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ORIGINAL

# Postgraduate degree in Applied Information Technologies, with a major in data analysis and artificial intelligence: a current trend

## Posgrado en Tecnologías de la Información Aplicada, con mención en análisis de datos e inteligencia artificial: Una tendencia actual

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## ABSTRACT

**Introduction:** the growing need for experts in Information Technology, specifically in Data Analysis and Artificial Intelligence, posed a challenge for educational institutions in Ecuador. This article analyzed the feasibility of offering a master's program aligned with the demands of the labor market at that time.
**Method:** a mixed approach was applied, combining surveys of professionals in the sector with interviews conducted with academics, to evaluate the relevance of the proposed program. The regulatory framework was examined under the Organic Law of Higher Education.
**Results:** the findings indicated a high demand for specialization in data analysis and artificial intelligence, with notable job placement opportunities. Furthermore, shortcomings were identified in the existing postgraduate program offerings in these fields within the national context.
**Conclusions:** the creation of a master's program in this field proved to be both feasible and relevant, aligning with labor market needs and complying with the regulatory requirements of the Ecuadorian educational system.

**Keywords:** Master's Program; Information Technologies; Data Analytics; Artificial Intelligence; Higher Education Trends.

## RESUMEN

**Introducción:** la creciente necesidad de expertos en Tecnologías de la Información, específicamente en Análisis de Datos e Inteligencia Artificial, representó un desafío para las instituciones educativas en el Ecuador. Este artículo analizó la viabilidad de ofrecer un programa de maestría alineado con las demandas del mercado laboral de ese momento.
**Método:** se aplicó un enfoque mixto, que combinó encuestas a profesionales del sector con entrevistas realizadas a académicos, con el fin de evaluar la pertinencia del programa propuesto. El marco normativo fue examinado bajo la Ley Orgánica de Educación Superior.
**Resultados:** los hallazgos indicaron una alta demanda de especialización en análisis de datos e inteligencia artificial, con notables oportunidades de inserción laboral. Además, se identificaron deficiencias en la oferta actual de programas de posgrado en estas áreas dentro del contexto nacional.
**Conclusiones:** la creación de un programa de maestría en este campo resultó ser factible y pertinente, ya que se alineó con las necesidades del mercado laboral y cumplió con los requerimientos normativos del sistema educativo ecuatoriano.

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**Palabras clave:** Programa de Maestría; Tecnologías de la Información; Análisis de Datos; Inteligencia Artificial; Tendencias en Educación Superior.

## INTRODUCTION

In today's context, where technology is advancing by leaps and bounds and the demands of the labor market are continuously transforming, the ability of higher education institutions to adapt and offer relevant training programs is more crucial than ever. In particular, the field of Applied Information Technologies, with its specific specializations in Data Analysis and Artificial Intelligence, presents an ideal opportunity to respond to these emerging needs. According to the Organic Law of Higher Education (LOES) in Ecuador, and the regulations established by the Council of Higher Education (CES), it is essential that graduate programs not only meet academic requirements but also align with the demands of national development.[1]

This article aims to assess the feasibility and relevance of establishing a master's program in Applied Information Technologies, with a major in Data Analysis and Artificial Intelligence at the National University of Chimborazo. This study is based on a prospective analysis of educational and labor trends, a preliminary study of the demand for specialization in the area, and the design of a graduate profile that responds to international standards and the expectations of the local market.

The research is based on the premise that the training of highly trained professionals in these areas is not only an academic imperative but also an essential component for the promotion of technological development and innovation in Ecuador. Using a rigorous methodology that includes the collection and analysis of qualitative and quantitative data, this study seeks to provide solid evidence that supports the creation of a program that trains leaders in the technological field, capable of facing the challenges of the contemporary digital environment and contributing to social and environmental well-being.[2]

The article is structured in different sections, where the review of current regulations, the analysis of labor market trends, and the academic proposal derived from the findings obtained are addressed.

## METHOD

The research was developed under a convergent mixed-methods design, integrating both quantitative and qualitative approaches to comprehensively address the research objectives, following the methodological principles outlined by Hernández Sampieri, Mendoza, and Baptista.

### Research Approach

A mixed-methods strategy was employed. The quantitative dimension allowed for the measurement of trends in labor market demand and prospective student interest, whereas the qualitative dimension facilitated a deeper understanding of the expectations, perceptions, and academic requirements related to the proposed master's program.[3]

### Research Design

The research was characterized as:

- Applied, aiming to solve a practical problem by proposing a relevant academic program aligned with technological and labor market needs.[4]
- Descriptive and exploratory, seeking both to characterize the current academic and professional landscape and to identify emerging trends within the field of Information Technologies and Artificial Intelligence.

### Population and Sampling

- The target population consisted of 83 professionals working in technology sectors and academia, and 157 potential postgraduate students interested in Information Technologies at the National University of Chimborazo.
- Sampling techniques included: Probabilistic random sampling for survey participants to ensure the representativeness of quantitative data. Purposive sampling for interviewees, targeting individuals with recognized expertise in data analytics, artificial intelligence, and postgraduate education development.[5] The sample size was calculated using an online tool, with a 95 % confidence level and a 5 % margin of error, resulting in 69 professionals and 112 students.

### Data Collection Instruments

Two principal instruments were deployed:

- Structured Surveys: Designed with both closed and open-ended questions to capture quantitative

data on perceptions of market demand, study modality preferences, and postgraduate expectations.

- Semi-structured Interviews: Conducted with industry experts and academic leaders to gather qualitative insights regarding program relevance, curriculum design, and key competency areas.

**Data Analysis Procedures**

- Quantitative Data Analysis: Survey data were processed using descriptive statistical methods (frequencies, percentages, and central tendency measures) to identify patterns in the respondents' preferences and expectations.
- Qualitative Data Analysis: A thematic content analysis approach[6] was used to analyze interview transcripts, identifying recurrent patterns and key emergent categories relevant to the master's program design.

**Ethical Considerations**

The study complied with ethical standards for research involving human subjects, adhering to the principles of informed consent, confidentiality, voluntary participation, and data protection.[7] All participants were informed about the purpose of the study, their rights, and the confidentiality of the information provided.[8]

**Chronogram**

A structured timeline was established to organize and monitor the entire research process, encompassing:

a) Instrument development and validation
b) Data collection
c) Data processing and interpretation
d) Reporting and dissemination of results

This structured methodological process guaranteed the production of reliable, valid, and contextually relevant results, providing a scientific foundation for the proposed master's program in Applied Information Technologies, with a specialization in Data Analysis and Artificial Intelligence.

## RESULTS

**Study trend analysis**

Trend analysis for master's programs in Applied Information Technologies, especially in the areas of data analytics and artificial intelligence, can be observed on various market analysis and education platforms. Among the most relevant trends are:

- Growth in Labor Demand: It is estimated that the AI and data analytics sector will grow by more than 28 % over the next decade, creating millions of new job opportunities.[9]
- Increase in Educational Offerings: According to data from Google Trends, there is a notable increase in searches related to master's programs in AI and data analysis, which reflects a growing interest among potential students.
- Adoption of Emerging Technologies: Companies are incorporating AI solutions into their operations, making training in these skills an urgent need.[10]

To illustrate these trends, a graph is presented showing the evolution of searches related to "master's degree in data analysis" and "artificial intelligence" on Google in the last ten years.

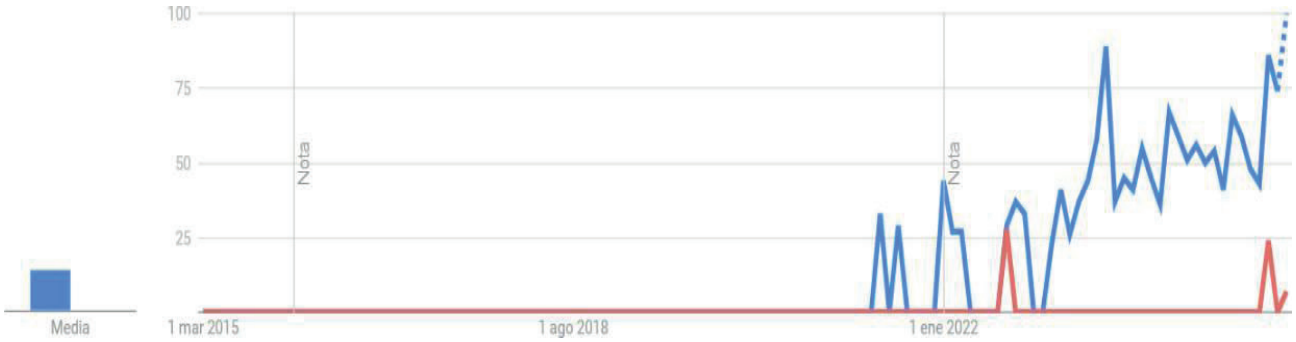


**Figure 1.** Google Trends searches from March 2015 to March 2025
**Source:** Google Trends 2025

Figure 1 shows the following axes: Time vs. Search Terms, Master's Degree in Artificial Intelligence, and

Master's Degree in Data Analysis.

The research presents a focus on current technologies and market demands to solve real problems, reflecting relevant trends in the field of artificial intelligence and data analysis. Below are key elements that guide the design of this program:

**Prospective study of the academic offer of undergraduate, and postgraduate, research and linkage of the National University of Chimborazo to the year 2041**

The study reflects a strategic planning exercise that aims to analyze current trends and foresee the needs and changes that may affect the university. It analyzes the prospective demands of social, educational, economic, cultural, technological local, regional, national, and international development trends in university education. It highlights the megatrends that represent the best-assumed knowledge about the most likely future, considering key characteristics such as a time horizon of at least 10 to 15 years, broad scope, and global effect.[11]

Considering part of the general synthesis of results, the postgraduate programs will have two currents: the first is associated mostly with sustainability and the initiatives of international organizations and agendas; the second focuses on the use of new technologies and scientific advances.

All the experts consulted affirm that short and specific courses will be the main endorsement of future workers. On the subject, they foresee that the certifications that will be issued massively in the future will be linked to Artificial Intelligence and Data Science, highlighting the finding of a double degree as a determining factor.[11]

**Relevant Findings**

*Study modalities*

The preference of study modalities, in the case of the Faculty of Engineering the following order stands out: face-to-face, blended, online, distance, hybrid, and dual.

*Graduate Options*

The results show that the majority (58 %) of respondents would consider obtaining a master's degree as a graduate program in Engineering Sciences. The inclination towards the face-to-face modality (34 %) is important, followed by the online modality (24 %).

**Mega Trends**

From the abacus of megatrends in higher education in the Technological dimension, the following significant variables are considered: process automation (T2), cybersecurity (T6), data analytics and uncertainty reduction (T7), big data and data mining (T5) and communication and data visualization (T12).

The results concerning the scenarios of expectation of academic offer to 2031 and 2041 are visible in Engineering: software expert, Big Data analyst, cybersecurity expert, data science expert, artificial intelligence and virtual reality expert, and growth hacker.

**Ecuador and the 2030 Development Agenda**

The 2030 Agenda is made up of 17 Sustainable Development Goals (SDGs) that aim to end poverty, fight inequality and injustice, ensure peace, and preserve our planet. The SDGs are linked to national priorities, constitute a guiding framework for public policies, and are included in national and local development plans. They are also a key reference for businesses, academia, and civil society.[12]

In this sense, the study of relevance for the creation of the master's program in Applied Information Technologies, with a major in Data Analysis and Artificial Intelligence, considers the following objectives: Objective 4 Education and quality; Goal 8 Decent Work and Economic Growth and Goal 9 Industry, Innovation and Infrastructure.

**Development Plan for the New Ecuador 2024-2025**

The National Development Plan (NDP) is the instrument to which public policies, programs, and projects are subject, the programming and execution of the State budget and public investment. In addition, Ecuador is committed to the global effort to end poverty and protect the planet through the linking of the 2030 Agenda with the NDP.

The linkage exercise resulted in 99 of the 105 goals included in the Development Plan for the New Ecuador 2024-2025 being aligned with the SDGs, that is, 94,3 % of the Plan's goals are directly related to the contents of the 2030 Agenda.

At the same time, the theme of the proposed master's degree, despite being a transversal catalyst in all axes, objectives, policies, strategies, and goals, is pertinent to select in which its evident relationship would

stand out, as follows:

**Table 1.** Development plan for the new Ecuador 2024-2025 and its link to the master's degree in applied information technologies, majored in Data Analysis and Artificial Intelligence

| | Axis | National Objectives | Policies | Strategies | Pertinence | |
|---|---|---|---|---|---|---|
| Development Plan for the New Ecuador 2024-2025 | Social | Objective 2 | 2.1 | Strengthen the educational offer in flexible and innovative modalities that meet the contextualized needs of the territories with the participation of the communities. | Information Technology | Master's degree in applied information technologies, major in Data Analysis and Artificial Intelligence. |
| | | | 2.3 | Expand the supply capacity of the Higher Education System at the national level through the provision of infrastructure, human talent, and the necessary operational capacity in a sustainable manner. | Information Technology | |
| | Economic development | Goal 6 | 6.2 | Expand continuous improvement programs for micro, small, and medium-sized enterprises (MSMEs). | Data Analytics and Artificial Intelligence | |
| | | | 6.4 | Offer training and skills-strengthening programs that allow young people to expand their opportunities in the labor market. | Data Analytics and Artificial Intelligence | |
| | Institutional | Goal 9 | 9.2 | Implement the Open State model through the Open Government Action Plan and promote the adhesion of institutions to this management model.<br>Strengthen transparency through access to timely information for all citizens. | Data Analytics and Artificial Intelligence | |
| | | | 9.6 | Improve institutional management processes through the innovation of organic structures, to provide quality services and meet citizen demands. | Information Technology | |

According to Ipsos[13] Ecuador is in a strong position in terms of understanding and awareness of AI compared to other countries. However, to further encourage the adoption of AI-based technologies, efforts could be made to address insecurities or concerns that Ecuadorians may have, such as data privacy or the impact of AI on employment. Tech jobs have gained a lot of relevance in recent years due to the growing digital transformation in various industries. The sectors with the highest growth include data analytics, artificial intelligence (AI), cybersecurity, and software development, essential areas for companies looking to stay competitive.[14]

In addition, the main challenge of academia is to close the gap between the demand for these skills and the available training, encouraging training in emerging technologies through educational programs and partnerships with companies.

In the demand survey study, applied to the selected sample, 76 responses from interviews with professionals in the area and 155 responses to the survey were obtained, and a marked trend is determined in acceptance of master's degree studies in the broad field of Information Technologies and an emphasis on Data Analysis and Artificial Intelligence. with the following results.

From the interviews, it was found that:

a) 92 % consider the creation of the master's degree as an offer in the center of the country to be adequate.

b) 83 % agree that Data Analysis and Artificial Intelligence is a fundamental specialty today, and

c) 78 % mention that Data Analysis and Artificial Intelligence should be analyzed as a transversal tool,

with a focus applied to the environment.

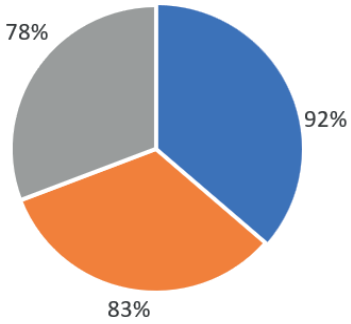


**Figure 2.** Global analysis in surveys

The surveys determined that 72 % of respondents are female, and 47 % are between 20 and 30 years old, most of them of mestizo ethnicity and between 3 and 5 years of undergraduate graduation.

65 % work in the private sector, (a) 81 % want to study a master's degree in the broad field of ICT, (b) 19 % want to study a master's degree in a broad field other than ICT, (c) 62 % want to study a master's degree with a major in data analysis and Artificial Intelligence and (d) 38 % mention that they would study a master's degree with a minor other than data analysis and Artificial Intelligence.

From the application of the survey and interview to the defined sample, 155 responses were obtained. Of these participants, 126 (81 %) wish to study for a master's degree in the broad field of ICT, and 96 participants (62 %) wish to study for a master's degree with a major in data analysis and Artificial Intelligence.

## DISCUSSION

The present study provides empirical support for the relevance and feasibility of establishing a master's program in Applied Information Technologies, with a major in Data Analysis and Artificial Intelligence, at the National University of Chimborazo. The high interest expressed by both professionals and potential students, with 81 % favoring postgraduate training in ICTs and 62 % prioritizing specializations in data analysis and AI, directly addresses the research objective of aligning academic offerings with market needs.

These findings are consistent with global trends described by Brynjolfsson and McAfee[15] and Davenport et al.[16], who emphasize the growing demand for skilled professionals in AI and data science, driven by the exponential increase in data generation and the integration of AI into organizational operations. Similarly, Holmes[17] and Zawacki-Richter et al.[18] highlighted the urgent need for higher education institutions to adapt their curricula to prepare graduates for a data-driven economy.

The preference for face-to-face and blended learning modalities observed in the present study contrasts with international trends towards fully online programs,[18,19,20,21,22,23] suggesting a hybrid educational approach may be more suitable in the Ecuadorian context. This preference may be attributed to cultural expectations regarding educational quality and infrastructural limitations in remote learning technologies.

Importantly, the study reveals a strong regional expectation that AI and data analysis should serve as transversal tools across disciplines (78 % of interviewees). This reflects a broader global movement toward interdisciplinary applications of AI, as described,[24,25] who argue that future AI professionals must possess not only technical skills but also the ability to apply technology across multiple sectors to drive innovation.[26,27,28,29]

The identification of critical competencies, including data analytics, algorithm development, cybersecurity, strategic management, and ethical responsibility; aligns with the curriculum structures of leading institutions such as MIT, Stanford, and the University of Oxford.[30,31] However, this study emphasizes a unique local demand for strong ethical and societal considerations in technological innovation, consistent with recent calls for integrating ethics into AI education.[32,33,34,35,36]

From a practical perspective, the results imply that Ecuadorian universities must urgently update their academic offerings to integrate emerging technologies and competencies, fostering graduates who can respond to local and global challenges. Policymakers should also ensure that national regulatory frameworks, such as the Organic Law of Higher Education,[1] promote flexibility and rapid program accreditation processes to keep pace with technological evolution.

Theoretically, this research contributes to the understanding of postgraduate education as a catalyst for technological and social transformation in developing countries. It supports the proposition by Benbya et al.[37] that education systems must anticipate labor market disruptions caused by AI and big data, positioning graduate programs as strategic responses to future societal needs.

Nonetheless, some limitations must be acknowledged. The cross-sectional design captures a static view of preferences and may not fully account for evolving trends. Additionally, the regional focus limits the generalizability of results to broader national or Latin American contexts. Future research should implement longitudinal designs to track the evolution of postgraduate education demand over time and comparative studies to benchmark Ecuador against other regions.

In conclusion, this study substantiates the urgent need for specialized postgraduate programs in data analysis and artificial intelligence. The proposed master's degree not only addresses the current educational gap but also positions the National University of Chimborazo as a leader in preparing technology professionals who can innovate responsibly, bridging the gap between technological advancement and societal well-being.

**Analysis of competencies, skills, and graduation profiles**

The results of the study highlight critical competencies and professional profiles directly aligned with the current demands of the labor market and the expectations expressed by prospective students and professionals. (38,39,40,41)

First, the strong interest in Data Analysis and Artificial Intelligence as areas of specialization (62 % of respondents) indicates the need for graduates to acquire robust technical skills in data processing, machine learning, and predictive analytics. These competencies are essential to meet the growing market demand for data-driven decision-making.

The analysis of emerging trends reveals additional critical skills demanded by the labor sector, particularly in big data management, cybersecurity, automation, uncertainty reduction through analytics, data mining, and data communication and visualization. These areas correspond to the technological megatrends identified for future professional development, especially in the Engineering and Information Technologies fields.

In terms of professional profiles, the prospective labor market favors roles such as:

- Software Expert
- Big Data Analyst
- Cybersecurity Expert
- Data Scientist
- Artificial Intelligence and Virtual Reality Specialist
- Growth Hacker

The postgraduate program must therefore ensure the development of these specialized profiles through a curriculum emphasizing technical mastery and applied innovation.

Additionally, the preference for face-to-face and blended learning modalities among potential students reflects the importance of integrating strong communication, collaboration, and project management skills within the program. These competencies are necessary for hybrid working environments and align with the expected transformation of academic training formats.

Moreover, the transversal application of Data Analysis and Artificial Intelligence, emphasized by 78 % of professionals interviewed, requires that graduates develop interdisciplinary competencies. This includes the ability to adapt technological solutions to diverse sectors such as business, health, education, and public administration, promoting innovation beyond traditional IT boundaries.

Finally, the competencies expected from future graduates align with global development agendas, particularly the 2030 Sustainable Development Goals (specifically SDG 8: Decent Work and Economic Growth, and SDG 9: Industry, Innovation, and Infrastructure). Therefore, in addition to technical capabilities, the program must foster ethical awareness, social responsibility, and sustainability principles in its graduates.

In conclusion, the proposed master's degree must prioritize the development of advanced analytical skills, cybersecurity knowledge, innovation capacities, and ethical competencies, directly responding to the variables identified in the study results and preparing professionals capable of addressing the complex challenges of the digital economy.

## CONCLUSIONS

The master's degree in information technologies – Major in Data Analysis and Artificial Intelligence is designed to prepare graduates with the necessary competencies to face the challenges of today's digital world. Through the comprehensive development of technical, managerial, and ethical skills, it seeks to train professionals capable not only of innovating within the technological field but also of contributing to social and environmental well-being.

The master's degree responds to the demands of the labor market and is aligned with the principles established by the Academic Regime Regulations of the CES. This program seeks to train competent professionals who can innovate within the technological field while acting with social responsibility.

The comprehensive training provided by this program is essential to ensure that future technology leaders

are prepared to meet the challenges of the contemporary digital world. Academic training must be aligned with global trends while adapting to local realities, thus creating a positive impact both nationally and internationally.

With the determination of a growing demand for professionals trained in data analysis and artificial intelligence in Ecuador, the proposed specialized training will strengthen the country's human capital in a booming sector and provide graduates with relevant skills for the digital age.

Current regulations allow the implementation of graduate programs that respond to these needs, for which coordinated efforts between academic institutions and the productive sector are required to maximize the impact of the new program.

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## CONFLICT OF INTEREST

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