



Artificial Intelligence Protocols Applied to Digital Transformation, Quality, Continuous improvement, and Technological Integration in Public and Private Administration

Juan de Dios Aguilar Sánchez¹; Horna Zegarra, Indalecio Enrique²; César Augusto, Mendivel Gerónimo³; Napoleón Cubas Irigoin⁴; Edi Rojas Campos⁵; Milord Idrogo Gálvez⁶; Wilder Omar Vargas Campos⁷; Jeiden Revilla Arce⁸
^{1,3,5,6,7} Universidad Nacional Autónoma de Chota, Perú, ¹jdaguilars@unach.edu.pe, ²ihorna@unc.edu.pe,
³cmendivel@unach.edu.pe, ⁴ncubasi@unach.edu.pe, ⁵erojasc@unach.edu.pe, ⁶midrogo@unach.edu.pe,
⁷wovargasc@unach.edu.pe, ⁴ytorresba@ucvvirtual.edu.pe, ⁸jeiden_revilla@unj.edu.pe

Abstract

The study analyzes the influence of artificial intelligence protocols on digital transformation, quality, continuous improvement, and technological integration in public and private administration. It contributes to the achievement of Sustainable Development Goal 9: Industry, Innovation, and Infrastructure, and Goal 16: Peace, Justice, and Strong Institutions, by promoting ethical and technological frameworks that strengthen competitiveness and institutional sustainability. It started from the general objective of determining how artificial intelligence protocols impact administrative management, considering dimensions such as business competitiveness, ethical and regulatory governance, citizen data protection, and corporate social responsibility. The research was basic, with a quantitative approach and a non-experimental correlational design, developed with a population of officials and representatives of public and private institutions in Peru, Cajamarca region. The main results show that the implementation of AI protocols contributes significantly to strengthening operational efficiency, transparency, institutional trust, and improving service quality, although challenges related to data protection and ethical governance remain. It is concluded that the implementation of artificial intelligence protocols constitutes an administrative modernization tool for consolidating digital transformation and organizational sustainability, providing useful empirical evidence for public policies and business strategies.

Keywords. Artificial Intelligence, administration, digital transformation, quality, technological innovation.

I. INTRODUCTION

Public and private administrations around the world are facing a scenario of constant transformation driven by advances in science and technology. In this context, Artificial Intelligence (AI) is becoming a key resource for digital transformation, service quality, continuous improvement, and technological integration, with the aim of achieving efficiency and entrepreneurship. Reference [1] highlights that the global workforce, equivalent to one-third of the population, has not yet incorporated AI into its governmental competencies, less than half of countries have begun this process, and only 21% apply ethical practices in public administrative management. The situation is forcing millions of public and private sector employees to adapt to the changes brought about by AI applications, leading to the need to close gaps in digital skills development. The challenge is directly linked to the achievement of Sustainable Development Goal (SDG) 9, focused on industry, innovation, and infrastructure, and SDG 16, which seeks to strengthen peace, justice, and strong institutions. The goal is to guarantee quality service and promote global learning initiatives among public and private workers. In response, Oxford University launched a course on AI and digital transformation in government, aimed at leaders and officials around the world, with the aim of providing knowledge and tools to address the challenges of digitization and AI in an ethical and responsible manner.

In Latin America and the Caribbean, public and private administrative management faces the challenge of integrating AI as a driver of digital transformation, service quality, continuous improvement, and technological integration. The process requires clear protocols, ethical frameworks, and the development of digital skills in the civil service, where continuous training and collaboration are essential. Reference [2] highlights that AI has become the most influential innovation for modernizing public and private management, although its rapid advancement and technological adoption allow its added value to be leveraged and competitiveness in the market to be maintained. In terms of privacy and data protection legislation, reference [3] indicates that Peru ranks at level 3 of consolidation alongside Costa Rica, Chile, and Colombia, ahead of countries such as Guatemala, Bolivia, and Argentina, which rank

at levels 4 or 5, but behind Brazil, Mexico, and Uruguay, which rank at levels 1 and 2. Given this scenario, both public and private institutions must implement protocols that regulate the responsible use of AI in order to ensure competitiveness, market presence, social responsibility, and ethical management of technology.

In Peru, public and private administrative management is moving towards digital transformation through the implementation of AI protocols, with the aim of ensuring quality, continuous improvement, and technological integration in its operational areas. Reference [3] highlights that “according to the 2024 Global Cybersecurity Index prepared by the International Telecommunication Union (ITU)” (p. 20), the country ranks third out of five possible levels of consolidation, highlighting progress in organizational and legal measures, while the areas of technical cooperation and capacity building show greater potential for growth. Current regulations on AI are based on Legislative Decree 1412, the Digital Government Law, and Emergency Decree 006-2020, which apply to both the public and private sectors. Furthermore, the Regulations of Decree Law 1412-05-2021 establish that the Secretariat of Government and Digital Transformation (SGTD) defines actions and Strategic

Objectives (SO) to regulate the use of AI. In particular, SO 5.1 seeks to position Peru as a regional leader in the responsible use of data and algorithms, promoting eight actions aimed at ensuring transparency, ethics, and accountability in the application of technologies.

In Cajamarca, the integration of AI protocols into administrative management faces limitations due to a lack of transparency, data protection, and equity, stemming from an insufficient regulatory framework. Even so, the need to modernize electronic governance is driving demand for clear regulations that guarantee safe and ethical use. Public and private organizations are governed by national standards that guide companies in designing and implementing AI protocols linked to digital transformation, service quality, continuous improvement, and technological integration. These actions seek to ensure that AI applications not only optimize processes but also guarantee explanation, transparency, and control. According to reference [4], strategic axis 3 promotes the dissemination of knowledge produced by universities, companies, and the state through digital resources, encouraging innovation and responsible use of technology.

Given the above, the following problem arises: ¿How do Artificial Intelligence protocols influence digital transformation, quality, continuous improvement, and technological integration in public and private administration? The theoretical justification focuses on understanding how the dimensions of business competitiveness, ethical and regulatory governance, citizen data protection, and corporate social responsibility shape the responsible use of AI protocols. It is based on approaches to technological governance and applied ethics, emphasizing equity, transparency, and sustainability in the implementation of intelligent protocols. It links social responsibility and organizational innovation, explaining how AI not only transforms administrative processes but also redefines relationships between citizens, markets, and institutions, consolidating AI protocols as an emerging field with an impact on public and private management.

Methodologically, the study is justified by the need for valid and reliable instruments that measure the use of AI protocols related to digital transformation, quality, continuous improvement, and technological integration in public and private administration, following the guidelines of a descriptive correlational quantitative approach, based on the construction of indicators and items obtained from dimensions previously identified in sources indexed in the Scopus database, which were used to develop the questionnaire and collect the information required by the objectives and express them in the results and conclusions of the study.

In practice, the study is justified by offering concrete tools to optimize institutional trust, strengthen administrative management, and guarantee the protection of citizens' rights in digital environments. The dimensions of the AI protocols variable made it possible to design indicators applicable to public policies and business strategies, ensuring that the implementation of AI increases operational efficiency, aligned with principles of equity, transparency, and sustainability, where the results contribute to empirical evidence that can be used by organizations, regulators, and managers to establish standardized protocols that reduce risks associated with the use of AI and promote a positive impact on society and global competitiveness.

The work was guided by the general objective: to determine how Artificial Intelligence protocols influence digital transformation, quality, continuous improvement, and technological integration in public and private administration. From this, the specific objectives were derived: To identify the extent to which artificial intelligence protocols are used in public and private administration. To identify the extent to which public and private administrative management is developed. Establish the relationship between Artificial Intelligence Protocols and digital transformation, quality, continuous improvement, and technological integration in public and private administration. Analyze the impact of Artificial Intelligence protocols on service quality in public and private administration. To examine the effects of artificial intelligence protocols on continuous improvement in public and private administration. To establish the relationship between artificial intelligence protocols and technological integration in public and private administration. To identify the challenges and opportunities associated with artificial intelligence protocols in public and private administration management.

As background, reference [5] stands out, a mixed-method systematic review of studies extracted from high-impact databases, which sought to generate a theoretical framework on public administration, quality management, and AI. The results reveal the need

to adopt innovative and disruptive epistemic and ontological approaches to address trends and challenges in the use of AI in administrative management. It was concluded that AI protocols should be implemented to ensure responsible, transparent, and sustainable use, coordinated with technological integration.

The study referenced in [6], with a quantitative correlational approach, analyzed the relationship between digital public services and governance quality in 27 European Union countries between 2017 and 2022. The contributions indicate that the growing digital transformation is key to boosting administrative management and institutional performance, providing empirical evidence to support political and financial investments, and highlighting the importance of strengthening cybersecurity regulations and measures to mitigate risks. The study concludes that digital public services offer an opportunity to increase government effectiveness, accountability, and innovation.

The study referenced in [7], with a quantitative approach and systematic review of 15 articles, evaluated the effects of AI on local governments. The results highlight that the responsible use of AI helps in the administrative management of municipal resources, but requires the establishment of protocols and standards to regulate its use. The study concludes that the implementation of AI requires preparing human talent to develop skills that address technological dynamics, addressing the ethical and legal challenges that accompany emerging applications.

The study referenced in [8], based on a bibliometric approach of 55 papers published between 2017 and 2025 selected using the PRISMA protocol, analyzed the impact of AI and emerging technologies on strategic decision-making in public administration. The results show significant growth in scientific output, highlighting administrative efficiency supported by democratic legitimacy and institutional transparency with a focus on state management. It was concluded that consolidating a global digital governance model requires regulatory frameworks that strengthen organizations and drive responsible innovation.

The study referenced in [9], based on a bibliometric analysis of research in Scopus, aimed to determine the influence of digital technologies on the efficiency and effectiveness of public administration. The results highlight that advanced technologies are essential for addressing administrative challenges, emphasizing the integration of AI and autonomous learning in processes that support decisionmaking and management. It concludes that it is important to create sustainable digitization policies and evaluate them constantly to adapt them to the dynamism of technological advancement.

The research in reference [10], developed using the PRISMA method and based on 125 Escopus, Scielo, and Erik studies, selected 40 articles from countries such as Argentina, Colombia, Mexico, and Uruguay. Its objective was to analyze the implementation and effectiveness of digital tools in state administrative processes. The results indicate that digital transformation optimizes the management of published information. It concludes that it significantly increases the operational effectiveness of the state, improves user service, and fosters an organizational culture oriented toward technological innovation.

The research in reference [11], based on 3,077 Scopus publications, analyzed the evolution and trends in digital transformation in the public sector using a bibliometric approach. The results highlight that variables are changing with technological advances focused on digitization and AI, governance, and sustainability. The United Kingdom and the United States lead the research, while Ecuador and Peru are showing growing interest. It concluded by identifying six main clusters, consolidating a comprehensive and up-to-date overview of digital transformation in public administration.

The study referenced in [12], with a qualitative approach and systematic review of indexed publications, analyzed the integration of digital transformation and AI in public administration to reduce bureaucracy and spending. The results show that both technologies increase managerial efficiency, significantly improve quality, economic and social productivity, and strengthen institutional accessibility and transparency. It was concluded that public investment is crucial to ensuring sustainability and competitiveness, promoting efficient, intelligent, and innovative administrations in the public sector.

AI protocols are defined as technical and ethical frameworks that guide the responsible use of AI applications, ensuring accountability, transparency, and respect for human rights. According to reference [13], they are an essential regulatory tool that establishes global standards aimed at human well-being, preventing misuse and ensuring accountability in the implementation of intelligent and autonomous systems. Reference [14] defines them as regulatory and technical frameworks that regulate the interaction of such systems, integrating ethical principles into their design and operation to ensure accountability, transparency, and respect for human rights.

Its dimensions include ethical and regulatory governance, which emphasizes the need for clear ethical frameworks to regulate the development and application of AI, including principles of equity, justice, and reduction of algorithmic biases in order to ensure institutional accountability; the protection of citizen data, framed within compliance with international standards; transparency and explainability, which highlights the importance of AI systems being interpretable, through the use of clear protocols on decision-making and clear training processes, linking external audits and traceability of results; and institutional accountability [15].

Another classification is proposed by reference [16], which highlights that among the AI protocols to be used in private administration are: business competitiveness, which seeks to use AI to gain strategic advantage; corporate transparency, which seeks

to build trust among investors and consumers; productivity and automation, which seeks to reduce errors and improve production processes; corporate data protection, which seeks to ensure the security of customer information and corporate reputation; and corporate social responsibility, which seeks to integrate AI into good governance and sustainability practices within the company.

Reference [17] categorizes AI usage protocols into: operational efficiency, aimed at optimizing procedures and reducing time; institutional transparency, linked to accountability and public trust; ethical governance, focused on regulatory compliance and institutional legitimacy; and social responsibility, key to oversight through ethics committees and prevention of negative impacts. The dimensions of business competitiveness, ethical and regulatory governance, citizen data protection, and corporate social responsibility are considered for development [15], [16], [17].

The optimization of technological processes is defined as the systematic improvement of activities to achieve greater efficiency, sustainability, and cost reduction. According to reference [18], it involves determining desirable operational objectives by solving optimization problems, seeking decision values that maximize productive performance. Reference [19] points out that it consists of applying analytical approaches to extract knowledge from process-related data in order to improve performance, support strategic decisions, and promote continuous improvement in business management.

The public and private administration of the future is defined as technological integration to guarantee service quality, continuous improvement, and efficiency in the use of human, material, and financial resources. Reference [20] highlights that management should be oriented toward adaptation and resilience, integrating participatory governance models and digital technologies capable of responding to dynamic social contexts and strengthening citizen trust. For its part, reference [21] points to the need to promote disruptive and sustainable innovation, where AI applied to data management and corporate ethics are essential to maintaining competitiveness and sustainability in the markets.

The dimensions of management in public and private administration include digital transformation, which promotes the use of web applications and integrated systems to optimize resources and communication; quality, linked to strategic management through internal controls that ensure regulatory compliance and efficiency; continuous improvement, aimed at increasing productivity with timely interventions; and technological integration, which coordinates human talent and resources to respond to organizational demands [22]. In the private sector, digital transformation and technological integration stand out as pillars of competitiveness, complemented by continuous improvement processes and strategic quality management, strengthening business innovation [19].

Public and private administration must be structured around four fundamental dimensions: digital transformation, a key tool for undertaking innovation; quality management, which must seek productive efficiency while adapting to regulatory compliance; continuous improvement, as a strategy for organizational adaptation; and technological integration, to integrate human talent and resources in order to respond to the demands of the global environment [23].

Technological governance and applied ethics emphasize equity, transparency, and sustainability in the implementation of smart protocols. According to reference [24], digital transformation must be approached as a comprehensive regional governance process that guarantees social inclusion and public trust. These approaches enable the design of regulatory and operational frameworks that ensure AI and emerging technologies optimize institutional efficiency while respecting universal ethical principles. Technological governance acts as a bridge between innovation and responsibility, strengthening services, citizen participation, and organizational sustainability.

It is based on the theory of continuous improvement in quality management, according to reference [25], which states that organizations must implement interactive evaluation and adjustment processes to ensure superior standards of performance and social satisfaction. The theory of digital governance and transparency, according to reference [26], states that AI protocols seek to ensure ethics, transparency, and accountability in public and private administration. It specifies that technical standards such as NTP-ISO/IEC 42002:2025 in Peru regulate AI management for citizen trust and promote open processes, articulating government and society through technological policies.

The theory of corporate social responsibility establishes that organizations are responsible for integrating ethics and collective action into their strategies, responding to inequalities and ecological crises where digital transformation demands that they be at the forefront of making organizations sustainable [27]. The theory of organizational innovation is also highlighted, which, according to reference [28], encourages organizations to use dynamic capabilities to adapt to highly uncertain environments, generating competitiveness and economic sustainability, expanding service to markets; social, providing good care and service to users; and ecological, creating healthy spaces and environments.

The theory of digital transformation in public and private administration emphasizes that implementing e-government as a strategy improves the transparency, quality, and efficiency of services, strengthens governance, optimizes decisionmaking, and encourages citizen participation in institutional processes [22]. Integrating disruptive technologies such as AI applications, automation, and big data into administrative systems, ensuring accessibility, cost reduction, and responsiveness to social demands. The theory is a reference for designing inclusive and sustainable public policies, promoting private competitiveness through organizational innovation and

continuous improvement. Consequently, it constitutes an essential foundation for research on AI protocols, guiding organizations toward transparency, quality, and efficiency in dynamic digital environments.

II. METHODOLOGY

The study is classified as basic, as it seeks information on the use of Artificial Intelligence protocols in digital transformation, quality, continuous improvement, and technological integration in public and private administration, so that, based on the results, innovation in organizations can be promoted to seek competitiveness in the market [29].

It follows the guidelines of the quantitative approach, as it develops knowledge based on observation and testing of theories through the presentation of numerical results from the application of a questionnaire, which generates descriptive and inferential statistical data in line with the objectives [30].

It follows a non-experimental correlational design, analyzing the relationships between AI protocols and the dimensions of digital transformation, quality, continuous improvement, and technological integration in public and private administration. It allows for the identification and analysis of how variables are associated without manipulating them, measuring the influence of AI protocols on administrative efficiency, transparency, resource optimization, and user satisfaction through technologies. It offers empirical evidence to guide public policies, strategic decisions, and the implementation of innovative models in the private sector. It becomes a key tool for establishing AI as an engine of modernization, integrating digital transformation, quality, and continuous improvement.

The Artificial Intelligence Protocols variable is defined as a regulatory tool that governs the use of derivative applications, establishing a global standard focused on human well-being, the prevention of misuse, and accountability in intelligent and autonomous systems [13]. Its dimensions include: Business competitiveness, Ethical and regulatory governance, Citizen data protection, Corporate social responsibility [15], [16], [17]. Its indicators are: Technological Innovation, Operational Efficiency, Market Adaptation, Business Sustainability, Regulatory Compliance, Equity and Justice, Transparency, Institutional Responsibility, Information Security, Privacy, Responsible Data Management, Positive Social Impact, Environmental Sustainability, Community Engagement, and Social Accountability. Each indicator generated an item in the instrument.

The variable of public and private administration management is defined as adaptation and resilience, integrating participatory governance and digital technologies to respond to dynamic social contexts and strengthen citizen trust [20]. Its dimensions include digital transformation, service quality, continuous improvement, and technological integration to optimize resources [22]. The following indicators stand out: integration of digital tools, master data management, security, privacy and compliance, performance measurement, user satisfaction, accessibility and coverage, response time, resource efficiency, implementation of improvements, training, time reduction, innovation, digitization of human resources, financial and material efficiency, and technological interoperability. Each indicator generated an item in the instrument.

The population consisted of representatives from public and private organizations operating in a province in the Cajamarca region. The sample was non-probabilistic and consisted of 128 representatives (62 from public institutions and 66 from private institutions).

The data collection technique was a survey, according to reference [30], which was used to develop the items and obtain the information required to meet the objectives. The instrument used was a questionnaire, which was used to record the items previously designed based on the variables, dimensions, and indicators, allowing the information to be standardized, ensuring the objectivity and comparability of the results.

Before being applied, the instruments underwent a validation process by five experts, who, after reviewing their consistency, clarity, adequacy, and relevance, gave their verdict for them to be applied to the sample. The questionnaire consisted of 32 items, of which 16 corresponded to the AI protocols variable (four for each dimension) and 16 to the public and private administration management variable (four for each dimension). Reliability was expressed in a pilot test of 15 representatives of organizations (seven public and eight private), where the analysis of Cronbach's alpha coefficient gave a value of 0.853 and 0.837, indicating that the instrument was acceptable for application to the sample.

The analysis and interpretation of the results was carried out using statistical methods, highlighting the measurement of frequencies to present descriptive data, and inferential methods to perform the normality test and the relationships required in contrast to the hypotheses.

In terms of ethical guidelines, the study is framed within the appropriate use of information, following the principles of transparency, honesty, and responsibility, respecting the identity of the participating subjects through informed consent, the appropriate use of information for academic purposes, and citations and references using the IEEE standard to guarantee copyright.

III. RESULTS

To determine how Artificial Intelligence protocols influence digital transformation, quality, continuous improvement, and technological integration in public and private administration, the results obtained from the questionnaires were processed and organized according to the objectives, as presented in the following tables:

TABLE 1

EXTENT TO WHICH ARTIFICIAL INTELLIGENCE PROTOCOLS ARE USED IN PUBLIC AND PRIVATE ADMINISTRATION

Level	Business competitiveness		Ethical and regulatory governance		Citizen data protection		Corporate social responsibility		Use of AI protocols	
Null	3	2.34	0	0.00	0	0.00	8	6.25	0	0.00
Minimum	10	7.81	19	14.84	19	14.84	14	10.94	8	6.25
Basic	50	39.06	70	54.69	65	50.78	60	46.88	79	61.72
Intermediate	59	46.09	33	25.78	42	32.81	46	35.94	39	30.47
Advanced	6	4.69	6	4.69	2	1.56	0	0.00	2	1.56
Total	128	100.00	128	100.00	128	100.00	128	100.00	128	100.00

The analysis of the table shows that the use of AI protocols in public and private administration is concentrated at the basic and intermediate levels, reflecting a process of adoption in development but limited in advanced consolidation. In business competitiveness, 40.09% are at the intermediate level and 39.06% at the basic level, indicating that organizations use AI to improve processes and adapt to the market, although 4.69% have reached the advanced level. In ethical regulatory governance, the basic level predominates with 54.69%, while 14.84% remain at the minimum level, revealing weaknesses in solid ethical policies. In citizen data protection, 50.78% is at the basic level and 32.81% at the intermediate level, with the advanced level barely reaching 1.56%, showing initial efforts in security and privacy. In corporate social responsibility, 46.88% are at the basic level and 35.94% at the intermediate level, with no cases at the advanced level, although the importance of integrating AI into sustainable practices and accountability is recognized. In terms of the use of AI protocols, the results are concentrated at the basic level with 61.72% and at the intermediate level with 30.4%, while the advanced level reaches only 1.56%, evidencing a scenario of progressive adoption, where AI is already present in administrative management, but the protocols are still in the maturation phase.

TABLE 2

EXTENT TO WHICH PUBLIC AND PRIVATE ADMINISTRATIVE

MANAGEMENT IS DEVELOPED

Level	Business competitiveness		Quality of service		Continuous improvement		Technological integration to optimize resources		Public and private administrative management	
Null	2	1.56	6	4.69	3	2.34	4	3.13	0	0.00
Minimum	15	11.72	17	13.28	9	7.03	17	13.28	20	15.63
Basic	70	54.69	69	53.91	72	56.25	65	50.78	72	56.25
Intermediate	39	30.47	36	28.13	44	34.38	39	30.47	36	28.13
Advanced	2	1.56	0	0.00	0	0.00	3	2.34	0	0.00
Total	128	100.00	128	100.00	128	100.00	128	100.00	128	100.00

The analysis of the table shows that public and private administrative management is mainly concentrated at a basic level (56.25%), followed by the intermediate level (28.13%), evidencing an initial consolidation process in business competitiveness,

service quality, continuous improvement, and technological integration. In business competitiveness and continuous improvement, more than 50% is at the basic level and nearly a third at the intermediate level, reflecting efforts to adapt to the market and optimize processes, although with little presence at the advanced level (1.56%). Service quality is concentrated at the basic level with 53.91%, at the minimum level with 13.28%, and at zero with 4.69%, which shows deficiencies in customer service and satisfaction. Technological integration to optimize resources reaches 50.78% at the basic level and 30.47% at the intermediate level, showing that most institutions are just beginning to incorporate digital technologies, while only 2.34% achieve the advanced level. The overall results show a scenario of progressive adoption, where institutions exceed the zero and minimum levels, but there is still a wide gap to reach advanced levels. The information confirms that administrative management is in transition, recognizing the importance of digital transformation and continuous improvement, although it requires strengthening innovation, staff training, and strategic technological integration to consolidate a sustainable, efficient, and competitive management model.

TABLE 3

KOLMOGOROV-SMIRNOV NORMALITY TEST

		Statistician	gl	Sig.
Artificial Intelligence Protocols	Business competitiveness	0,181	128	,000
	Ethical and regulatory governance	0,134	128	,000
	Citizen data protection	0,127	128	,000
	Corporate social responsibility	0,142	128	,000
	AI protocols	0,125	128	,000
Public and private administration management	Digital transformation	0,146	128	,000
	Quality of service	0,135	128	,000
	Continuous improvement	0,203	128	,000
	Technological integration to optimize resources	0,158	128	,000
	Public and private administrative management	0,200	128	,000

To analyze the influence of AI protocols on the digital transformation of public and private administration, the information recorded in the database was subjected to the Kolmogorov-Smirnova normality test, given that the largest sample exceeded 50 people. The results showed that the data did not follow a normal distribution, with p-values < 0.05 in all dimensions and variables, so Spearman's Rho correlation coefficient was used for the inferential analysis of the results.

TABLE 4

LIST OF ARTIFICIAL INTELLIGENCE PROTOCOLS IN THE DIGITAL TRANSFORMATION OF PUBLIC AND PRIVATE ADMINISTRATION

Dimensions	Rho de Spearman	Digital transformation	Quality of service	Continuous improvement	Technological integration to optimize resources	Public and private administrative management
Business competitiveness	Correlation coefficient	0,475**	0,429**	0,542**	0,479**	0,563**
	Sig. (bilateral)	0,000	0,000	0,000	0,000	0,000
Ethical and regulatory governance	Correlation coefficient	0,423**	0,455**	0,513**	0,465**	0,531**
	Sig. (bilateral)	0,000	0,000	0,000	0,000	0,000
Citizen data protection	Correlation coefficient	0,578**	0,464**	0,618**	0,612**	0,639**

	Sig. (bilateral)	0,000	0,000	0,000	0,000	0,000
Corporate social responsibility	Correlation coefficient	0,612**	0,455**	0,519**	0,542**	0,605**
	Sig. (bilateral)	0,000	0,000	0,000	0,000	0,000
AI protocols	Correlation coefficient	0,641**	0,555**	0,652**	0,623**	0,714**
	Sig. (bilateral)	0,000	0,000	0,000	0,000	0,000
N		128	128	128	128	128
**. The correlation is significant at the 0.01 level (two-tailed).						

The analysis in Table 4 indicates that AI protocols have a significant positive relationship with the digital transformation of public and private administration. The precise information that both the correlation of dimensions of the variable use of AI protocols and the dimensions of administrative management have a positive relationship, reaching values ranging from 0.423 to 0.652, where the value $p = 0.000$ indicates a significant correlation. This fact is consolidated by the general analysis of the results of the AI protocols variable with each dimension of public and private administration management, obtaining a Spearman correlation coefficient of 0.641 with a p-value of 0.000, which demonstrates a strong association. It is also observed that AI protocols are consistently related to service quality (0.555), continuous improvement (0.652), and technological integration (0.623), consolidating their influence on overall administrative management (0.714).

TABLE 5

IMPACT OF ARTIFICIAL INTELLIGENCE PROTOCOLS ON SERVICE QUALITY

IN PUBLIC AND PRIVATE ADMINISTRATION

	Value	df	Asymptotic significance (two-tailed)
Pearson's chi-square	189,865 ^a	80	0,000
Reason for plausibility	142,438	80	0,000
Linear association by linear	33,536	1	0,000
Number of valid cases	128		
a. 93 polling stations (93.9%) have expected a count of less than 5. The minimum expected count is 0.02.			

The statistical data shown in Table 5 demonstrate that the value of 189.865a, with 80 degrees of freedom (df) and an asymptotic (bilateral) significance of 0.000, shows that there is a statistically significant association between AI protocols and service quality in public and private administration, since the p-value is < 0.05 . On the other hand, the likelihood ratio value of 142.438, with 80 df and a significance of 0.000, confirms the robustness of the result, showing that the relationship between the variables is not a product of chance. As for the value of 33.536 of the linear association, whose 1 df and significance of 0.000 demonstrate that there is a strong relationship between the variables: the greater the implementation of AI protocols, the greater the positive impact on service quality.

TABLE 6

EFFECTS OF ARTIFICIAL INTELLIGENCE PROTOCOLS ON THE

CONTINUOUS IMPROVEMENT OF PUBLIC AND PRIVATE ADMINISTRATION

	Value	df	Asymptotic significance (two-tailed)
Pearson's chi-square	143,139 ^a	72	0,000
Reason for plausibility	136,256	72	0,000
Linear association by linear	41,933	1	0,000
Number of valid cases	128		
a. 82 polling stations (91,1%) have expected a count of less than 5. The minimum expected count is 0,02.			

The statistical values shown in Table 6 indicate that Pearson's chi-square value of 143.139a with 72 degrees of freedom (df) and a significance level (p) of 0.000 indicate that there is a statistically significant association between the implementation of AI protocols and continuous improvement, demonstrating that the use of AI is not dependent on continuous improvement protocols, but rather directly influences them. The likelihood ratio value of 136.256 with 72 df and significance of 0.000 reinforces this,

showing that the relationship between variables is consistent, supported by the linear association value of 41.933 with 1 df and significance of 0.000, which shows a strong linear relationship, indicating that the greater the implementation of AI protocols, the greater the level of continuous improvement in public and private administration.

TABLE 7

RELATIONSHIP BETWEEN ARTIFICIAL INTELLIGENCE PROTOCOLS AND
TECHNOLOGICAL INTEGRATION IN PUBLIC AND PRIVATE ADMINISTRATION

			AI protocols	Technological integration to optimize resources
Spearman's rho	AI protocols	Correlation coefficient	1,000	0,623**
		Sig. (bilateral)		0,000
		N	128	128
	Technological integration to optimize resources	Correlation coefficient	0,623**	1,000
		Sig. (bilateral)	0,000	.
		N	128	128

** . La correlación es significativa en el nivel 0,01 (bilateral).

Spearman's correlation coefficient Rho of 0.623 shows a moderate positive correlation, indicating that the use of AI protocols significantly increases technological integration in institutions; although it is not a perfect relationship, the pvalue of 0.000 confirms its statistical significance. The values show a direct association between the application of AI protocols and the ability of institutions to optimize resources through technological integration. This implies that AI not only improves isolated processes, but also drives system interoperability, reduces operating costs, and strengthens the modernization of administrative management.

TABLE 8

CHALLENGES AND OPPORTUNITIES ASSOCIATED WITH ARTIFICIAL
INTELLIGENCE PROTOCOLS IN PUBLIC AND PRIVATE ADMINISTRATION MANAGEMENT

Appearance	Challenges	Opportunities
Digital transformation	- Digital skills gaps among civil servants. - Resistance to organizational change. - Poor technological infrastructure.	- Modernization of administrative processes. - Greater accessibility to digital services. - Optimization of decisionmaking.
Quality of service	- Risk of algorithmic bias. - Lack of transparency in data use. - Low public confidence in automated systems.	- Improved efficiency and reduced errors. - Increased user satisfaction. - More agile and personalized services.
Continuous improvement	- Poor culture of innovation in institutions. - Limited training and updating of personnel. - Institutional regulations to regulate AI.	- Constant feedback to optimize processes. - Sustained organizational innovation. - Dynamic adaptation to technological changes.

between the implementation of AI protocols and the dimensions of public and private management; the values confirm that AI protocols directly influence digital transformation, quality, continuous improvement, and technological integration. The likelihood ratio of 153.390 with a significance of 0.000 indicates that the relationship is not random. the linear-by-linear association of 59.464 with a significance of 0.000 shows a strong relationship, highlighting that the higher the level of implementation of AI

protocols, the greater the positive impact on digital transformation, quality, continuous improvement, and institutional technological integration.

Technology integration	- System fragmentation and lack of interoperability. - Security and data protection risks. - High initial implementation costs.	- Interoperability between administrative areas. - Optimization of material and financial resources. - Reduction of long-term operating costs.
Ethical and regulatory governance	- Lack of clear regulatory frameworks. - Weak protection of citizen data. - Risks of misuse of algorithms.	- Strengthening institutional trust. - Developing inclusive public policies. - Regional leadership in the responsible use of AI.
Corporate social responsibility	- Ethical challenges in automation. - Potential negative impacts on traditional employment. - Need for accountability.	- Integration of AI into sustainable practices. - Generation of positive social impact. - Improvement of business competitiveness.

Analysis of the challenges associated with AI protocols in public and private administration reveals structural and cultural limitations that condition their implementation. In digital transformation, digital skills gaps, resistance to change, and poor infrastructure hinder modernization; in service quality, algorithmic biases and lack of transparency reduce citizen trust; continuous improvement faces obstacles such as limited innovation and training, and technological integration is affected by fragmented systems, security risks, and high initial costs. Regulatory inadequacies and weak data protection generate uncertainty, and corporate social responsibility raises ethical tensions and negative impacts on traditional employment.

AI protocols offer strategic opportunities to modernize administrative processes, expand accessibility to digital services, and optimize decision-making. In terms of service quality, they improve efficiency, reduce errors, and provide agile and personalized attention, increasing user satisfaction. Continuous improvement is strengthened by constant feedback, sustained innovation, and technological adaptation. Technological integration facilitates interoperability, resource optimization, and cost reduction. On an ethical and regulatory level, it consolidates institutional trust and responsible leadership. Finally, in terms of corporate social responsibility, AI is integrated into sustainable practices, generates positive social impact, and improves competitiveness, promoting positive social impact and business competitiveness.

TABLE 9

INFLUENCE OF ARTIFICIAL INTELLIGENCE PROTOCOLS ON DIGITAL TRANSFORMATION, QUALITY, CONTINUOUS IMPROVEMENT, AND TECHNOLOGICAL INTEGRATION IN PUBLIC AND PRIVATE ADMINISTRATION

	Value	df	Asymptotic significance (two-tailed)
Pearson's chi-square	166,659 ^a	56	,000
Reason for plausibility	153,390	56	,000
Linear association by linear	59,464	1	,000
Number of valid cases	128		
a. 67 polling stations (93,1%) have expected a count of less than 5. The minimum expected count is 0,02.			

Pearson's chi-square analysis, with a value of 166.659 and a significance level of 0.000, shows a significant relationship

IV. DISCUSSION

Based on the results that consolidate the achievement of the first specific objective, the use of AI protocols is concentrated at the basic level (61.72%) and intermediate level (30.47%), with little presence at the advanced level. The findings coincide with reference [5] in pointing out that AI is in a phase of progressive adoption, where initial application in administrative and service quality processes predominates, but its strategic and ethical integration still needs to be consolidated. Likewise, the theory of organizational innovation supports this result, highlighting that institutions go through stages of technological maturation before reaching disruptive levels of competitiveness and sustainability [28].

Regarding the second specific objective, administrative management is mostly at the basic level (56.25%) and intermediate level (28.13%), demonstrating initial progress in business competitiveness, service quality, continuous improvement, and technological integration. The results are consistent with the responsible party [8], who mentions that the consolidation of a digital governance model at the global level requires regulatory frameworks that strengthen organizations using strategies that guide innovation in a responsible manner. They are also similar to the approaches of digital transformation theory, which posits that public and private administration undergo gradual adaptation processes, where infrastructure and training are critical factors in achieving higher levels of efficiency and transparency [22].

The results of the third specific objective, presented in Table 3, show statistically significant associations, with a maximum correlation of 0.714 and bilateral significance of 0.000 in all cases, confirming that the implementation of AI protocols is related to and directly influences digital transformation, service quality, continuous improvement, and technological integration in public and private administration. The findings are similar to reference [22], which states that digitization strengthens governance and institutional efficiency; it is in line with the theory of digital transformation, where AI and e-government are key pillars of modernization. However, they differ from reference [3], which points to basic levels of adoption due to regulatory and infrastructure gaps. It reinforces the theoretical approaches of technological governance and applied ethics [24], and corporate social responsibility [27], by pointing out that AI must be implemented under principles of transparency, equity, and sustainability to consolidate institutional trust. Empirical evidence confirms its potential, conditional on overcoming structural and regulatory limitations.

The analysis of the impact of AI protocols on service quality, which responds to the fourth objective, shows a significant relationship, evidencing a reduction in errors and an increase in user satisfaction. However, challenges remain, such as the risks of algorithmic bias and low public confidence in automated systems. The information is similar to reference [12], which highlights that digital transformation and AI lead to increased managerial efficiency, significantly improving the quality, economic and social productivity, accessibility, and transparency of public institutions. It is also supported by the theory of corporate social responsibility, which emphasizes the need to integrate ethics and transparency into the implementation of AI to strengthen institutional trust. [27].

The results of the third objective indicate that the linear-by-linear association ($p = 0.000$) confirms that AI protocols drive continuous improvement, facilitating constant feedback and dynamic adaptation to technological changes; however, the lack of a culture of innovation and limited staff training are barriers that restrict their consolidation. This finding is consistent with reference [11], which identifies six clusters linked to semantic ontological themes, the creation of public value through innovative digital strategies, and consolidates a comprehensive overview of digital transformation in administration. It aligns with the theory of continuous improvement in quality management, proposing that innovation is a systematic and sustained process that guarantees higher standards of performance and social satisfaction [25].

The results of the sixth objective show a Spearman correlation of 0.623 with $p = 0.000$, evidencing a positive and significant relationship between AI protocols and technological integration to optimize resources. This confirms that AI favors system interoperability and the reduction of operating costs, although challenges related to security and data protection persist. The findings are similar to those of reference [9], highlighting the influence of digital integration on administrative efficiency and effectiveness. The results are supported by the theory of digital governance and transparency, demonstrating that technological integration is key to institutional sustainability, provided it is accompanied by robust regulatory frameworks [26].

The analysis of the seventh specific objective reveals challenges such as insufficient regulatory frameworks, weak data protection, and ethical risks in automation; however, there are significant opportunities such as: process modernization, strengthening institutional trust, and generating positive social impact. The findings coincide with reference [7], which highlights the need to prepare human talent to face the technological dynamics and ethical and legal challenges of AI. It is linked to the theory of corporate social responsibility and organizational innovation, stating that AI can be a driver of competitiveness and sustainability under principles of equity, transparency, and accountability [27], [28].

The response to the overall objective indicates that chisquare tests ($p = 0.000$) confirm the influence of AI protocols on digital transformation, quality, continuous improvement, and technological integration, acting as a driver of modernization by improving efficiency, transparency, and resource optimization. The results coincide with reference [6], which highlights the importance of digitization in institutional governance and performance. It supports the approach of technological governance and applied ethics,

requiring ethical and regulatory principles to ensure legitimacy [24]. Although adoption is at basic and intermediate levels, AI already drives modernization and efficiency, but requires consolidation of ethical governance, data protection, and social responsibility. Theories of digital transformation, continuous improvement, and corporate social responsibility agree that AI is a driver of innovation, whose sustainable impact depends on clear regulatory frameworks, ongoing training, and institutional commitment.

V. CONCLUSIONS

It was determined that AI protocols influence digital transformation, service quality, continuous improvement, and technological integration in public and private administration, consolidating themselves as drivers of institutional modernization and reflecting their impact on efficiency, transparency, and resource optimization, with regulatory and cultural challenges limiting their full consolidation.

It was identified that the use of AI protocols in public and private administration is concentrated at the basic and intermediate levels, revealing a process of progressive adoption; while progress has been made in business competitiveness and ethical governance, there is a need to strengthen training and technological infrastructure.

It was identified that public and private administrative management is developed at the basic and intermediate levels, showing advances in service quality, continuous improvement, and technological integration, requiring institutions to commit to disruptive innovation and sustainable policies to achieve higher standards of efficiency.

It was established that AI protocols have a significant relationship with digital transformation, quality, continuous improvement, and technological integration in public and private administration, confirming their role as catalysts for modernization and supporting the contributions of theories of technological governance and continuous improvement.

It was analyzed that the impact of AI protocols on service quality in public and private administration lies in the reduction of errors and increased user satisfaction; however, risks of algorithmic bias and low public trust persist, which requires strengthening transparency and corporate social responsibility in their implementation.

It was examined that AI protocols drive continuous improvement in public and private administration through constant feedback and dynamic adaptation to technological changes, requiring organizations to train their staff, carry out evaluation processes, and make adjustments to ensure higher performance standards.

It was established that there is a positive relationship between AI protocols and technological integration in public and private administration, demonstrating that AI favors system interoperability and resource optimization, actions that require clear regulatory frameworks and digital governance policies to ensure institutional sustainability.

The main challenges associated with AI protocols were identified as regulatory inadequacy, weak data protection, and ethical risks in automation. The opportunities are significant, notably the modernization of processes, strengthening of institutional trust, and generation of positive social impact, consolidating AI as a support for competitiveness and sustainability.

REFERENCES

- [1] United Nations Educational, Scientific and Cultural Organization, «Preparing the public sector for the era of artificial intelligence,» UNESCO, 2025.
- [2] M. Campos, Artificial intelligence and public policy in Latin America and the Caribbean, Caracas: Latin American and Caribbean Economic System, 2025.
- [3] United Nations Educational, Scientific and Cultural Organization, Peru: Assessment of the stage of readiness of artificial intelligence, Montevideo: UNESCO, 2025.
- [4] Regional Participatory Council for Education, Cajamarca Regional Educational Project to 2036, Cajamarca: School that Generates Development in the Community PER DECO, 2023.
- [5] R. M. Padilla y J. J. Nuñez, «Quality management and artificial intelligence in public administration: theory and trends in scientific research,» Journal of Management & Business Studies, vol. 7, n° 1, pp. 1-30, 2025.
- [6] A. F. Vatamanu y M. Tofan, «Integrating Artificial Intelligence into Public Administration: Challenges and Vulnerabilities,» Administrative Sciences, vol. 15, n° 4, pp. 1-23, 2025.
- [7] H. F. Vilca, «Artificial intelligence and public management: approach in local governments,» Tribunal. Journal of Educational Sciences and Legal Sciences, vol. 5, n° 12, pp. 567-580, 2025.
- [8] M. F. Espinoza y M. G. Espinoza, «Artificial intelligence and emerging technologies as tools for strategic decision-making in public administration,» Administrative, Accounting and Economic, vol. 6, n° 4, pp. 3171-3188, 2025.
- [9] G. Rojas, M. Chura, G. López y G. Pinto, «Digital government and public management: themes, influences and international collaborations,» Venezuelan Journal of Management, vol. 30, n° 109, pp. 247-268, 2025.
- [10] O. Huayra y R. J. Contreras, «Data-driven public policies and artificial intelligence: A systematic review on state modernization and digital transformation,» Impulso Management Magazine, vol. 5, n° 11, pp. 315329, 2025.
- [11] L. A. López, G. G. Uquillas, I. M. Jácome y F. P. Pérez, «Digital transformation in public administration: evolution and research trends,» Social and Administrative Perspectives, vol. 3, n° 1, pp. 17-36, 2025.

- [12] A. Androniceanu, «The new trends of digital transformation and artificial intelligence in public administration,» *Administratie si Management Public*, vol. 40, pp. 147-155, 2023.
- [13] F. Morandín, *Normative principales for an ethics of artificial intelligence*, México: Universidad Autónoma de Puebla, 2023.
- [14] S. Jordan, R. Day y M. Ingram, *A glossary for discussion of ethics of autonomous and intelligent systems*, Alignet Desing: IEEE, 2017.
- [15] L. Manosalvas, C. Manosalvas, M. Manosalvas y J. Jaramillo, «Bibliometric Study on the impact of artificial intelligence on public management,» *Knowledge Pole*, vol. 10, n° 4, pp. 579-594, 2025.
- [16] M. P. Hernandez, J. A. Martínez y M. A. Valenzo, «Artificial intelligence and its impact on administration: A bibliometric analysis from Scopus (1972-2025),» *International Network of Researchers in Competitiveness*, vol. 19, pp. 220-238, 2025.
- [17] A. E. Cárdenas, H. A. Cárdenas, J. C. Luzuriaga y K. I. Bricio, «Impact of artificial intelligence on the administrative management of public institutions,» *Ciencia y Educación*, vol. 6, n° 12.1, pp. 2025-236, 2025.
- [18] J. A. Romagnoli y A. Palazoglu, *Introducción to process control*, Boca Raton: CRC Press, 2020.
- [19] A. Khan, A. Ghose, H. Dam y A. Syed, «Advances in process optimization: a comprehensive survey of process mining, predictive process monitoring, and process-aware recommender systems,» *Arxiv*, pp. 1-36, 2025.
- [20] C. E. Yarin y C. A. Berrocal, «The future of work in the public administration in Perú: adaptation and resilience,» *Political Issues*, vol. 42, n° 81, pp. 111-125, 2024.
- [21] M. Sorían, C. Bruna, C. Robles y G. Vaca, «Business management of sustainability, CSR and artificial intelligence. A new frontier in decisionmaking,» *Scientific Región*, vol. 4, n° 1, pp. 85-102, 2024.
- [22] I. V. Aguilar, «Digital transformation into peruvian public management: a systematic review on the implementation of the e-government (2010-2024),» *Scientific Journal Virtual Classroom*, vol. 6, n° 13, pp. 921-938, 2025.
- [23] J. N. Vaca, «Analysis of strategic management in the digital age: a comparative study,» *PENTACIENCIAS Multidisciplinary Refereed Scientific Journal*, vol. 7, n° 4, pp. 523-529, 2025.
- [24] E. J. Sangama, «Digital transformation and regional governance in Perú: a systematic review,» *Electronic Journal of Generational Sciences*, vol. 7, n° 13, pp. 91-106, 2025.
- [25] S. A. Moscoso, «The role of quality in continuous improvement and excellence in organizations,» *Signos*, vol. 16, n° 2, pp. 13-19, 2024.
- [26] E. L. Alfaro, «Digital transformation and artificial intelligence in modern public management - Perú,» *Journal of Science and Research in Defense - CAEN*, vol. 4, n° 3, pp. 22-38, 2023.
- [27] R. A. Chavez, J. S. Miraval y J. L. Rivera, «Corporate social responsibility in Perú 2023-2025: Ethics and Collective Action,» *Impulse Magazine in Management*, vol. 5, n° 11, pp. 347-360, 2025.
- [28] B. A. Santillán, «Management of organizational innovation: A systematic Review from the dynamic capabilities approach,» *Reincisol*, vol. 4, n° 8, pp. 254-274, 2025.
- [29] Organization for Economic Co-operation and Development, *Oslo Manual 2018. Guidelines for collecting, reporting and using data on innovation*, Paris: European Union, 2018.
- [30] R. Hernández y C. P. Mendoza, *Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta*, México: McGraw - Hill Education, 2018.