# The Use of Information and

# Communication Technologies in

# Educational Institutions

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## Abstract

The objective of the research was to analyze the use of ICT in educational institutions in the department of La Guajira, Colombia. This allowed evaluating the aspects that influence the use of ICT in the teaching-learning processes that the teacher implements in their classes. Therefore, the research was classified as descriptive, carried out in 17 institutions in 15 municipalities of La Guajira, through the application of Likert questionnaires. There were moderate shortcomings regarding the appropriation of technologies for teaching teachers, in addition too little implementation of technological tools such as chat, email and webcast, due to its impact on the learning process. The results served as a reference to determine strategic guidelines, optimize the teaching-learning process and provide students with comprehensive training, according to the real needs of the environment.

**Keywords**: Technological management, ICT, educational institutions

## Introduction

Technological management considered a management discipline [1], has evolved from its beginnings as research and development processes to processes of innovation, operation and strategy, key elements for the achievement of a competitive advantage in organizations [2]. Technological management and the development of new technologies have allowed the emergence of ICTs, which help solve problems and impact their applications in various fields. Taking into account the above, applications such as: transport in relation to the operation and administration of networks, information and guidance for users, and in the operation and management of freight transport systems are enunciated [3]; in the case of occupational therapists in Australia, with the development of a model for knowledge of the factors that contribute to the acceptance and use of ICT [4]. The contribution of ICT solutions for environmental sustainability in tourism activities [5]; as well as, the impact on the promotion and management of reserves in the tourism sector [6]; the evaluation of the use of ICT in the workplace and its relationship with the stress levels of the workers [7]; in the field of agriculture in developing countries to provide information on areas, problems and solutions [8]; and the effects on business organizations depending on the type of technology used [9]. In the field of education, there are studies that reflect the importance of the use of ICT in the achievement of educational management objectives [10]; evaluation of virtual educational technology for blog format [11]; review of factors associated with the use of learning technologies in a faculty of education [12]; factors that influence the decisions of teachers to use ICT in the classroom [13] or the provision of a prescriptive guide to identify the current challenges of higher education institutions [14]. Similar applications with the use and the way people relate to systems and that refer to the use of ICT in educational institutions, are found in works on the factors that affect the adoption of ICT by teachers [15]; as well as research on the obstacles in the effective implementation of ICT in education in Bangladesh [16]; and how to improve the effectiveness of the educational process in physical education in institutions of higher education through the development and application of ICT [17]. Taking into account the above, which demonstrates the usefulness of ICT in the field of education, the objective of the research is to analyze the use of ICT in educational institutions in the Department of Guajira, Colombia. The results will be useful for the directives of educational institutions, who by knowing opportunities and strengths can make more accurate decisions and determine objectives and goals for technology management.

## Study Development

The present investigation was descriptive in that it analyzed the use of ICT in the educational institutions of the Department of La Guajira. The design is characterized by being field, which is defined by [18], who states that it consists of obtaining information through the people investigated without altering the variab-

les. In reference to the approach of the population understood by [19], as the set of persons or objects to which the results of the research are going to be referred, in this case it was made up of the total of educational institutions of the Department of La Guajira, which amount to 213, distributed in 15 Municipalities, as follows: Riohacha 86, Maicao 14, Uribia 25, Dibulla 9, Manaure 16, Barrancas 8, Fonseca 9, Villanueva 6, San Juan del Cesar 16, Distracción 5, El Molino 2, La Jagua del Pilar 2, Albania 7, Hatonuevo 5, Urumita 3.

Once the population under study was identified, the sample was determined, which refers to the specific segment of the population from which the information will be extracted; in this case, the type of sample is intentional, where information was collected arbitrarily, taking into account different criteria analyzed. According to [20], the sample of intentional non-probabilistic type does not depend on the elements of probability, but on causes related to research; for the purposes of this research, a non-probabilistic sampling of intentional type was applied, while the selection of the analysis units comprised a set of established criteria, highlighting in the first instance the ease of access to information, geographic location and educational institutions in the capitals of each municipality. According to the above, three educational institutions of Riohacha were chosen as a sample, and for each municipality, it was applied to an educational institution, having in all 68 key informants (Table 1).

Table 1. Characterization of key informants

| Key informants | Profile | Quantity |
|---|---|---|
| Teachers | Teachers of the computer science area | 1 |
| | Teachers from other areas | 1 |
| Academic directives | Rector | 1 |
| | Teacher Director | 1 |
| Total of key informants for educational institutions | | 4 |
| Total key informants | | 68 |

The technique used for data collection in the study was observation, which is defined by [21] as the process by which certain existing risks are perceived in reality by means of a previous conceptual scheme. Likewise, the survey technique and the questionnaire instrument were applied. For the purposes of the research, an integrated triangulation was carried out in the first instance by the survey as a technique and the questionnaire as an instrument for data collection. The latter, consisting of 30 items referred to the variable use of ICT, with a Likert scale and five response alternatives (Table 2).

Table 2: Weighting of items in the questionnaire

| Items weighting | Scale | Range | Abbreviation |
|---|---|---|---|
| 5 | Always | $4.28 \geq X \leq 5.00$ | A |
| 4 | Almost always | $3.46 \geq X \leq 4.27$ | AA |
| 3 | Sometimes | $2.64 \geq X < 3.45$ | S |
| 2 | Almost ever | $1.82 \geq X < 2.63$ | AE |
| 1 | Never | $1.00 \geq X < 1.81$ | N |

Each answer alternative was assigned a numerical value, which was totaled at the end, to obtain the total score, adding the scores obtained in relation to all the statements. Likewise, direct observation was applied, through an observation guide as an instrument, consisting of 30 items, corresponding to the aspects to be evaluated to measure another approach to the study variable. Finally, both techniques were contrasted with the purpose of complementing the perspectives of the use of ICTs and defining the situation of educational institutions with respect to the variable studied.

On the other hand, the designed instrument was subjected to a validation process through the judgment technique of five experts, which allowed establishing that the instrument is relevant for its application to the selected sample. Likewise, the reliability of the instrument, a pilot test of the measurement instrument was applied, its procedure involved selecting a small sample, inferior to the definitive sample, which was made up of 10 subjects (with similar characteristics). To determine the reliability of the instrument, it was calculated using the Cronbach's Alpha method:

$$rtt = \left[\frac{k}{k-1}\right]\left[1 - \frac{\sum_{i=1}^{k} S_i^2}{S_t^2}\right] \tag{1}$$

Additionally, to characterize the reliability value of the instrument, a scale was developed: Very low is between 0.01 and 0.20, Low is between 0.21 and 0.40, Moderate is between 0.41 and 0.60, High is between 0.61 and 0.80 and Very high is between 0.81 and 1.0, where ranges were established and categorized, in order to interpret the result obtained from the calculations of the same.

The instrument produced as a result 0.764 to the TIC variable, which means, according to the result obtained in the application of the pilot test, that the instrument has a high reliability range.

## Results and Discussions

The results corresponding to the variable Use of ICT, according to the dimensions of the types of technologies are presented in Table 3.

Table 3. Evaluation of the variable Use of ICT

| Dimension | Indicators | Always | | Almost always | | sometimes | | Almost never | | Never | | Average | Deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | | |
| Types of technologies | Soft | 8 | 12 | 34 | 50 | 18 | 26 | 6 | 9 | 2 | 4 | 3,58 | 0,9 |
| | Hard | 6 | 9 | 53 | 79 | 7 | 10 | 1 | 1 | 1 | 1 | 3,95 | 0,4 |
| | Key | 0 | 0 | 28 | 41 | 37 | 55 | 3 | 4 | 0 | 0 | 3,37 | 0,5 |
| | **Average** | **5** | **10** | **38** | **54** | **21** | **30** | **3** | **5** | **1** | **1** | **3,63** | **0,6** |
| Technological Tools | Internet | 3 | 5 | 58 | 85 | 7 | 10 | 0 | 0 | 0 | 0 | 3,94 | 0,3 |
| | E-mail | 0 | 0 | 7 | 10 | 55 | 81 | 6 | 9 | 0 | 0 | 3,00 | 0,4 |
| | Chat | 0 | 0 | 0 | 0 | 0 | 0 | 68 | 100 | 0 | 0 | 2 | 0 |

Table 3. (Continued): Evaluation of the variable Use of ICT

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Webcast | 0 | 0 | 0 | 0 | 68 | 100 | 0 | 0 | 0 | 0 | 3 | 0 |
| | **Average** | **1** | **1** | **16** | **24** | **33** | **47** | **18** | **28** | **0** | **0** | **3** | **0,1** |
| Barriers of Appropriation | Knowledge | 0 | 0 | 13 | 19 | 50 | 74 | 5 | 7 | 0 | 0 | 3,11 | 0,3 |
| | Competencies | 0 | 0 | 11 | 15 | 55 | 81 | 2 | 4 | 0 | 0 | 3,12 | 0,4 |
| | Resistance to change | 1 | 1 | 13 | 18 | 40 | 60 | 14 | 21 | 0 | 0 | 3,00 | 0,6 |
| | **Average** | **0** | **0** | **12** | **18** | **49** | **72** | **7** | **10** | **0** | **0** | **3,08** | **0,4** |

### Dimension: Types of technologies

In relation to the observed analysis, it was shown that it coincides with [22], when he explains that soft technologies are those in which their product is not a tangible object, such as services that seek to improve the functioning of institutions or organizations for the fulfillment of their objectives. Likewise, [23] confirm in their study on the use of ICT in the educational process of the technological baccalaureates of Oaxaca (Mexico), that they represent a means of support for work in the classroom and a monitoring tool to the development of the academic practices of the students.

### Dimension: Technological tools

According to the evidenced analysis, [24] conclude in their study on the pedagogical strengthening in the universities through the TIC, that its use is more oriented to the use of devices and resources such as electronic mail, computer or internet, follow-up of the tasks related to its pedagogical function in an asynchronous way, and it does not seem to be directed to the strengthening of competencies related to e-research or the generation of learning networks.

### Dimension: Barriers of appropriation

The results show a relationship with the study by [25] on the use of ICT as a didactic resource in the teaching-learning processes, finding that there is widespread knowledge of ICT as a teaching resource by teachers and students, but they do not know the adequate utility for the different moments of their work and training process. Similar results were obtained by [26] that conclude that the introduction of ICT resources does not displace traditional resources, but that they lead to hybrid or mixed models, in which both types of resources coexist. Also, in the study of [27], it is concluded that the perception of a student more competent than the teacher in the use of ICT, often generates feelings of insecurity in the teacher and even rejection of the use of these in the teaching and learning processes.

### Triangulation

For research purposes, an integrated triangulation was performed in the first instance by direct observation, the survey as the data collection instrument and the opinion of the researchers as shown in Table 4, Table 5 and Table 6.

Table 4. Comparison of Results: Types of technologies

| Indicator | Direct observation | Survey | Investigator's Trial |
|---|---|---|---|
| Soft | It was noted that the institution recognizes that this tool is required to meet its objectives. | It was demonstrated through the collection of data that seeks to obtain competitive advantages in some intangible processes for the management of technological tools. | The result is favorable for the mastery of soft technologies to be applied by the teacher in the institution. |
| Hard | It was shown that there are tools for daily use in the institution that correspond to this indicator | As evidenced, the tools and technological equipment have a high use for educational purposes by teachers | It was considered necessary to corroborate that the use of the equipment is pedagogically correct |
| Key | The expositions and expectations of the institution must be verified in an integral manner to obtain the result that requires | It was evidenced that not always the management of the technologies adapts to the needs of the institution | All expectations of operation and use of the equipment must be fully met to guarantee trust in the institution. |

Table 5. Comparison of Results: Technological Tools

| Indicator | Direct observation | Survey | Investigator's Trial |
|---|---|---|---|
| Internet | Interactivity is taken into account in the processes carried out in educational institutions. | Communication by electronic means is a priority to adapt to technological changes | It is necessary to know the search shortcuts for research, and obtain better results. |
| Electronic Mail | The computer is used in the different areas of the institution, for the control of activities | High management and knowledge of electronic communication, important decisions are made by this way of connection | It is required that the institution handle the use of electronic mail in an institutional way, since it has a high personal use with the student body. |
| Chat | Online interaction is considered fairly useful for the activities that are carried out | Less use has been made of this electronic format despite its rapid communication | Expectations are not covered in reference to the use of this tool, so it is considered that information about their uses should be updated. |
| Webcast | There is a deficiency in the existence of devices that facilitate the use of audio and video for presentations | It is a key factor for the presentation in person and has a high weakness in its use | It is a presentation that is not having an adequate knowledge, it was evidenced lack of equipment for its use |

Table 6. Comparison of Results: Barriers of Appropriation

| Indicator | Direct observation | Survey | Investigator's Trial |
|---|---|---|---|
| Knowledge | They are not prepared to acquire the necessary information of the required technologies. | Resistance to knowledge was observed, due to the medium acceptance shown in the survey | Expectations that still exist must be solved through internal discussions about their use |
| Competencies | It was evidenced the lack of belonging in those responsible for issuing the information. | No commitment was observed with the students to deepen more the learning by means of technologies. | The technologies used can still be used, for the internal and external benefit of the institution |
| Resistance to change | It is considered that traditional methods are still present and are a critical factor for technological advancement. | There is a high degree of discomfort in educational facilitators, with ICT. | Keeping teachers updated with the technology would reduce the doubt about its use. |

For the analysis of the indicators by means of direct observation, the similarity they have with the reality raised in the survey is highlighted, which indicates that the results of the triangulation complement the information on the use of ICT in edu-

cational institutions of the Department of Guajira, Colombia. In reference to the Technology types dimension, direct observation was corroborated by the result obtained by the application of the instrument, which shows that the institution has the virtual resources to develop ICT, although they need to reinforce areas to achieve better results. In the analysis of the dimension Technological tools, there are considerations that are evident in direct observation and are based on the result of the survey. In the case of the webcast, it was evident in the direct observation that not enough equipment was found within the institution to carry out these activities, for which the result obtained is below the study's expectations.

Finally, for the dimension Barriers of appropriation, it was evidence that there is a level of knowledge in reference to the topic. However, the belonging of these technologies was not evident in the results, and they do not apply in the classrooms although they recognize that it is necessary.

Taking into account what has been described, it is evident that the development of society demands a progressive incorporation of ICTs in education and its processes, because they must serve as a link and interaction between the actors in the community. From this perspective, teachers are required to be aware of the need to be timely and innovative in the development of their areas. It is also significant to note that ICT allows teachers to perform different tasks more easily, which provides satisfaction for the effective progress of the process of adaptation and use.

With the results of the triangulation obtained, strategic guidelines were proposed (Table 7), to strengthen the use of ICT in educational institutions. This proposal is adapted to the real needs that were detected in the institutions of the Department of La Guajira, Colombia.

Table 7. Strategic guidelines for the appropriation of ICT

| Dimension | Guidelines | Strategies |
|---|---|---|
| Technological tools | Educate the teaching staff about the impact that ICTs has achieved in education, incorporating the legal framework that exists related to these technologies | - Knowledge through reflective reading about achievements. <br> - Confront knowledge among teachers and produce their diagnosis |
| | Provide support to teachers, to acquire a detailed knowledge about the technological tools that make up the ICT regarding the use of computers and computing environments such as: equipment, programs and applications. | - Present demonstrations through facilitators, illustrations, digital slide projection. <br> - Show the use of equipment. <br> - Complementary readings. |
| Barriers to appropriation | Promote the internal use of ICT through the computers of the institution, for the search for teacher training and innovation in both the educational and administrative areas. | - Show with support of slides on the use and management of Multimedia tools. <br> - Propose practical activities on the Internet and special activities in the activities. |
| Types of technologies | Promote the development of personal growth activities to raise awareness about the incorporation of ICT in institutions (social networks). | - Promote self-esteem workshops and motivation to achieve and to better manage the types of tools that have ICT |
| | Develop plans for the evaluation and monitoring of the use of ICT | - Establish feedback systems within the institution. |

## Conclusions

The analysis on the use of ICT in educational institutions of the Department of Guajira (Colombia), produced the following conclusions: i) It is necessary to coordinate the training of teachers in the computer science area, to balance their teaching work with the virtual activities. ii) The soft and hard technologies are important, because it allows to dynamize the teaching-learning process and strengthens the academic level. iii) In relation to technological tools, teachers make continuous use of the Internet, however, they do not find a high educational value with email, chat or webcast. iv) The teacher uses ICT but only as a didactic resource. v) The results facilitate the formulation of strategic guidelines that allow strengthening the use of ICT in educational institutions.

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