

Digital Transformation and Big Data in Ecuadorian Journalism: Challenges in Academic Training and Professional Practice

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Purpose. The study of Big Data in the training of Ecuadorian communicators in response to the 4.0 demand lies in how Big Data has influenced communication work and how higher education institutions are responding to these new demands. The general objective of the research is to establish and identify the Big Data domain in Ecuador. **Methodology.** It was developed in a mixed paradigm, which started from a bibliographic review, where information available in repositories and libraries was considered; 724 surveys were applied under a simple random sampling, and an interview was conducted that corresponds to seven Big Data experts. **Results and Conclusions.** The results revealed a diversity of approaches and levels of adoption of Big Data among professionals, highlighting the need for greater understanding and training in these digital tools. It was concluded that, due to the age range of the respondents, it is understandable that digital skills have not been considered in the curriculum of social communication careers in the country. However, given the evident rise of the Internet and the proliferation of technologies, it is imperative to update the curricular grids so that the contents respond to contemporary demands. **Original contribution.** Based on this research, studies could emerge that focus on the integration of Big Data as an integral part of digital skills in related degrees, which can address various crucial dimensions.

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Introduction

The technological solutions provided by Big Data are fertile ground for the media and communicators, becoming a unique opportunity to generate useful and relevant content for society. Providing more direct contact between the media and their audience or users. Because it not only allows them to capture and understand their opinions, perceptions and interests in real time, but also facilitates the personalization of content, the reception and construction of new content, making the user the central axis of the network conversation.

Under this premise, it is understood that it is the user who, converted into (*prosumer*), gets involved in issues of public interest and manages to capture their attention, generating new content and impact on society. Therefore, it is necessary to adapt the formats to the new media and demands of the hyperconnected user. This milestone requires that the traditional media carry out a true convergence and exercise leadership on the Web.

This implies presence in digital social networks, and through hypermediality (video, photography, audios, articles, forums) and interactivity (commenting, sharing, participating), it can simplify the process of collecting, analyzing and interpreting that data, turning it into valuable online information for publications (news) in real time. Faced with this, social communication professionals require that their profiles contemplate technological knowledge, from their academic training.

The relevance of this research topic lies not only in the requirements of communicators but also in society, based on their interaction with these new data collection formats. In this context, this research proposes to study the Social Communication training programs of the three best-positioned universities in Ecuador, with the aim of evidencing the presence of topics related to Big Data in their curricula, and if there is a relationship, in the context of industrial demand 4.0.

Indeed, this article offers an approach to the Big Data phenomenon and its impact in the field of

communication; the topic is focused on analyzing the practices of the main media in Ecuador to identify if data journalism is carried out and to what extent they have digitized their platforms. Likewise, the curricula of the three universities in Ecuador with the best educational ranking are investigated to determine if Big Data is present in the training of Ecuadorian communicators.

Frame of reference

Journalism before digital technology

The need for information has existed since before digital technologies arrived, although freedom of the press did not always exist. In the past, the monarchy was the way society was managed, where the sovereign was the only one who could command and decide what to communicate to the people, his word being the law (González, 2020). The situation was changing and adapting, creating the executive, legislative and judicial powers of the State, established to maintain a balance in the well-being of the social majority; providing the population with the ability to intervene in the decisions that affect them, such as shared information about the events that occur in their locality and even worldwide.

Society continues to evolve and the opinion of the public becomes indispensable and its need to obtain real, truthful and transparent information increases; it is where the fourth estate (media and press) enters, with influence on the social and political affairs of a nation, its function being to monitor the actions and transparency of the three powers, creating a balance for the benefit of the population (Malo, 2022). Such has been the reach of traditional media and journalism even before digital technologies, that journalistic bulletins and magazines were created in educational institutions, leading to the appearance of abundant literature on the main events at the educational level and with relevance in the student community; through a group of students selected for their research skills; with an inclination for journalism, continuing the profession with their university studies in most cases (I. Fernández et al., 2018).

Evolution of journalism and the media

Twenty-first century journalism conditioned to an information society focuses on multimedia content that is the one that supposes a genuine interest in the topics, questions, design, journalistic ethics of the new

generations (Behar, 2021), so its evolution is constant and they are being reinvented according to technological advances and innovations that arise on the network as tools and services that add value to the information they produce and become more attractive.

Therefore, the media have a relevant part in the life of every individual, they have been evolving from their beginnings to the present, trying to stay at the forefront along with society, which is why according to specialists in the area they have had a hard job to define them (Sánchez, 2015); rather, they recognize their objective and purpose, which is to obtain information, edit it and transmit it massively to the population.

Market segmentation and expanding their potential market is one of these possibilities, it makes it easier for information professionals to communicate in shorter times and sometimes immediately while the news is developing, reducing production costs and increasing revenues (Fransi et al., 2017); becoming a business that is associated with the digitization of information through media content (Pérez, 2023).

Evolution of journalism and the media in Ecuador

Communication had its beginnings, as in other communities since its most primitive ancestors, as a human need that has been increasing and developing on different fronts, with the sole purpose of keeping people aware of how society was doing at an economic and social, as well as political and religious level. Journalism has played a fundamental role in shaping public opinion and denouncing injustices since the time of independence, becoming a tool to monitor and control public powers in the political sphere.

It has been used to monitor government actions and denounce corruption and abuse of power. In addition, it has served to give visibility to the social and political reality of the country, serving as a place to discuss, denounce, and reflect on the challenges faced by Ecuadorian society. Consequently, journalism has evolved throughout history, they are transmitters of relevant news in all aspects; and after that, as the relevance of the media is recognized, they began more formally the conduction, production, and dissemination of content, giving priority to narrative and having clear thematic axes (Morejón & Zamora, 2019).

Journalism from the digital context

Newspapers, radio and television are recognized as traditional media, that is, those that have accompanied people since the beginning of journalism and have spread throughout the planet on a massive scale. For most people, including multinational companies, the Internet was considered a passing fad, which over time would lose interest and return to the traditional; a situation that was far from reality since the digital era is here and is here to stay, being in this way where journalists, companies and users in general have had to adapt to stay in the medium (Pérez, 2023).

These technologies are also evolving rapidly to such an extent that they have ended up laying the foundations for the discovery of the use of the Internet, which marks a milestone in the way journalism is done. The great difference that exists between the traditional media press and the one made by and for the Internet is the lack of limits, in addition there is no adequate articulation in the formats, simply the audience increases and becomes more diverse than they are used to, therefore it is a new world and they are beginners when making news (Rolando, 2017)

It is clear that not everything has been positive, since the adaptation of journalism to the digital era produced a direct impact on traditional media, in addition to the wide audience and magnitude that the network handles, consolidating its presence on the networks immediately, continuously and often requires being attentive to reputation management (Pérez, 2023).

Media in the digital context

The Internet in the twenty-first century became a powerful means of communication, its penetration in society reached high levels since its inception, increasing to such an extent that they have millions of users around the world, a figure that is increasing. "Digitalization is a factor that has marked a before and after in the media" (Bravo et al., 2021, p. 186). Interactivity and multimedia have become a priority, with a focus on the user and the use of Internet languages to redesign the Web experience. The explosion of social networks and the adoption of multiple platforms have led to greater interaction and global reach, generating a significant increase in media traffic and audience.

In addition, the development of digital applications has allowed easier and faster access to news, as well as

to other entertainment and sports sections, attracting the attention and loyalty of users. There are practices on the Web that are used to generate greater visits, being one of the basic characteristics for journalism in the digital context; since the more audience content has, the more interaction it generates, this is achieved through novel titles and eye-catching content, thus appealing to the curiosity of readers to access their website (Bravo et al., 2021).

Digital journalist profile

This new professional profile presents two types of journalists that, according to Gonzáles et al., (2016) are:

- **Traditional journalist:** It is the one who produces news for the traditional media (press, radio and television) and its digital versions.
- **Digital journalist:** It is the one who was born on the Internet, who has experience in cyberjournalistic writing and promotes this process of change worldwide. It is characterized by the use of new techniques such as hypertextuality, multimedia and interactivity.

In this context, the profile of the new journalist must have three fundamental values to be considered a professional in the field, which according to Jaramillo (2019) are:

1. **Credibility:** In this profession, what has the greatest value is the career of the professional, consolidated in the signature of his journalistic note, this goes beyond a simple name, it commits the journalist to society by being the author of his note which arose after an arduous investigation, so he has verifiable sources, as well as the relevant evidence if it is the case.
2. **Rigor:** The journalist should never speculate, or believe or consider, much less give an opinion, manipulate or distort situations; but rather he must be sure of the story for which he resorts to an investigation of the event, in this way he will have the data, arguments and evidence necessary to corroborate the story: Objectivity, depth, rectitude and neatness.

Data journalism

Big Data

Data is created every minute of every day going unnoticed by people's eyes. Given the amount of

information circulating these days, it's tempting to talk about *Big Data* only in terms of size. For Gutierrez (2018) *Big Data* describes the massive avalanche of digital activity pulsating through wires and airwaves, but it also describes all the things that can never be measured before. Being the way businesses get insights in today's world.

With each status that is shared, each article that is being read on the Web, the images that are uploaded to social networks; they facilitate the creation of a digital trail that is self-designed to create individual stories of each user over the years. As there are millions of users who consume some of these services, it would be talking about data never sleeping, rather it is generated every minute.

Applicability of Big Data in Journalism

Big Data, being a set of big data that becomes complex due to its structure, requires specific applications for its correct processing, management and development; therefore, it does not maintain a specific definition since the volume of data is greater than 50 *terabytes*, which can vary between structured and semi-structured data. In such a way, since its establishment on the network, it has become popular, to such an extent that in some cases it is becoming indispensable due to its importance in business management (Gutiérrez, 2018).

In such a way, when journalism accesses information, it has to carry out the steps framed in the previous figure, in order to make the most of the truthful information that is kept on the Internet and avoid inconveniences or some type of demand. Applying the responsibility that journalists have during the creation and dissemination of data, since their contribution, although it is purely documentary, also requires the application of processes, methods, and even instruments during the analysis of the data, as well as extensive knowledge of the use of metadata on the internet (Cevallos, 2022).

Open Data

One of the cultures that has been promoted with technological progress is transparency within the information and communication environment; considering the irruption of several disruptive technologies, the influence of the open data

movement in some fields of knowledge is promoted (Sandoval, 2019). " *Open Data* and *Big Data* have transformed work in the media in a globalized informational world. It entails changes in the tasks of documentary filmmakers and journalists" (García & García, 2018, p. 77).

They must be complete, which they associate with all public data have to be kept available, as long as they are not subject to any type of privacy restriction or in their absence security, based on the law in force in each state. They have to be primary, because they must be available in all the primary sources that exist and that can be created over time, without having to go through any type of modification or processing; but rather preserve as they have been uploaded so that they are a reliable and verifiable source.

Big Data Opportunities in Social Communication

The opportunities presented by modern communication are innumerable, considering as a first instance the speed for the development of activities, in addition to the fact that thanks to technologies the communication sector has managed to position and generate more value for companies within this society that is increasingly interconnected within the digital era (Portales & Castañeda, 2019).

Big Data is one of the phenomena of the technological era, with the greatest influence on the communication sector, as it impacts business, journalism and also art; which is why organizations are increasingly motivated to incur in this new wave of information instead of investing in physical infrastructure (Seijas, 2016).

Methodology

This research is developed in a mixed paradigm, an approach that systematically integrates quantitative and qualitative methods in order to analyze the phenomenon under study from a holistic view (Chaves Montero, 2017). Consequently, depending on the researcher and the questions he or she asks, the research will take different forms. Ergo, a mixed approach according to Pole (2009) empowers the researcher to propose answers to questions that other paradigms cannot answer. The studies developed under this approach allow us to identify the various characteristics and modalities that a mixed design can adopt, according to the object of study and its context.

In this context, the research starts from a bibliographic review that will serve as a critical basis for the consolidation of criteria regarding the relationship between *Big Data* and Social Communication. The information available in repositories and digital libraries will be considered for the analysis of the impact of *Big Data* on the performance of the communicator, before and during his professional practice.

This study will describe the axioms and conceptions that have been developed regarding the use of *Big Data* in the field of communication, both from training in higher education institutions to professional practice, both the theoretical positions that contextualize the object of study and the academic offer of the main universities of Ecuador and their curricular meshes will be analyzed. The observation of the media *El Comercio* and *El Universo*, during the period January 2021 – July 2022, will allow the identification and evaluation of the use of *Big Data* in the Ecuadorian media. Bernard Berelson, sociologist and communication theorist, in his book "*Content Analysis in Communications Research*" (Berelson, 1952) proposes content analysis as a methodology applied to the transmedia discourse of the media.

This research technique is characterized by its objectivity, systematization and the quantification of qualitative data, in order to make logical deductions in relation to the phenomenon of study and its components. Bardin (1991) establishes three phases for the development of content analysis: One of the variables of the study is *Big Data* as part of the educational curriculum in undergraduate communication careers, it is therefore imperative to analyze the curricular meshes to determine if *Big Data* has been included in the programs and what is its impact on the academic training of future communicators.

In this context, the following universities are selected: San Francisco de Quito; National Polytechnic School and Pontifical Catholic University of Ecuador. In addition to being the three best universities according to the QS Ranking, their positioning makes them benchmarks of higher education in Ecuador at an international level, so the analysis of their academic offer and their respective curricular meshes will frame the research within the current educational context

A survey of Ecuadorian Social Communication professionals was developed and applied in order to carry out a comparative analysis of the management of *Big Data*, its application and labor requirements. The research was carried out considering all people immersed in the communication field as a population, it is important to emphasize that, although in Ecuador several networks of communicators, associations, movements, among others, have been consolidated. There are no updated or freely accessible statistics to consider a specific number of people who practice social communication. According to CORDICOM (2014), around 17,000 people practice this profession, while data from the Ministry of Education, Science and Technology (SENESCYT) indicate an average of 24,000 graduates in social communication for the year 2021.

Due to the characteristics of the context of the universe under study, it has been decided to carry out a simple random sampling, considering 19,000 communication professionals as a population, a figure obtained from SENESCYT and CORDICOM databases. Consequently, a statistical formula was implemented to determine the sample size in order to

optimize time and resources in the development of the research.

In this way, it has been determined to apply 724 surveys under simple random sampling, in which the only variable that has been considered for the person to be the object of study is that he or she works as a communication professional. Mercado and Coronado (2021) consider that, under a mathematical approach, simple random sampling is one of the simplest forms of sample selection, however, in practice it is one of the most complex techniques.

An interview was prepared that corresponds to the objectives of the research, questions that have been validated by experts in the field of communication and research. The selected sample is comprised of six experts in teaching and research. In order to substantiate the contributions of the research, it has been proposed to carry out seven interviews with teachers who are experts in *Big Data*. This will allow to contrast the information collected through interviews and content analysis, in addition to deepening the theme and establishing conclusions based on the context of the object of study and the criteria of the social actors involved.

Analysis of results

Ecuadorian communicators' perspective on *Big Data*

Figure 1.
Professional performance area

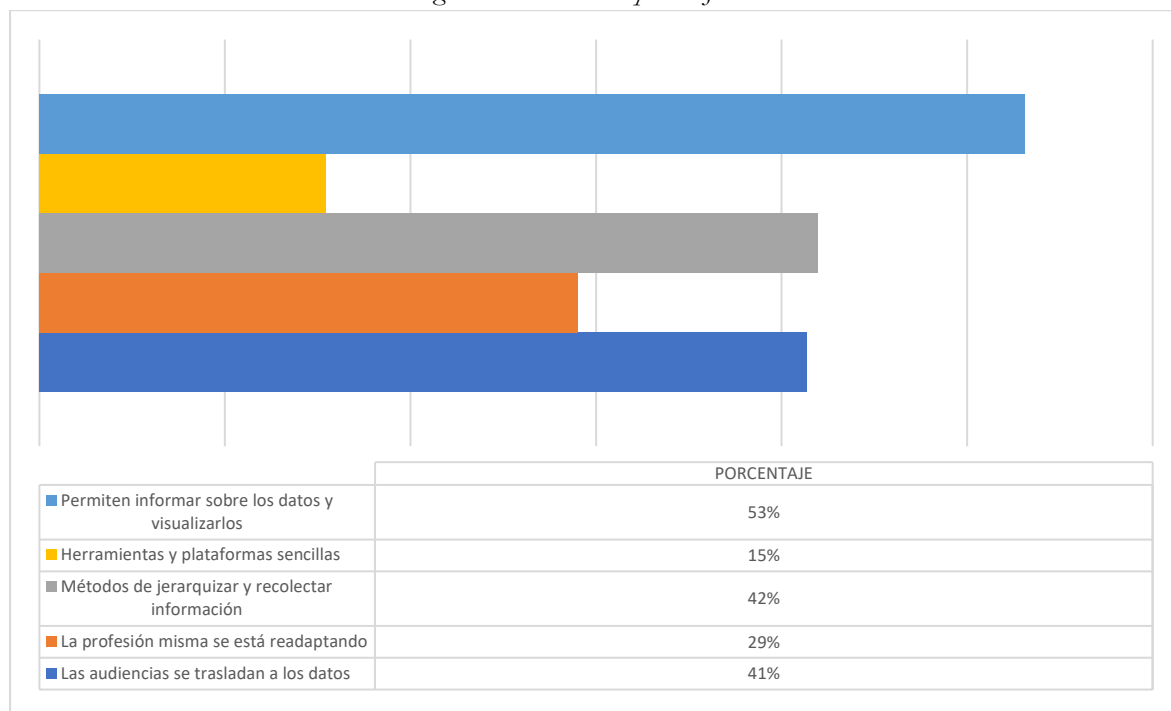
	PORCENTAJE
■ Infógrafo	1%
■ Editor	9%
■ Fotógrafo	3%
■ Diseñador Gráfico	4%
■ Productor Audiovisual	15%
■ Producto Radial	9%
■ Asesor y/o Consultor	5%
■ Reportero	4%
■ Periodista Independiente	10%
■ Periodista	17%
■ Community Manager	6%
■ Asesor Político, Cultural y/o Social	2%
■ Relacionador Público y/o Privado	5%
■ Docente	22%
■ Comunicador Institucional	24%

Note: Online Survey (2021).

A great diversity of areas of professional performance can be appreciated, although they all share a training in social communication, the possibilities of professional practice are extensive. Of these, the main ones are Institutional Communication, Teaching and Journalism, areas that are directly related to the object of study, which reaffirms the importance of data collection with this population. It is important to note

that communication is the cornerstone of society, not only from a media approach, but of all dialectical practices. Therefore, it is required that communicators receive contextualized academic training, that is, that in the chairs the subjects to be taught take into consideration the social, political and cultural contexts in which students develop.

Figure 2.
Big Data's Relationship with Journalism

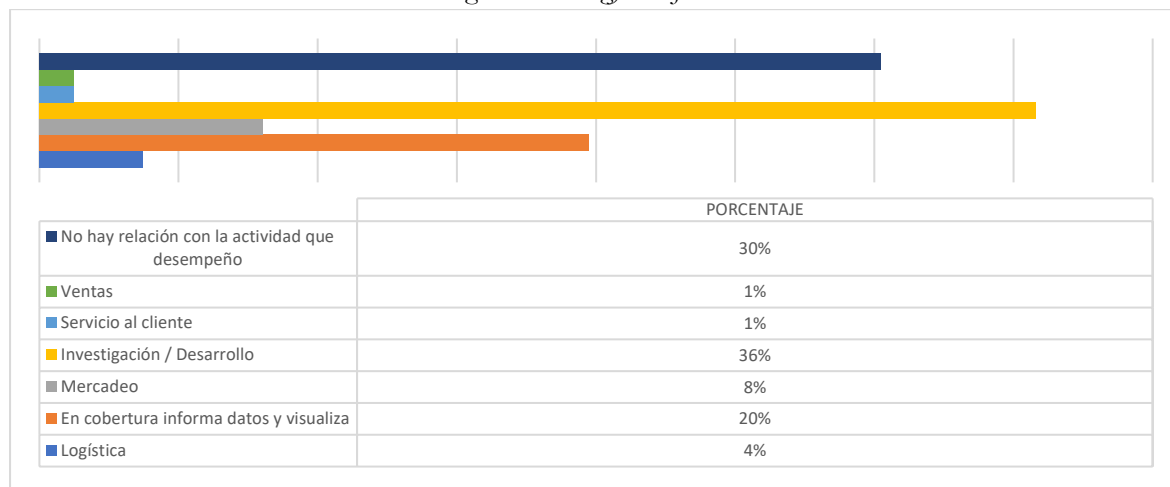


Note: Online Survey (2021)

The perceptions of the respondents are diverse, it is considered that *Big Data* allows reporting on data and visualizing it, in addition to providing methods for hierarchization and collection of information so that audiences can move to the data. The expert in *Big Data*, Colle (2013) considers that the analysis of big data has gradually acquired greater relevance and represents a fundamental element in the success of *mass media*. Since it can be applied from research or data journalism, to consumption management, that is, adaptation of content to the reader's devices (smartphone, PC, Tablet, etc.), therefore having trained personnel is essential.

Currently, data journalism takes advantage of the large volume of information available on the network and through ICTs these inputs are managed and processed. According to Bravo (2013), more and more websites or platforms are being created that host public and accessible data. Thus, according to Pérez (2015), *Big Data* is the tool that allows the transformation of information without processing revealing details and stores all this data, both structured and unstructured. In other words, *Big Data* in journalism also encompasses techniques that facilitate the effective handling, ordering, and analysis of large volumes of data, so that they can then be implemented in journalistic writing.

Figure 3.
Big Data Strategy and Journalism

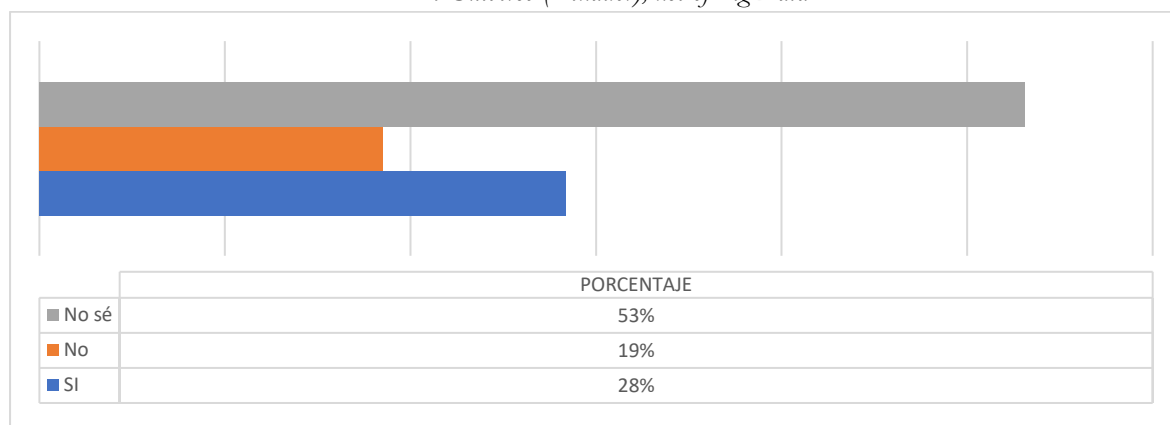


Note: Online Survey (2021)

While 30% of respondents mention that they do not use strategies that merge *Big Data* and journalism, an even higher percentage indicate that in activities such as research and development, as well as in coverage and visualization, *Big Data strategies are implemented*. Oswaldo Vera, a consultant at *Black Box* in an interview with Líderes (2020) states that, in Ecuador, the use of *Big Data* is still limited because organizing information with these platforms is excessively expensive. On the other hand, Llorente and Cuenca (2016) argue that *Big Data* can be implemented as a communication strategy by converting data into useful information in the definition of messages, or decision-making.

As for journalism, it converts the large volume of data into information that enriches a journalistic note. In other words, the journalist can combine various sources of information in a single article, as long as they take into consideration that as media the reliability and verifiability of the sources used are emphasized. In this context, *Big Data* is consolidated as a technological matrix that can improve the experience for users. In the words of Segarra and Aced (2019) "there are more and more companies that integrate *Big Data* into their global and corporate communication strategies" (p. 115).

Figure 4.
El Universo (Ecuador); use of Big Data



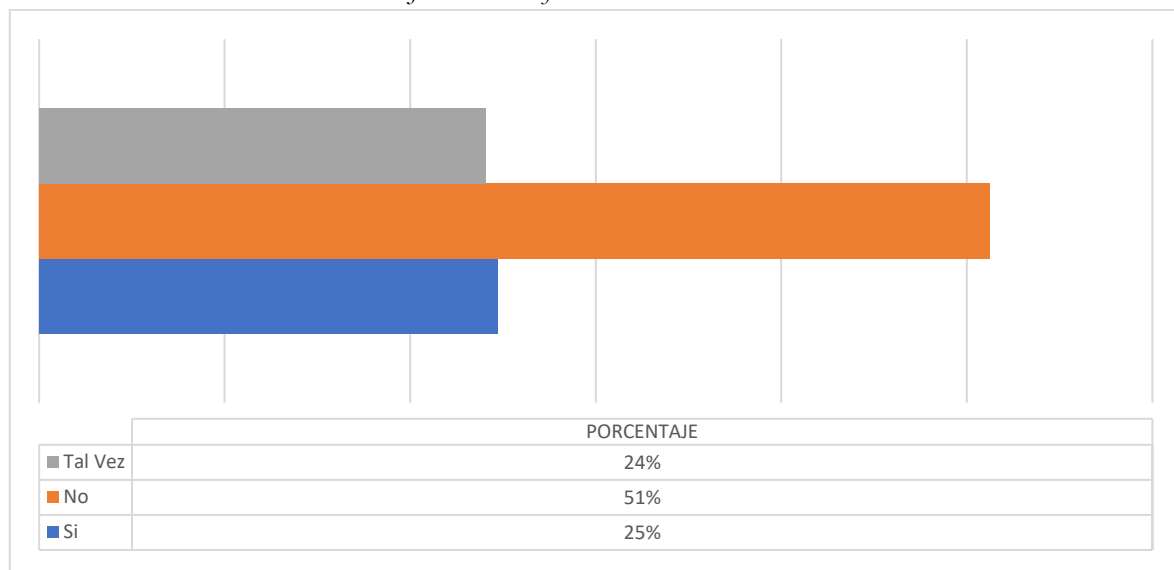
Note: Online Survey (2021)

Charlie Vayas, mentions to the media outlet *Primicias* that "to take advantage of *Big Data*, a great technical and human investment is required, due to the complex classification and analysis of information" (Dávalos, 2019). In this context, the current demand requires professionals to update their knowledge, 47% of respondents to this say that courses or workshops represent the best way to train in *Big Data*.

There is a great lack of knowledge about the use of *Big Data* by the Ecuadorian media outlet *El Universo*. This high degree of misinformation is due to the fact that

this type of strategy has not been in the media and even because many communication companies are unaware of the relationship between *Big Data* and journalism and the opportunities it represents. According to López et al. (2017), technological innovation requires an update in the professional profiles of journalists "that includes everything from research and inquiry to documentation, the construction of the message, its presentation, dissemination and management. Journalists are asked to have a good humanistic training, talent and technological skills" (p. 86).

Figure 5.
Journalistic information: COVID-19



Note: Online Survey (2021)

In Ecuador, the impact of COVID-19 was not only in socioeconomic areas, the pandemic marked a communicational milestone in the country. There were several points in which the messages circulating from the official government contradicted figures presented by the media and much more so with messages circulating on social networks. Regarding this last point, it should be emphasized that nowadays users, now prosumers, have become content creators (Luengo, 2020). This is how, according to Fernández (2014), audiences "cease to be passive and are located at an intermediate point between the producer and the consumer" (p. 55).

In this context, a large percentage of respondents consider that no real databases or figures have been

implemented in this period of time. Indeed, because this event was a milestone not only in Ecuador but worldwide, the challenge for communication professionals was very great.

Added to this is the strength of the official message that showed figures that differed from those presented by unofficial media. In this sense, it is important to remember that among the main characteristics of *Big Data* are the reliability and verification of sources. The proper use of this tool could have meant for the media a better way to inform citizens and avoid generating speculation regarding what was happening at that time in Ecuador.

Curriculum analysis of the main universities

Table 1.

Analysis of the curriculum

University	Careers Offered	Communication Careers	Big Data in Mesh	Big Data Subjects
San Francisco de Quito Universidad Francisco de Quito	45 Undergraduate 19 Master's Degrees 11 specializations 1 PhD	Journalism	Yes	Data journalism, digital strategies, multimedia practices
		Digital Animation	No	None
		Advertisement	No	None
		Graphic Design	No	None
National Polytechnic School Escuela Politécnica Nacional	20 undergraduate 4 Superior Technology 12 Professional Master's Degrees 8 Research Master's Degrees 6 PhDs	Information Technology	Yes	Databases, Operating Systems, Information Theory and Coding, Data Mining
		Telecommunications	Yes	Advanced programming, embedded systems, digital communication
		Networks and Telecommunications	No	None
		Software	Yes	Data structure and algorithms, database fundamentals, distributed databases, usability and accessibility, embedded systems, security technology
Pontificia Universidad Católica del Ecuador Pontificia Universidad Católica del Ecuador	45 Undergraduate 27 Master's Degrees	Information Systems	Yes	Databases, data structure, analysis and design of information systems, ICTs, algorithms and pseudocodes.
		Information Technology	Yes	Operating systems, algorithms and pseudocode, databases, database administration
		Communication	No	None
		Master's Degree in Information Technology	Yes	Storage, handling and protection of digital information.

Note: Own elaboration (2021).

In the table you can see in the first instance the total amount of the academic offer of the universities San Francisco de Quito, the National Polytechnic School and the Pontifical Catholic University of Ecuador. Through the curricular meshes of each university, an ethnographic analysis was carried out where it is evident that in the case of the San Francisco de Quito

University the academic offer in communication or linked to communication work is 8.89%; this figure in the case of the National Polytechnic School is 16.67%, it is worth mentioning that in this case they are telecommunications careers. Finally, in the case of the Pontifical Catholic University of Ecuador the percentage is 8.89%.

Based on these percentages, it is inferred that the academic offer of communication or areas related to communication in Ecuadorian universities is on average 11.48%. From this percentage, the curricular meshes that are hosted on the websites of each university were investigated, to determine if communication students are receiving *Big Data subjects* in their academic training. In this regard, only the degree in journalism at the Universidad San Francisco de Quito includes within its curriculum three Big Data subjects, which are: data journalism, digital strategies and multimedia practices.

At the Universidad San Francisco de Quito, within its curricular mesh, it denotes that there is a little approach to the issue of data management, although the Journalism career includes specific subjects such as data journalism, digital strategies and multimedia practices. On the other hand, at the National Polytechnic School there is no communication career, however, they offer a technology that has to do with software and through this they teach on the subject of data collection, data mining among others, as well as the Information Technology and Telecommunications careers present a broader coverage in terms of *Big Data*, with subjects such as databases, operating systems, data mining and advanced programming.

In contrast, at the Pontificia Universidad Católica del Ecuador, while the Information Systems and Information Technology majors include relevant

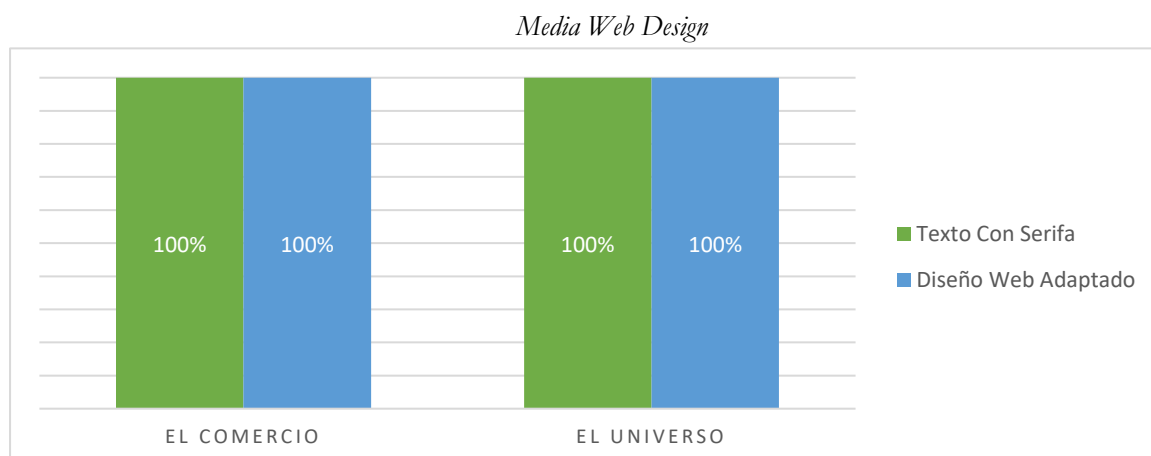
subjects such as databases, data structure, and algorithms, the lack of Big Data-related content in the Communication major could be a limitation for students interested in integrating data analysis skills into the field of communication. However, the introduction of a new career in Data Science shows a commitment to specialized training in this field, with specific subjects on data cleaning, purging, and curation, which could provide an option for those looking for a more focused background in *Big Data*.

Therefore, it is evident that 50% of the careers analyzed have *Big Data* subjects, however, these have been oriented exclusively to technological careers, leaving aside digital skills in other areas such as communication. What has been stated in the surveys is taken up, since the focus that has been given to *Big Data* from academia focuses on *Cloud Computing*, that is, storage of large volumes of data. Thus, within the curricula of these careers, the subjects prevail: databases and algorithms.

Faced with this scenario, it is imperative to develop projects to restructure the curricula of communication careers to include *Big Data* subjects that transcend data storage to the management, analysis, and socialization of this information. As stated by Bravo (2013), Díaz and Chaparro (2018), López et al. (2017), Renó and Renó (2015) and Toural (2020), *Big Data* offers multiple opportunities for communicators not only from data journalism, but also as a tool for the definition of communication strategies.

Analysis of Ecuador's main media

Figure 6

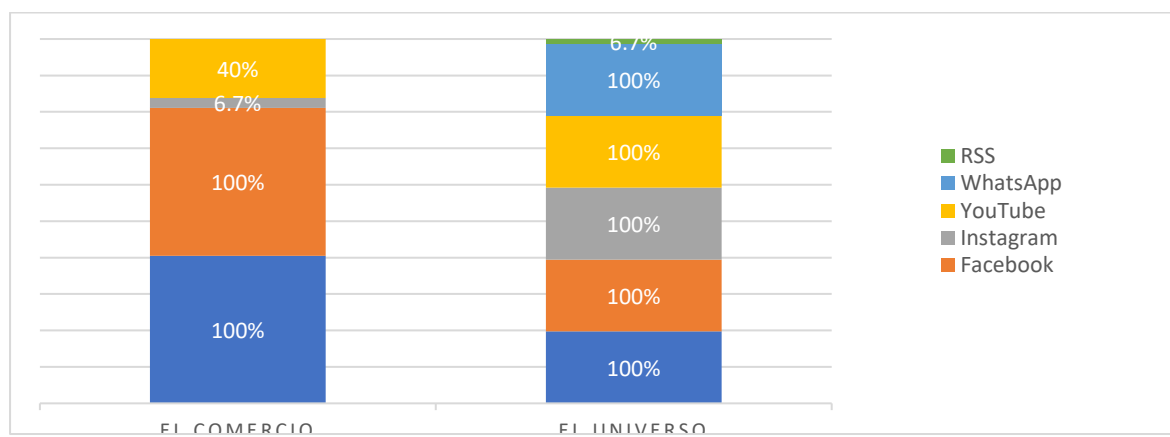


Note: *Media Architecture* (2021).

As can be seen in the graph, both *El Comercio* and *El Universo* currently have a similar Web design, in which text with font and typography has been used: serif, in addition the content is adapted for visibility both from the computer and on mobile devices. In this sense, as mentioned by Guimarey (2020) *El Comercio* has opted for the use of a serif font with the aim of projecting seriousness in its content, because it is primarily of a political and social nature. However, Web design experts such

as Costa Pinto (2017) recommend the use of text and typography on the Web with serif, because this increases readability in digital formats with elegance and style. As far as Web design is concerned, in both cases it adapts to the various screens from which the content is consumed, in addition to having a simple navigation menu, in which it is possible to interact between the different sections that the medium has.

Figure 7
2.0 tools in the media

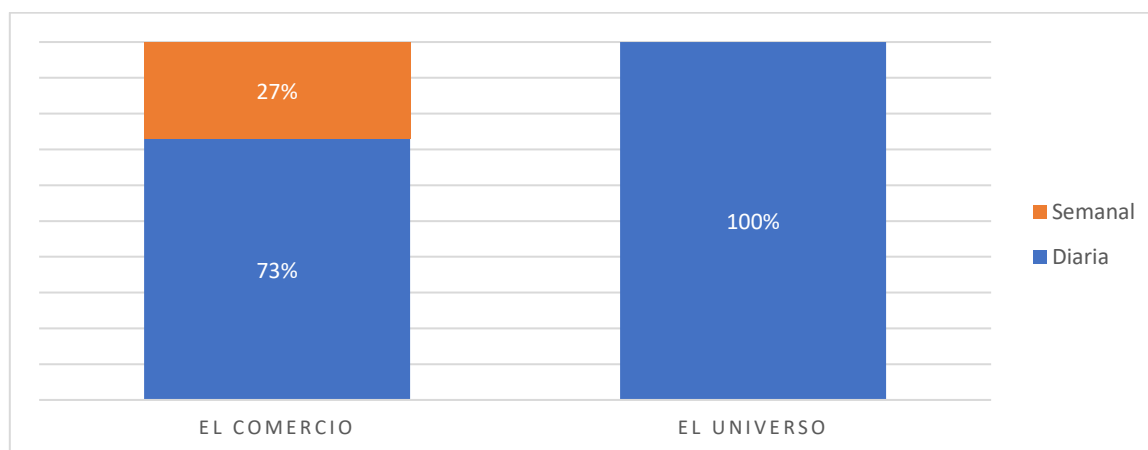


Note: Media Architecture (2021)

As can be seen in the graph, both *El Comercio* and *El Universo* implement in their social media accounts, such as *Facebook*, *X* and *Instagram*. This coincides with what was stated by Newman, et al. (2021), authors who in their research on the use of the media in 2021 shows

that 82% of the population prefers to be informed through the Internet, emphasizing the use of social networks. Therefore, it is of great relevance that the media articulate with social networks as part of their adaptability to the 4.0 demand.

Figure 8
Frequency of transmedia narrative



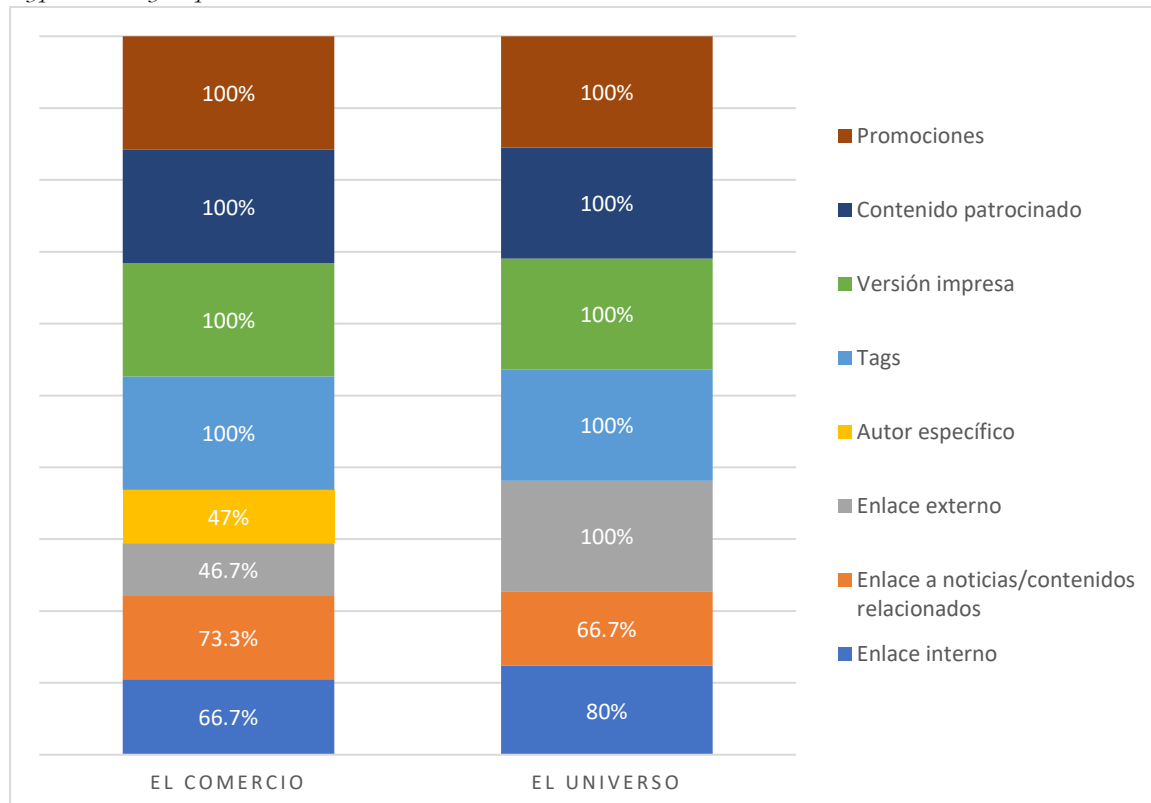
Note: Media Architecture (2021).

Based on the analysis carried out, it is inferred that in the case of *El Comercio*, 73% of the transmedia narrative is presented daily and 27% weekly. Meanwhile, *El Universo* has implemented these narratives in all its contents. In this sense, González-Díez et. al. (2018) consider that "the journalistic design is implicit in the transmedia narrative itself; to begin

with, to ensure an identity that unifies the medium in its different channels" (p. 463). In this context, the importance of the use of transmedia narrative as part of the actions to consolidate the personality of the media outlet and that its contents maintain uniformity is reiterated.

Figure 9.

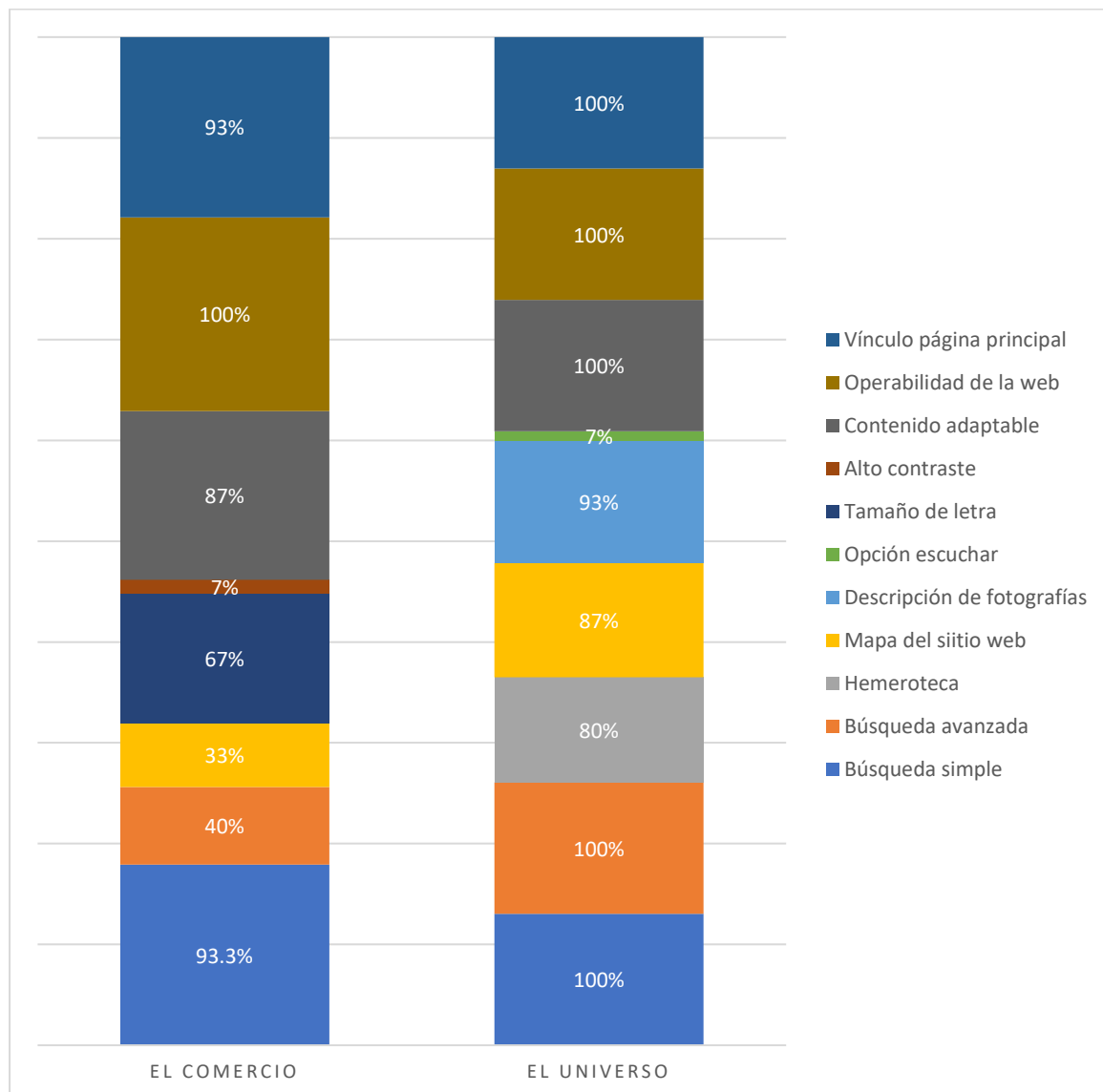
Hypertextuality in publications



Note: Media Architecture (2021).

In relation to the previous graph, the links used by the media in question were analyzed to determine what type of content they correspond to. Starting with *El Comercio*, promotions, sponsored content, links to the print version and tags were identified in 100% of the journalistic pieces analyzed. With 73.3%, they follow the links that direct the reader to related content, which in 66.7% are internal links, that is, they are redirected between articles in the same medium. Of all the links implemented by this medium, only 47% of them are redirected to a specific author and 46.7% represent external links, that is, they redirect the reader to sites outside the media, generally to official sources.

As for *El Universo*, this medium includes promotions, sponsored content, redirection to its printed version, tags and external links in 100% of the journalistic pieces analyzed. In other words, in a large part of the journalistic pieces there is evidence of a strong advertising presence. On the other hand, 80% of the articles have internal link hypertexts, that is, the reader can navigate between various articles that are interconnected or whose topics are related, as a way of expanding the information, these links belong to the content published by the same media. On the other hand, 66.7% of the links belong to related content, but that is not necessarily found within the media's website.

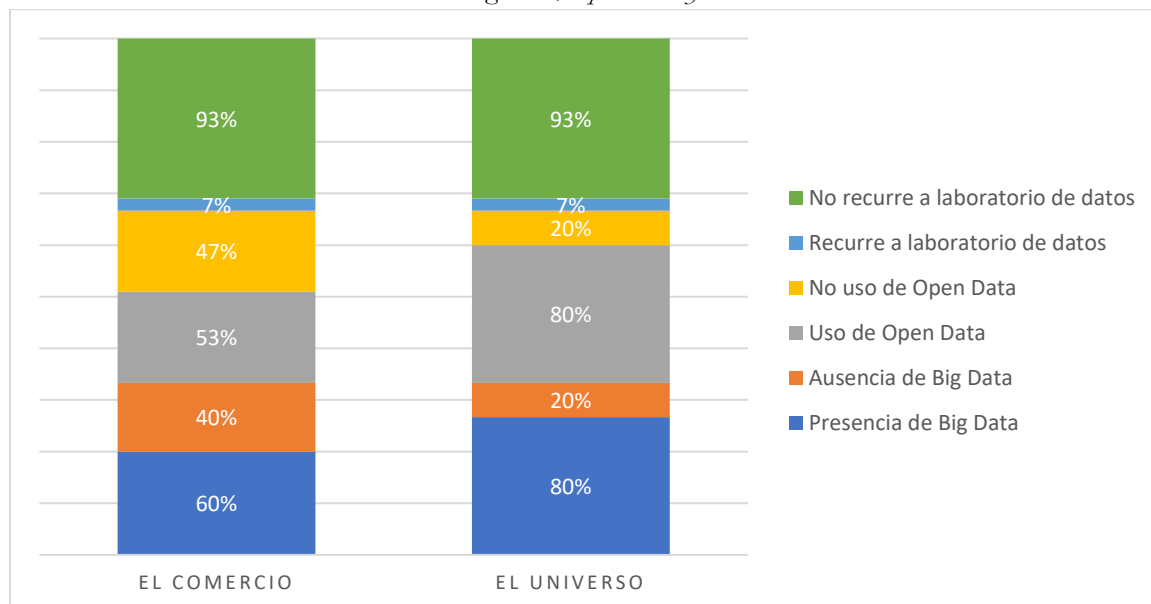
Figure 10.*Accessibility on digital platforms*

Note: Media Architecture (2021).

Accessibility on digital platforms is a fundamental factor that determines the experience that the media outlet provides to the user, as emphasized by Salas Hernández et al. (2017) "It is important that cybermedia use tools that in turn facilitate the user to access information in an optimal way" (p.109). In this context, both *El Comercio* and *El Universo* have a very good Web operability in 100% of the journalistic pieces analyzed. In relation to the adaptability of the task, in the case of *El Comercio*, this was reflected in only 87% of its publications.

On the other hand, *El Universo* presents an optimal adaptability of its content in 100% of its publications. Likewise, it adds descriptions to the images used, a map of the website and a search that can be both simple and advanced. In this sense, *El Comercio* has lower percentages in adaptability, 100% of its articles lack a description in the images and only 40% of its articles have advanced search. Therefore, it is inferred that *El Universo* is the media that has worked the most on the adaptability of its website, incorporating not only graphic pieces but also an interface that satisfies the basic requirements of the user.

Figure 11.
Big Data, Open Data y Labs



Note: Media Architecture (2021).

Regarding the use of *Big Data*, in a large part of the articles the presence of *Big Data* was evidenced in a higher percentage with 80% in *El Universo* while in *El Comercio* it is visualized in 60% of the journalistic pieces analyzed, in this context, as stated by García and García (2018) *Big Data* influences the social dynamics of citizens in the information society, therefore it also affects communication work "which leads to changes in documentary and journalistic tasks" (p.77). From the search for information sources to the projection of data in real time, the use of *Big Data* in the Ecuadorian media has gradually improved. In the case of *Open Data*, it is also evident within the journalistic newsroom of 80% of articles of *El Universo* and 53% of *El Comercio*. It should be emphasized that *Open Data* has promoted a new vision of transparency in the media.

In the words of García and García (2018) "Open data is so called because it is freely accessible and can be used, reused and distributed by anyone with the only obligation to present the attribution of authorship and knowing that it can be shared without technological restrictions" (p.84).

Finally, in relation to the so-called data laboratories with a percentage of 93% in both *El Comercio* and *El Universo*, it is evident that these media do not resort to this type of newsrooms that integrate not only journalistic knowledge but also technology as an innovation in communicational work. Therefore, it is inferred that despite an evident use of *Open Data* and *Big Data* as a strategy for the execution of data journalism, the investigated media have not yet managed to cohere the role of the journalist with the *Big Data* specialist to promote new spaces for the creation of content such as Data Labs.

Results of interviews with experts in the use of Big Data

Table 2.
Big Data Expert Opinions

Expert	Opinion
Roberto Esteves Systems Engineer, Manager of Masaap.	<i>Big Data</i> not only encompasses computer science and statistics, but also has applications in areas such as social sciences, biology, economics, and more. Including these practices in

	different disciplines would foster a more complete and relevant education.
Toural Bran Carlos Professor of the Department of Communication Sciences / Director of the Office of the Rector of the University of Santiago de Compostela.	<i>Big Data</i> has transformed almost every sector, from healthcare to finance, marketing and education. Through teaching-learning it is possible to understand how to collect, analyze and interpret large volumes of data; crucial for students entering the labor market.
Gabriela Coronel Salas Expert in <i>Big Data</i> and Research Professor at the Universidad Técnica Particular de Loja.	<i>Big Data</i> allows us to implement practices and projects in real environments and improve our knowledge of how <i>Big Data</i> is applied in specific situations, facilitating their training and preparation for the world of work.

Note: Personal interviews (2021).

Based on what was stated by the experts in Communication and *Big Data*, the importance of the development and execution of a curricular adaptation project in which *Big Data* is considered as part of the training of communicators is ratified, for this, the challenge of higher education institutions in Ecuador is to transmute into subjects the different ways of

applying *Big Data* in the professional practice of communicators and thus enhance their digital skills, in addition to responding to the current demand for professionals with knowledge that adapts to the new communicational dynamics of the media, which day by day adapt to new technologies.

Table 3.

Expert Opinions

Expert	Opinion
Francisco Vargas Inbound Marketing Support at the Universidad Técnica Particular de Loja	Digital evolution makes it possible to transform the role of the journalist. Nowadays, <i>Big Data</i> is an important tool to achieve speed in the delivery of information. Similarly, thanks to data analysis, relevant content can be delivered for each type of audience.
Toural Bran Carlos Professor of the Department of Communication Sciences / Director of the Office of the Rector of the University of Santiago de Compostela	Difficult. There is, without a doubt, a clear need for renewal and constant updating on the part of social communicators when implementing <i>Big Data</i> in their day-to-day work. Corporations must also assume this training need. It is a process, that of learning, in which <i>Big Data</i> is framed as one more discipline that must be understood, implemented consciously and pursue objectives that must be measurable.
Gabriela Coronel Salas Expert in <i>Big Data</i> and Research Professor at the Universidad Técnica Particular de Loja	The media and journalism have had to adapt to the use of large amounts of data for the creation and dissemination of journalistic content. This in order to provide users with quality information.

Note: Personal interviews (2021).

As experts in Communication and *Big Data* argue, it is inescapable that the current context demands that communicators renew their strategies and

methodologies, as well as participate in a constant updating of knowledge. In this sense, Salazar (2017) states that in Ecuador projects have already been

developed that include the use of *Big Data*, however, they have primarily focused on the massive storage of data, that is, the creation of servers. Therefore, enhancing the digital skills of Ecuadorian communicators is a key to improving the national journalistic work. However, as Zaldumbide (2017) emphasizes, despite the fact that Ecuador has the necessary technology for the development of *Big Data* projects, the impediment is actually a lack of specialists who can execute these projects.

The positions of the experts are diverse, but they agree on several aspects. First, as Esteves (2020) mentions, "every Internet user with a cell phone is a potential source of information" therefore, the first change within the journalistic field must be the way readers are viewed, since they are no longer just consumers, but have become prosumers, their interactions allow the journalistic narrative to be expanded and it is necessary that there are the necessary communication channels for people to express their appreciations.

Discussion

The information collected through the surveys showed that Ecuadorian communicators show great interest in the use of *Big Data* in their professional practice, which is why they consider the updating of knowledge as a great possibility not only to adapt to the new communicational paradigms but also as part of a process of potentiation of the communicational work in Ecuador. 75% of the surveyed communicators stated that they did not receive lectures on the use of *Big Data* in their third-level training, this may explain why *Big Data* has not been used in a great way due to lack of knowledge.

The impact of technology on people's lives, even more so in the information society. From the perspective of Justice (2021), due to the high incidence of *Big Data* in the business environment, approximately 80% of CEOs consider it essential to incorporate experts in the field into the work team in order to promote the use of technological tools and properly apply *Big Data* strategies. Under these precepts, 96% of respondents defined it as a need for universities to make a curricular adaptation that includes *Big Data* within the curriculum of communication careers.

Obviously, communicators in Ecuador have not received within their academic training the guidelines

that allow them to understand the selection, handling, and processing of high volumes of data. This has had an impact on their professional practice since they have been forced to update themselves in order to meet the expectations that companies have regarding communicators and their skills in data processing and analysis as a computer resource. The lack of specialization is therefore a great challenge, which from the position of Pereira et al (2019) can be understood as an opportunity for growth in the communication field. These authors consider that *Big Data* provides the possibility of segmenting audiences, defining user profiles, among other characteristics that promote the development of highly effective communication strategies.

Broadly speaking, based on surveys, curricular and content analysis, in addition to interviews, it is postulated that there is a great lack of knowledge of the methods of applying *Big Data* in the field of communication. In this regard, Toural (2020) mentions that in the field of communication, *Big Data* provides organizations with a high amount of data that can be used for the effective development of messages that respond to the interests of the public, generating a greater impact. However, as stated by Díaz and Chaparro (2018), technological progress promotes epistemological and methodological changes in the training of future professionals, therefore, we must work together with higher education institutions to respond to the current demand for communicators with *Big Data knowledge*.

According to the experts, *Big Data* can be implemented in various ways in the field of communication, from data research or journalism, to consumption management, that is, adaptation of content to the reader's devices (smartphone, PC, tablet, etc.). Therefore, having trained personnel is essential. Indeed, practices such as data journalism currently take advantage of the large volume of information available on the Internet. In this regard, Bravo (2013) mentions that there are multiple platforms that make Open Data available to the public, that is, public, free and accessible data that can be integrated into the transmedia narratives of the media.

Therefore, journalists need to learn how to combine various sources of information in a single article,

adequately filtering the sources used to guarantee the reliability and verifiability of the data. In this context, *Big Data* is consolidated as a technological matrix that improves the user experience, since the quality of information increases significantly. In this regard, Bravo (2013), Díaz and Chaparro (2018), López et al. (2017), Renó and Renó (2017) and Toural (2020) have exposed the wide range of possibilities offered by the use of *Big Data* in the field of communication, not only from the storage of large databases, but also from a multimedia perspective in the adaptation and renovation of the Web platforms used by the media to upload their content.

However, it is evident that in Ecuador the technological gap makes these precepts still a distant reality. The lack of specialists and lack of knowledge has limited the implementation of *Big Data* to *cloud computing actions*. In this sense, Nelson Vargas, an expert in *Big Data*, argues that "currently, the Ecuadorian market is waking up, but not in a search for *Big Data* technologies or implementation projects, but towards improving its understanding and adoption of more refined analytics techniques and methodologies" (Vargas, 2020, para. 2). In an interview with Líderes (2020), Black Box consultant Oswaldo Vera states that, in Ecuador, the use of *Big Data* is still limited due to the excessive cost involved in the development of these platforms.

The analysis of the journalistic pieces of *El Comercio* and *El Universo* also made it possible to evidence a change in the paradigm of the media, which were initially unidirectional. However, comment sections have been enabled on their platforms, which from the perspective of González (2020) "beyond comments and replies on banal topics, there are corpus of messages" (p.23). Certainly, comments are not only spaces for interaction typical of Web 2.0, but also represent spaces for dialogue between users, the media and also with the community that consumes the content.

In the words of Rivera Gonzáles (2018) "journalism also needs to be nurtured in databases of image banks, repositories and historical archives and other resources specialized in textual or graphic journalistic information" (p. 56). Under this precept, the journalistic pieces of *El Comercio* and *El Universo* were analyzed in the search for complementary resources.

Once the information has been processed, it is inferred that these media mainly implement images and videos, and with a lesser preponderance static infographics. However, in 80% of the content, no interactive resources were found.

The new communicational paradigm requires the media to adapt to new forms of consumption, generation and dissemination of information. According to Robledo and Atamara (2018), through the interaction achieved by the user thanks to multimedia content, the publications of the digital media are enhanced. For *El Comercio* infographic scientist Pablo Iván Parra, implementing dynamic elements such as infographics allow the transmutation of the content into a dynamic image that allows the reader to understand from simple topics such as a cooking recipe to more complex realities such as the chronologies of a conjunctural event as was the case of the data related to COVID-19 in the journalistic production of 2020.

Finally, it was inquired whether in Ecuador there has been interdisciplinary work in the media in what have been called Data Laboratories. However, the analysis showed that 93% of the articles in both *El Comercio* and *El Universo* have not resorted to this type of newsrooms in which journalistic knowledge is cohesive with the skills of technology experts, which would represent a great innovation in communication. In short, although it has been shown that the media outlets analyzed have implemented *Open Data* and *Big Data* in their narrative as a strategy for the execution of data journalism, it is still a professional challenge to merge the role of the journalist with the *Big Data* specialist to promote new spaces for content creation such as Data Labs.

Conclusions

Big Data is not being part of the academic training of communication students in the three best-positioned universities in Ecuador. The analysis carried out on the curricular meshes of the universities of San Francisco de Quito, Escuela Politécnica Nacional and Pontificia Universidad Católica del Ecuador shows that *Big Data* has been coupled within three components of the curriculum at the Universidad San Francisco de Quito, while in the remaining two universities it is smaller.

In Ecuador, projects have already been developed that include the use of *Big Data* by professionals, however, these have focused mainly on the massive storage of data, that is, the creation of servers. Interdisciplinary work has been carried out in the media that have been called Data Laboratories; however, the analysis showed that the journalistic articles, both from *El Comercio* and *El Universo*, have not resorted to this type of newsrooms in which journalistic knowledge is cohesive with the skills of technology experts, which would represent a great innovation in communicational work.

The application of instruments such as surveys and interviews with Social Communication professionals in Ecuador has provided valuable perspectives that have allowed an in-depth comparative analysis to be carried out. It should be emphasized that, due to the age range of the respondents, it is understandable that digital competencies have not been considered in the country within the curriculum of careers in social communication. However, given the evident rise of

the Internet and proliferation of technologies, it is imperative to update the curricular meshes so that the contents respond to contemporary demands.

The interest on the part of the surveyed communicators is evident, which is in line with the current demands regarding the updating of knowledge. The implementation of courses or workshops on *Big Data* is a great opportunity for communication professionals who, generally, due to their work schedules, tend to prefer this modality of study because it suits their time availability. The choice of communicators also shows that more than a fourth-level degree, what communication professionals are looking for is to acquire sufficient knowledge to adapt to the current context, which is governed by the paradigms of the information society. These findings not only contribute to academic knowledge, but also offer practical guidance for the updating of digital skills and the optimization of communication strategies in an environment increasingly influenced by the data revolution.

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