of the actions taken and the results obtained to develop an improvement plan. Best practices of the use of ICT in education are studied and introduced in the curriculum development. In this phase, knowledge is explicit, can be documented and shared with all the members of the school.</td>
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3.2 Validation of the Model

Today, school is required to educate its students for life; to train new generations in a context of technological and economic transformations, with processes that extend to all stages of life. That means to train in the values of collaboration, solidarity, tolerance, acceptance and coexistence. Knowledge management and learning for life are two demands that the knowledge society poses to the school.

Understanding knowledge management as the intentional development of competence in both people and the organization, that is, as an innovation supported by an interactive process of learning in which those individuals involved increase their competence while dealing with innovation at the same time, it can be stated that innovation in knowledge management can be represented as a repetitive cycle, as illustrated in Figure 2.

![Knowledge Management Cycle](image)

Figure 2. Knowledge Management Cycle [20]

Knowledge management strategy will allow the institution to create a process in which some individuals learn from others, through an interaction between them. Because of the diversity of cultures of this school staff, the training acceptance and receptiveness of many of them increases considerably when it comes from people who share the same culture and / or teaching area, because they find it more contextualized. It is for this reason that this strategy is more relevant than a general training program, which has been implemented for a long time and has not produced the level of acceptance or development of skills desired in the staff.

3 Conclusions

A knowledge management model to carry out the process of integration of ICT into the curriculum in this school was adopted due to the advantages it offers, as it is an intentional development of a competence of people, in this case teachers, and the organization, through an interactive learning process in which those individuals involved increase their competence while they are engaged in innovation, within a repetitive cycle framework: creation, discovery and capture of knowledge, then storage, systematization and organization, later appropriation,
use and maintenance and finally transfer, dissemination and generalization of knowledge, all this phases protected by a self-assessment phase to ensure the organization continuous improvement. Implementing model will allow the institution to generate competitive advantages in the market, since it tends to enhance its teaching-learning processes, the development of competences in the use of ICT in staff and an increase in the satisfaction level of all the members of its community.

References


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