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Mastering MPOX: Knowledge, Prevention, and Treatment Strategies for Tomorrow Healthcare Leaders

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ABSTRACT:

Purpose: This study aimed to evaluate the effectiveness of an educational webinar in improving knowledge and awareness of Monkeypox (MPOX) among health science students. It specifically sought to address critical gaps in understanding regarding transmission, clinical symptoms, prevention strategies, and treatment options, thereby empowering future healthcare leaders to respond effectively to emerging infectious diseases.

Methods: A quantitative research approach was utilized, involving a pre-test and post-test design among 150 health science students from the Adventist University of the Philippines and the University of Gitwe. Participants were selected through stratified random sampling to ensure representative data. A validated survey instrument covering ten key areas of MPOX knowledge was administered before and after the webinar session. Descriptive statistical analysis was conducted using Jamovi software to determine knowledge acquisition.

Findings: Pre-test results revealed a low baseline knowledge level (*grand mean* = 1.725), with most students unaware of key prevention and treatment strategies. However, post-test scores demonstrated a significant improvement (*grand mean* = 3.066), indicating a high level of knowledge acquisition. The most substantial gain was observed in the understanding of antiviral treatments and prevention protocols, while some epidemiological concepts like the incubation period remained less well understood. These findings affirm the efficacy of interactive and targeted educational interventions in enhancing public health preparedness among emerging healthcare professionals.

KEYWORDS: Mastering MPOX, Knowledge, Prevention, Treatment Strategies, Healthcare Education, Public Health Readiness

INTRODUCTION

Over the past few years, Mpox (previously referred to as monkeypox) has become a key global health issue, calling for prompt action for enhanced surveillance, prevention, and response. The World Health Organization (WHO) has established Mpox as a Public Health Emergency of International Concern because case increases are observed not only in endemic areas in Central and West Africa but even in some European, North American, and Asian regions (Abdullahi et al., 2024; Chanpitakkul, 2024). The observation of this wide spread necessitates extensive education and readiness measures in healthcare workers.

In spite of global attention, gaps in knowledge continue to be abysmally large. An international study reported that a mere 13.8% of medical staff had been given any information regarding Mpox during medical school, and their average score on a test of knowledge was a mere 13.84 out of 34 (Swed et al., 2023). In Bangladesh too, just 53% of professionals showed good knowledge, with widespread regional variations (Imran et al., 2023).

In Africa, where Mpox is traditionally endemic, healthcare workers tend to have inadequate knowledge and readiness. In Ethiopia, a mere 28.13% of professionals possessed good knowledge about the disease, and previous exposure to credible information sources had a significant impact on knowledge levels (Kiros et al., 2025). In Cameroon, although 92.7% of HCWs were aware of Mpox, only 12.9% possessed excellent knowledge (Nka et al., 2024). Likewise, in Nigeria, just 60.5% of HCWs had sufficient knowledge (Awoyomi et al., 2023). These statistics unambiguously indicate the necessity for focused education programs, ongoing professional development, and the inclusion of Mpox in healthcare curricula in all African countries (Nachega et al., 2024).

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Focusing specifically on Rwanda, while complete national data remain limited, regional closeness to outbreak areas and rising cross-border movement increase the risk of transmission. Research in Africa has indicated that the knowledge of Mpox transmission dynamics, clinical presentation, and prevention is essential to preparing effective health systems (León-Figueroa et al., 2024; "Epidemiological Updates of MPOX," 2023). In addition, the One Health concept, which brings together human, animal, and environmental health, is especially important for endemic nations such as Rwanda (Gemperli et al., 2014; Awoyomi et al., 2023).

Against this backdrop of challenges, this webinar of Mastering MPOX: Knowledge, Prevention, and Treatment Strategies for Tomorrow's Healthcare Leaders has been crafted to bridge the current knowledge gaps. It seeks to empower tomorrow's healthcare leaders with evidence-based knowledge on Mpox epidemiology, symptoms, prevention, and treatment. Through a global-to-local approach, this session highlights the value of interdisciplinary collaboration, education, and realistic readiness in preparing tomorrow's leaders to respond effectively to infectious disease threats.

Research Questions

This webinar aimed to enhance understanding and awareness of Monkeypox (MPOX) transmission, prevention, and management. Specifically, the investigation addressed the following questions:

1. To what extent does direct contact with infected animals or humans contribute to the transmission of Monkeypox (MPOX)?
2. To what extent is the presence of a rash with lesions and subsequent scabbing a defining clinical symptom of MPOX infection?
3. To what extent does the incubation period of 5 to 21 days affect early detection and containment of MPOX?
4. To what extent is the smallpox vaccine effective and recommended in preventing Monkeypox infection?
5. To what extent are antiviral drugs, such as tecovirimat, utilized as first-line treatments in managing MPOX cases?
6. To what extent are young children and immunocompromised individuals at increased risk for severe outcomes from MPOX infection?
7. To what extent is patient isolation until symptom resolution effective in preventing secondary transmission of MPOX?
8. To what extent do strict isolation protocols in healthcare settings control and prevent the spread of MPOX?
9. To what extent does promoting hand hygiene and safe animal handling serve as a key public health measure in reducing MPOX transmission?
10. To what extent can healthcare leaders contribute to MPOX prevention through sustained public awareness and education campaigns?

METHOD

A quantitative research design was employed in order to determine changes in Mpox knowledge and awareness among 150 Adventist University of the Philippines and University of Gitwe health science students. Participants were proportionally chosen across different levels of academics by using stratified random sampling to ensure representative results.

Data were collected using a pre-test and post-test survey instrument designed by the webinar staff, addressing ten major topics under Mpox transmission, symptoms, prevention, and treatment. Pre-test was taken prior to the webinar to evaluate baseline knowledge and post-test was taken after the session to gauge knowledge acquired.

The survey was pre-tested by public health researchers and data collected online with full assurance of confidentiality and informed consent and full ethical standards. The data analysis was carried out using Jamovi and utilized descriptive statistics to aggregate participant responses and assess knowledge change.

RESULTS AND DISCUSSION

Pre-test

Respondents' Level of Knowledge and Awareness on Monkeypox (Mpox)

Table 1 presents the grand mean score of respondents' pre-test responses regarding their knowledge and awareness of Monkeypox (Mpox). The grand mean was 1.725 with a standard deviation of 0.5301, indicating an overall qualitative descriptor of "Disagree" and a low level of knowledge. Based on these results, it is generally observed that the respondents had limited baseline knowledge of Mpox prior to the educational intervention.

The highest mean score was recorded for Item 1 ($Mean = 2.85$, $SD = 0.503$), which stated that "Monkeypox (Mpox) is primarily transmitted through direct contact with infected animals or humans." This high mean suggests that students are relatively well-informed about the primary mode of transmission, likely due to increased public discourse and global reporting on Mpox cases.

Conversely, Item 10 registered the lowest mean score ($Mean = 1.05$, $SD = 0.323$), which stated that "Healthcare leaders can help prevent future Mpox outbreaks through regular public awareness campaigns." This lower score suggests that while students may recognize the role of individual preventive practices, they may lack awareness of the broader role of healthcare leadership in long-term epidemic control. It indicates a potential gap in understanding the significance of strategic leadership and public health advocacy in disease prevention.

No.	Pre- Test	Mean	SD	Scale response	Qualitative Descriptor
1	Monkeypox (MPOX) is primarily transmitted through direct contact with infected animals or humans.	2.85	0.503	Agree	High
2	A common symptom of MPOX infection is a rash with lesions that eventually turn into scabs.	1.16	0.408	Strongly Disagree	Very low

3	The incubation period for Monkeypox ranges from 5 to 21 days.	2.09	0.488	Disagree	Low
4	The smallpox vaccine is recommended for preventing MPOX.	1.94	0.289	Disagree	Low
5	Antiviral drugs such as tecovirimat are considered a first-line treatment for MPOX.	1.57	1.172	Disagree	Low
6	Young children and immunocompromised individuals are at higher risk of severe illness from MPOX.	1.20	0.617	Strongly Disagree	Very low
7	A person infected with MPOX should remain in isolation until all symptoms resolve and scabs fall off.	1.38	0.784	Strongly Disagree	Very Low
8	Strict isolation protocols are essential in healthcare settings to control the spread of MPOX.	1.97	0.424	Disagree	Low
9	Promoting hand hygiene and safe animal handling is a key public health measure in preventing MPOX spread.	2.03	0.293	Disagree	Low
10	Healthcare leaders can help prevent future MPOX outbreaks through regular public awareness campaigns.	1.05	0.323	Strongly Disagree	Very Low
Grand Mean		1.725	0.5301	Disagree	Low

Legend: 0.5-1.5 = Strongly Disagree, 1.51-2.5 = Disagree, 2.51-3.5 = Agree, 3.51-4.00 = Strongly Agree

Post - Test

Respondents' Level of Knowledge and Awareness on Monkeypox (Mpox)

Table 2 presents the grand mean score of respondents' post-test responses regarding their knowledge and awareness of Monkeypox (Mpox). The grand mean was 3.066 with a standard deviation of 0.856, corresponding to the scale response of "Agree" and a high level of knowledge. Based on these results, it is generally observed that the respondents experienced a significant improvement in their understanding of Mpox following the educational intervention.

The highest mean score was recorded for Item 5 (*Mean* = 3.21, *SD* = 0.861), which stated that "Antiviral drugs such as tecovirimat are considered a first-line treatment for Mpox." This high mean suggests that students effectively retained clinical treatment-related information presented during the webinar, indicating their reliance on updated, evidence-based guidelines discussed by the facilitators.

Conversely, the lowest mean score was noted in Item 3 (*Mean* = 2.87, *SD* = 0.882), which stated that "The incubation period for Monkeypox ranges from 5 to 21 days." Although this item still falls within the "Agree" range, its relatively lower mean suggests that students may find epidemiological data like incubation periods less impactful or more difficult to retain, potentially due to the technical nature of such content or limited practical application in their academic context.

No.	Post-test	Mean	SD	Scale response	Qualitative Descriptor
1	Monkeypox (MPOX) is primarily transmitted through direct contact with infected animals or humans.	3.15	1.018	Agree	High
2	A common symptom of MPOX infection is a rash with lesions that eventually turn into scabs.	3.02	0.753	Agree	High
3	The incubation period for Monkeypox ranges from 5 to 21 days.	2.87	0.882	Agree	High

4	The smallpox vaccine is recommended for preventing MPOX.	3.12	0.832	Agree	High
5	Antiviral drugs such as tecovirimat are considered a first-line treatment for MPOX.	3.21	0.861	Agree	High
6	Young children and immunocompromised individuals are at higher risk of severe illness from MPOX.	3.15	0.772	Agree	High
7	A person infected with MPOX should remain in isolation until all symptoms resolve and scabs fall off.	2.89	0.910	Agree	High
8	Strict isolation protocols are essential in healthcare settings to control the spread of MPOX.	3.09	0.811	Agree	High
9	Promoting hand hygiene and safe animal handling is a key public health measure in preventing MPOX spread.	3.09	0.856	Agree	High
10	Healthcare leaders can help prevent future MPOX outbreaks through regular public awareness campaigns.	3.07	0.865	Agree	High
Grand Mean		3.066	0.856	Agree	High

Legend: 0.5-1.5 = Strongly Disagree, 1.51-2.5 = Disagree, 2.51-3.5 = Agree, 3.51-4.00 = Strongly Agree

CONCLUSION

This webinar indicates that students demonstrate a growing awareness and understanding of key concepts discussed, including critical thinking, collaboration, and the application of theoretical knowledge in real-world scenarios. It also highlights their active engagement and willingness to embrace innovative learning strategies that enhance both academic and personal growth.

The webinar concludes that incorporating interactive and student-centered learning approaches significantly boosts motivation, participation, and retention of knowledge. This suggests that educational institutions should continue to integrate such strategies into their curriculum to foster a more dynamic and effective learning environment.

RECOMMENDATION

Based on these findings, the study recommends that educators and institutions consistently implement interactive webinars, workshops, and group-based projects to promote collaborative learning and practical application of knowledge. Additionally, students should be encouraged to take an active role in their learning by engaging in reflective practices and peer-led discussions.

Further recommendations include the incorporation of technology-enhanced tools and platforms to support remote and hybrid learning models, ensuring accessibility, flexibility, and continuity of education. Continuous professional development for educators is also advised to keep pace with evolving pedagogical trends and digital competencies.

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***Da'wah*, Sustainable Democracy, and National Development: An Islamic Ethical Framework for Political Participation in Lagos State**

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ABSTRACT: Islamic religious scholars are entrusted with the responsibility of guiding the Muslim community toward righteousness in all aspects of life e.g. spiritual, social, economic, and political. In Nigeria, and particularly in Lagos State, the democratic process has been undermined by unhealthy political practices, including electoral violence, political imposition, and inadequate stakeholder consultation. These issues have contributed to widespread political apathy and disengagement among citizens. This study examines the role of Islamic propagation (*Da'wah*) as a potential instrument for promoting sustainable democracy and fostering national development. Employing a qualitative methodology and meta-analytical approach, the paper draws on Qur'anic injunctions and the Prophetic tradition to highlight Islamic ethical principles relevant to governance, civic responsibility, and political engagement. Through a contextual analysis of Lagos's socio-political environment, the study argues that the absence of moral and spiritual guidance has significantly contributed to leadership crises and declining public trust in democratic institutions. It proposes *Da'wah* as a moral framework capable of addressing electoral misconduct, political disengagement, and governance failures. The paper concludes by recommending the integration of religious ethics into civic education, the promotion of interfaith dialogue, and the strengthening of partnerships between religious institutions and government bodies to enhance democratic participation and national development.

KEYWORDS: *Da'wah*, Sustainable, Democracy, Sustainable Democracy, Development

INTRODUCTION

Islam is a comprehensive faith that addresses all aspects of human life with no exception of spiritual, social, economic and political but with divinely ordained guidance. Rooted in the main primary sources of *Shari'ah* (i.e. the Qur'an and Hadith), the religion imposes on its adherents the responsibility of inviting others towards righteousness and moral rectitude in all facets of life. This responsibility is highlighted in the following Qur'anic text where Allāh (SWT) says: *كُنْتُمْ خَيْرَ أُمَّةٍ أُخْرِجَتْ لِلنَّاسِ تَأْمُرُونَ بِالْمَعْرُوفِ وَتَنْهَوْنَ عَنِ الْمُنْكَرِ* 'You are the best of peoples, evolved for mankind. You enjoin what is right and forbid what is wrong'. (Qur'an 3:110).

In the cited verse Allāh (SWT) did not only elevate the status of the Muslim *Ummah* as the best community raised for humanity but also underscores a divine obligation, towards engaging in moral advocacy (*Da'wah*) for the betterment of society. Hence, the concept of *Da'wah*, derived from the Arabic verb "*da'a*" means "to call" or "to invite," encapsulates the act of inviting people (both Muslims and non-Muslims) towards the understanding and practice of Islam. According to Hafeez, as cited in Sule *et al*, *Da'wah* is "an act of inviting others to adopt Islam and/or to practice their religious commitments accurately and ardently".¹ This definition emphasises that Islam, as a system, encourages actions rooted in justice and peace.

Meanwhile, following her creation in 1967 with five administrative divisions known as (*IBILE*) namely; Ikeja, Badagry; Ikorodu; Lagos Island, and Epe respectively, Lagos State has experienced a range of socio-political challenges. Among these, political crises stand out as a recurring issue across all the divisions. These unhealthy political manners among the Lagos residents under the guise of democracy include such practices like electoral violence, imposition of candidates, political intimidation, and voter apathy has marred the democratic process. These actions undermine public trust and discourage meaningful political participation, ultimately threatening the political stability and democratic sustainability of the state.

Against this background, this study seeks to examine the potential of Islamic propagation (*Da'wah*) as a viable mechanism for addressing the political dysfunctions prevalent in Lagos State. The aim is to explore how *Da'wah*, (when properly implemented) can foster moral consciousness, encourage active civic engagement, and promote the emergence of God-fearing and accountable leadership. Thus, the study argues

that integrating Islamic ethical values into political education and participation could contribute significantly towards restoring public confidence and enhancing democratic governance in Lagos State.

RESEARCH METHODOLOGY

This study employed a qualitative, descriptive, and contextual approach to explore the role of Islamic propagation (*Da'wah*) in promoting political stability and sustainable democracy in Lagos State, Nigeria. It utilised a meta-analytical review of literature, historical analysis, and textual interpretation of Islamic sources. Primary Islamic texts (Qur'anic verses and authentic Hadith) were examined for principles related to governance and social justice, and these were contextualised within Lagos State's political realities. The study also drew on academic publications, policy documents, and historical socio-political records to provide a comprehensive understanding of democratic challenges and public disengagement in the sub-region.

Understanding Democracy as a Political Mechanism for Governance: An Overview

The term Democracy is often described as a cultural system sustained through active public participation.² According to his scholarly submission, the strength of democracy lies in its design to limit the potential abuse of power and in its commitment to keeping governance as close to the people as possible. Perhaps it is for this reason, among others, that democracy is considered the most central and dominant political system in global affairs, especially in the developed world.³ Thus, as a cultural system, democracy is shaped by the people, their environment, and the legal frameworks governing their societies. From another perspective, Williams in his lexicon description: *Dictionary of English Language*, defines democracy as a political term that reflects respect for human rights and an attitude toward life rooted in civilisation and cultural values.⁴ These rights include access to education, freedom of association, the right to vote, and the right to be voted for.

Etymologically, as cited by Oseni *et al*, the word democracy originates from the Greek term *demokratia*, a compound of *demos* (people) and *kratos* (power or rule).⁵ Hence, according to Atte and Haruna, democracy refers to "rule by the people" or "power belonging to the people".⁶ This according to Kiramat and Khalil is a system of government wherein the masses are fully in charge of governance through direct or indirect (i.e. by their chosen elected) representatives.⁷

Meanwhile, within a democratic system, every adult citizen possesses the right to vote for their preferred candidates and to contest for public office.⁸ While democracy has been defined in numerous ways, one of the most widely accepted definitions remains that, it is a government in which everyone has a share.⁹ Aristotle, as cited in Kiramat and Khalil, viewed democracy as a political system governed by the indigent rather than the wealthy elite.¹⁰

Looking at the various allusions, the term democracy is expected to function as a social contract between the government and the governed, fostering a coordinated and just society. This notion is supported by scholars like Rainer and Ingrida, who describe democracy as a government legitimately endorsed by the people through elections and constitutional frameworks.¹¹ However, to sum up the various definitions and submissions of the learned individuals, democracy can be conceptualized as a system of governance formed in accordance with principles of popular sovereignty, majority rule, and civic participation. It is a political structure that reflects the supremacy of the people's will through lawful, organized mechanisms. That is, a political system that actualized popular power through political structures that are based on mass participation and political sovereignty.

According to Osondu, democracy is expected to be a universally acceptable political system founded on the principles of law and order, regulating social norms and practices.¹² It is characterized by three main features: the supremacy of the people's power, freedom of expression, and open access to political office for all citizens.

Conceptualizing *Da'wah* (Islamic Propagation) and its Roles in Electoral Education

Da'wah is an Arabic term commonly translated as Islamic propagation. It literally means "calling" or "inviting" individuals to enter the fold of Islam wholeheartedly. Scholars agree that *Da'wah* involves the formal transmission of the message of Islam to both Muslims and non-Muslims. More specifically, it refers to the re-education and spiritual guidance of non-practicing Muslims and the invitation of non-Muslims to the understanding and worship of Allah.

Technically, Oseni and Balogun postulate Islamic propagation (*Da'wah*) as "the conveyance of divine instructions (of Islam) to non-Muslims, inviting them to the path of Allah."¹³ In other words, *da'wah* refers to calling and inviting non-Muslims to Islam as well as to its practice. Similarly, Yahya in Oseni and Baogun explains *Da'wah* as both a call to non-Muslims and an invitation to Muslims to practice Islam with sincerity and correctness.¹⁴ It is, therefore, a comprehensive process of guiding individuals toward the knowledge of Allah and their obligations to Him.

To scholar like Ibn Taymiyyah cited in Bello and Abdulmumini, the term *da'wah* means calling to the belief in Allah and what the Prophets came with by accepting all they said and total obedience to the divine instructions.¹⁵ According to them, the obligation entails teaching and ensuring the correct observance of the messages of Islam to people through words and actions. Perhaps the reason why Muhammad al-Ghazali cited in Adediran referred to *da'wah* as 'a perfect program that consists of "a comprehensive program that includes all the knowledge necessary for humans to understand the purpose of life and walk the path guided by divine truth."¹⁶

However, going by the foregoing definitions and submissions of various scholars on the concept of Islamic Propagation (*Da'wah* in Islam), its main objectives is not only to invite people (Muslims and non-Muslims alike), to understand the worship of Allāh as expressed in the Qur'an and the *Sunnah* of the Prophet Muhammad (SAW), but to equally inculcate in man an acceptable culture that will inform them of their roles on earth as Allah's vicegerents and agents of positive change, towards ensuring political stability which will in return give birth to national development and sustainable democracy.¹⁷ This is in consonance with the text of the glorious Qur'an where Allāh (SWT) refers to man as best community on earth: *كُنْتُمْ خَيْرَ أُمَّةٍ أُخْرِجَتْ لِلنَّاسِ تَأْمُرُونَ بِالْمَعْرُوفِ وَتَنْهَوْنَ عَنِ الْمُنْكَرِ* 'You are the best of peoples, evolved for mankind. You enjoin what is right, forbid what is wrong Q3:110

Thus, this divine mandate implies that Muslims are expected to promote good governance and moral consciousness across all spheres of human life, including politics, by obeying Allah's command to spread Islamic awareness and values. Political engagement, far from being excluded, is regarded as an essential area where Islamic ethics must be upheld, and this responsibility is held in high esteem by the entire Muslim Ummah As Allāh (SWT) commands in the Qur'an: "وَادْعُ إِلَىٰ رَبِّكَ وَلَا تَكُونَنَّ مِنَ الْمُشْرِكِينَ" "...call to your Lord and do not be among the polytheists." (Qur'an 28:87). This emphasises the obligation of Muslims to spread the message of Islam, including its political and ethical dimensions, using peaceful and appropriate methods.

Objectives of *Da'wah* in Islam as means of Electoral Education

Among other aim and objectives of Islamic propagation (*da'wah*) according to Abu 'Iyad as-Salafi (an online source), is to ensure and accomplish the following:

- i. Returning to the Qur'an and authentic Sunnah, and understanding both according to the methodology of the *Salaf al-Ṣāliḥ* (Qur'an 4:115);
- ii. Clarifying true Islamic teachings, refuting misconceptions and deliberate misrepresentations, and defending the image of Islam;
- iii. Educating Muslims to practice their faith sincerely, embodying its ethics and values in daily life (Qur'an 103:1-3);
- iv. Reviving Islamic thought in line with core principles while discouraging blind adherence to schools of thought and sectarian loyalties (Qur'an 3:103);
- v. Providing Islamic solutions to modern societal challenges and striving to establish a society governed by divine law (Qur'an 5:49).¹⁸

These stated goals makes it clear that *Da'wah* is not limited to spiritual matters alone but includes social, cultural, and political reformation. The intention is not necessarily to convert non-Muslims but to inform, educate, and morally guide individuals in ways that lead to peaceful coexistence and democratic accountability. Hence, effective *Da'wah* can enhance electoral awareness, promote civic responsibility, and cultivate leadership rooted in Islamic ethics. As Adetona notes, *Da'wah* driven solely by conversion motives can become aggressive and alienating.¹⁹ Instead, it should be seen as a divine mandate to be carried out with wisdom and compassion. The Qur'an states: وَمَنْ أَحْسَنُ قَوْلًا مِّمَّنْ دَعَا إِلَى اللَّهِ وَعَمِلَ صَالِحًا وَقَالَ إِنَّنِي مِنَ الْمُسْلِمِينَ 'And who is better in speech than he who invites (people) to Allāh and does Righteous deeds and says: 'I am one of the Muslims'.Q41:33

This verse highlights that *Da'wah* must be accompanied by righteous conduct and humility. In the context of electoral education, this means engaging the public with ethical messages, encouraging active participation, and fostering a sense of shared responsibility for national development and democratic sustainability.

Da'wah and Sustainable Democracy in Nigeria: The Lagos State Experience

The term sustainability carries diverse meanings across various disciplines and contexts. Etymologically, it is derived from the Latin "*sustenerere*", which implies "under or beneath," and "*tenere*", which means "to hold", connoting the act of supporting or upholding. To scholars like Bello, sustainability implies the support or reinforcement given to something an idea, process, cause, or institution to ensure, through deliberate and continuous effort, that it remains relevance and continues to exist.²⁰

According to Adeyemi *et al.*, quoting the World Commission on Environment and Development (WCED, 1987), sustainable development refers to "a principle of development whereby societies must meet their present needs without compromising the ability of future generations to meet theirs."²¹ Building on this scholarly view, Stiftung conceptualises sustainable democracy as a political system in which state power is balanced by strong, competing interests capable of strengthening democratic institutions.²²

In essence, a sustainable democracy depends on resilient institutions, functional governance structures, and meaningful citizen engagement and participation. These elements collectively support civic development, institutional capacity-building, and the democratisation of critical political and governance processes, including the activities of social movements, civil society organisations, political parties, security agencies, electoral bodies, and local governments. According to Stiftung, achieving this form of democracy requires a careful balance between state authority and countervailing forces that might otherwise impede democratic consolidation.²³

On the contrary, from an Islamic perspective, all aspects of creation (i.e. everything on the earth), including socio-political structures are divinely ordained for the benefit of humanity. Islam teaches that the earth and everything within it is a trust (*amānah*) from Allah, accompanied by responsibilities and ethical obligations. This extends to governance, i.e. political and social order should serve the collective good, guided by moral principles derived from divine revelation.

Therefore, the nature of Lagos State, being formerly Nigeria's capital and now its economic nerve centre, exemplifies a pluralistic and highly diverse society. Its economic prospects and strategic location have attracted the influx of people from diverse ethnic, linguistic, and cultural backgrounds. While this diversity drives innovation and dynamism, it has also produced a number of socio-political challenges, such as political intimidation or bullying, candidate imposition, lack of inclusive consultation, voter apathy, and insecurity. Scholars often link these issues not simply to political competition but to broader systemic gaps which includes insufficient moral or ethical guidance from religious leaders and propagators (*du'āt*), whose role traditionally includes offering counsel grounded in Islamic ethical principles.

However, in a scholarship study carried out by Onakoya and Hassan, the authors argue that reports of intimidation, threats and harassment of some groups of residents following the February 25 Presidential and National Assembly elections in Lagos State reflect deeper systemic weaknesses within Nigeria's political culture.²⁴ Their analysis draws on accounts of physical attacks, threats, denial access to social services and restrictions on civic duties, which they interpret as manifestations of longstanding political tensions, rather than isolated reactions to the performance of particular political candidates.²⁵ They therefore recommend that security agencies and community leaders within Lagos state and across the South-West act decisively to prevent the escalation of such dangerous and inflammatory patterns and foster a more inclusive and tolerant political environment.

Meanwhile, sustainable democracy and political participation are inherently interdependent; neither can be fully realised without the other. Thus, Democracy which George in his study: Democracy and the Muslim World, describes as both a value system and a method of governance, requires the active involvement of citizens, either directly or through elected representatives.²⁶ Participation in this context, encompasses the various ways individuals express their views and influence political, economic, and social decisions. Research also indicates that

the breakdown of effective communication system, coupled with the absence of spiritually informed ethical engagement among political actors in Lagos State, contributes to widespread of political apathy and perceptions of socio-political insecurity. Such conditions undermine democratic sustainability, as effective democratic practice depends on robust institutions, credible structures, and active citizen involvement in politicking.

As a globally recognised political system, democracy is acknowledged for upholding core values such as human dignity, fundamental rights, justice, and collective welfare. It extends beyond periodic elections; it is grounded in ensuring that all voices are not only count but heard and that decisions reflect the collective will. Thus, in the Nigerian context, particularly within a complex and culturally heterogeneous State like Lagos, the integration of Islamic ethical principles through *Da'wah* may offer a constructive pathway for fostering responsible leadership, strengthening social cohesion, promoting peace, and supporting the long-term sustainability of democratic governance.

***Da'wah* and Role of *Dā'ī*: Its implication on Sustainable Democracy and Good Governance in Nigeria**

Al-Jami' Channel for Qur'ānic Sciences, an online source postulate Islamic *da'wah* as the process of inviting people to the way of Islam. This religious act according to the article is basically categorised and discharge in three different stages for the purpose of promoting Islam, these include; inviting people to Islam by conveying the message to them, secondly, is by teaching Islam in its pristine form to the people who had already accepted the message, and the third stage is helping people to implement Islam in their lives.²⁷ Therefore the socio-political implication of these identified of *da'wah* is that Islamic propagation is not directed only to non-Muslims in politics but to Muslims as well, at various levels of knowledge and *Iman*.

As earlier mentioned, there are three pillars of *da'wah*. Of the three pillars of *da'wah*, the first is the caller to Islam, i.e. the *dā'ī*. The second pillar is the audience of the message, (the people who are being called to Islam), and the third pillar is the message itself, what the *dā'ī* is calling to, i.e. Islam. From these analyses, and as earlier mentioned, the *da'ī* is therefore central to this process. The individual are not only responsible for delivering the message but also for teaching and guiding others toward implementing Islamic values, such as *shūrā* (mutual consultation), *al-mas'uliyah* (accountability), etc. which are vital for good governance and political justice.²⁸

Historically, Prophet Nūḥ (AS) was the first *dā'ī*, and Prophet Muhammad (SAW) serves as the model *dā'ī* for the current *Ummah*. This underscores the fact that calling people to the path of Allah (SWT) is among the most honorable roles in Islam and carries immense spiritual reward. Thus, in the quest to guarantee an all-inclusive and security threat-free electoral processes, that will foster not only a credible election where every stakeholders will be freely participating in the decision making processes without bully or molestation but uniting every citizenry with a preconceive intention of national development and sustaining the growing democracy in the land, the caller (*dā'ī*) should endeavor to carry out the following roles:

i. Mutual Consultation (As-Shura):

The term mutual consultation refers to the process of seeking advice and exchanging opinions with others before making a decision, thereby fostering collaboration and collective wisdom. This principle was fully observed during the lifetime of Prophet Muhammad (SAW), as he himself regularly consulted his companions on all matters, whether social or spiritual. The Prophet recognized the youth as a strategic resource and vital decision-makers within society. He therefore encouraged the inclusive participation of both the young and the old in decision-making processes on issues affecting their socio-political and spiritual lives. This principle was applied by the Holy Prophet (SAW) in both his private and public affairs, and it continued to be fully upheld by the early rulers of Islam.²⁹

ii. Implementation of Core Principles of *Da'wah*:

Here, a *da'ī* is required to admonish or reawake people on their individual civic responsibility to the community with the scriptural provision of the fundamental principles of *da'wah*, as entrenched in the Qur'an, which include the use of wisdom (*hikmah*), good counsel (*maw'izah hasanah*), and engaging in dialogue in the best possible manner, avoiding harshness or compulsion.³⁰

iii. Periodical/Regular Lectures:

The *dā'ī* should conduct regular educational and counseling sessions for both the electorate and political actors. These sessions should aim to awaken their awareness of their responsibilities as vicegerents of Allah, particularly in dealing with others justly and upholding ethical *dā'ī* governance.

iv. Moral Uprightness:

A *dā'ī* is expected to embody the values he/she preaches, such as honesty, humility, patience, and kindness, both before, during and after the electoral processes, so as to serve as a living example of the Islamic way of life to other Muslims and non-Muslim alike,

v. Giving Muslims the Benefit of the Doubt:

The *dā'ī* should approach fellow Muslims with a spirit of goodwill and give them the benefit of the doubt. By showing respect and humility, he fosters openness, allowing people to receive and accept the true message of Islam more readily.

vi. Mixing and Isolating Appropriately:

The *dā'ī* should engage with people when his presence can be beneficial and uplifting. However, he should also know when to withdraw, especially when social interaction may compromise his values or effectiveness. While social engagement is commendable, isolation is preferable when continued interaction risks undermining his credibility or influence.

vii. Striving for Justice and Trusting in Allah:

The *dā'ī* should exert his utmost effort in pursuing just and righteous causes, entrusting the outcome to Allah (SWT). As stated in the Qur'an: Allah says: *وَتَوَكَّلْ عَلَى الْعَزِيزِ الرَّحِيمِ الَّذِي يَرَاكَ جِئْتَنَّا بِكَ* "And put your trust in the Almighty, The Most Merciful, Who sees you when you stand up" (Q26: 217-218).

viii. Safeguarding and Fulfilling the Rights of Others:

The *dā'ī* must not only safeguard the rights of individuals in society but also strive to fulfill them. This includes advocating for justice, fairness, and the preservation of human dignity in both public and private life.³¹

RECOMMENDATION

- Integration of *Da'wah* as a concept into Civic Education in the National Curriculum: The need for its inclusion in the national curriculum is to help to promote religious education that accentuates the significance of civic responsibility of every citizenry, in order to foster peaceful coexistence and patriotism.
- Periodical Interfaith Dialogue for Peace and National Unity: There should be established regular interfaith forums to encourage mutual respect and collaboration among religious and ethnic groups on national issues.
- Establishment and implementation of Islamic propagation centers: Dedicated centers for religious and moral education should be set up across Lagos State's five administrative divisions to restore public trust and enhance civic engagement.
- Government-Religious Institution Collaboration: Governments at all levels should develop policy frameworks for partnering with faith-based organizations, promoting ethical leadership through capacity building and values-based governance., so as to stimulate ethical leadership that will instill values of justice, transparency, and accountability among public officeholders through Islamic *da'wah*.
- Episodically Religious Propagation/Education: Islamic scholars and propagators should provide continuous religio-political education and respond to current political issues, helping to foster civic responsibility and support good governance.

CONCLUSION

This study examined *Da'wah* (Islamic propagation) as a strategic tool for promoting ethical political participation and sustainable democracy in Lagos State, Nigeria. Rooted in the Qur'an and Sunnah, *Da'wah* extends beyond religious duty towards fostering justice, accountability, and communal responsibility, principles essential to good governance. While Islam may not align fully with Western democratic models, it emphasises consultation (*shūrā*), leadership accountability, and public participation, offering a framework for democratic values. As regards the *shūrā*, the principle advocate due consultation rested on values of truth and faith being a divine commandment of Allah (SWT) entrenched in the glorious Qur'an: ... and consult them in the affairs. Then, when you have determined, then put their trust in Allah. Allah loves those who put their trust in Him' Q3:159.

Furthermore, given challenges such as political apathy, electoral malpractice, and poor leadership in Lagos, the study recommends establishing moral and *Da'wah* centers across its five divisions. These centers could restore public trust, promote civic responsibility, and enhance political engagement. Ultimately, the research concludes that *Da'wah* can serve as a transformative moral and educational force in shaping a just, accountable, and participatory democratic culture in Nigeria.

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The Implementation of the National School Nutrition Programme in Selected Education Districts in the Eastern Cape

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ABSTRACT: This study aimed to investigate the implementation of the National School Nutrition Programme (NSNP) in rural schools in the Eastern Cape, with a particular focus on the Joe Gqabi Education District. A qualitative desktop research design was adopted to identify the gaps and limitations hindering effective implementation. This study demonstrates that the NSNP functions as a poverty alleviation initiative, aimed at enhancing learners' socio-economic conditions in both the Joe Gqabi District and the broader South African context. However, it emerged that temporary workers often face precarious employment conditions, lacking job security and benefits. This contributes to low morale and hampers the programme's sustainability and consistency. The study further highlighted the critical need for increased financial resources to enhance meal quality and ensure the effective operation of the NSNP in this district. This investigation is vital in guiding the Eastern Cape Department of Education in making informed decisions regarding the province-wide implementation of the NSNP. Accordingly, the study recommends a thorough reassessment of NSNP suppliers to guarantee compliance with acceptable food standards. Furthermore, it calls for active stakeholder engagement in school gardening and overall monitoring processes. The Department of Education is also encouraged to address issues related to theft and corruption to ensure the successful and accountable execution of programmes in rural Eastern Cape schools.

KEYWORDS: Department of Education, Joe Gqabi Education District, National School Nutrition Programme, Poverty, Stakeholders

INTRODUCTION

The Eastern Cape Province is widely recognised for its low levels of human development and widespread poverty, ranking among the most disadvantaged regions in South Africa. In response to this, the National School Nutrition Programme (NSNP) was introduced in 1994 under the leadership of President Nelson Mandela. This government-led initiative aims to reduce poverty and promote children's right to nutritious food that supports learning and development (Department of Basic Education [DBE], 2013). The premise behind the NSNP is that access to healthy meals has a positive impact on learners' cognitive development and academic performance (DBE, 2013). According to the Department of Basic Education (2011–12) and DBE (2020), approximately 9.6 million learners rely on the NSNP across South Africa. In 2020, the programme benefitted around 21,000 schools nationwide (Eastern Cape Department of Education Annual Report [ECDoEAR], 2020–2021). Additionally, the Eastern Cape has the second-highest proportion of learners benefitting from the NSNP, with a 90% participation rate (Province of the Eastern Cape Education, 2021–22: 24).

The NSNP primarily targets learners attending no-fee public schools, specifically those in quintiles 1 to 3, although under certain financial circumstances, it can be extended to quintiles 4 and 5. The programme has three core elements: provision of nutritious meals, nutritional education to promote healthy eating habits, and school food gardens, which aim to impart sustainable agricultural skills to learners, educators, and parents (Sanousi, 2019). The Department of Basic Education coordinates the NSNP in conjunction with provincial education departments, which are responsible for implementation and oversight. These departments are organised into districts that handle budgeting, promote local economic development, and monitor programme delivery (DBE, 2013).

The need to investigate how the NSNP is being implemented in Joe Gqabi Education District arises from persistent challenges linked to poverty and food insecurity. This district, one of twelve in the Eastern Cape, has faced significant socio-economic hardships, with many households struggling with hunger and unemployment (ECDoEAR, 2020–2021). Sanousi (2019) argues that hunger is detrimental to both personal and national development, severely hindering the physical and mental growth of children. Similarly, the World Food Programme (2017) argues that inadequate nutrition impairs cognitive development and educational outcomes in children.

In many developing countries, including South Africa, education is viewed as a crucial means of breaking the poverty cycle. Nevertheless, access to education for children from low-income households remains limited despite the existence of no-fee schooling. The provision of meals through the NSNP serves as an incentive to encourage attendance and reduce dropout rates among these learners (Ahmed and

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Babu, 2017). By addressing hunger, the NSNP aims to improve concentration, reduce absenteeism, and support educational achievement. However, the programme has encountered a range of implementation challenges, including inadequate food quality, delays in paying service providers, lack of permanent monitors, and weak coordination (Ndilele, 2017). In the Joe Gqabi District, these issues have contributed to a decline in learner attendance and an increase in dropout rates over the past five years (ECDDoEAR, 2020–2021). Moreover, the Department of Education has failed to provide meals to learners in non-phased-in grades (Ndilele, 2017). In 2022, approximately 120 learners were hospitalised due to suspected food poisoning linked to the NSNP. Furthermore, reports from the National Portfolio Committee on the Provincial Department of Education revealed systemic weaknesses in the overall implementation strategy, which deviated significantly from established policy guidelines (DBE, 2020).

Hence, it is also important to note that poor monitoring and evaluation approaches, as well as policies that are unclear or poorly defined, have, to this day, hindered the implementation process. Given these shortcomings, this study aims to critically assess the current barriers to implementing and delivering the NSNP within the Joe Gqabi Education District. The objectives of this study are to identify existing barriers in the programme's implementation and to propose practical and sustainable strategies for improvement. This investigation is guided by the following research question: What are the present obstacles in the implementation of NSNP, and how did the programme address issues of quality delivery and accessibility of the NSNP within the Joe Gqabi Education District?

Scope and Context

This review synthesises an array of academic articles, empirical research, policy frameworks, official government publications, and relevant literature that address school nutrition initiatives in South Africa. Emphasis is placed on implementing the National School Nutrition Programme (NSNP) within rural contexts, with a particular focus on the Joe Gqabi Education District. It outlines the genesis and progression of the NSNP, evaluating its significance, execution, and influence within the broader South African educational landscape. The review also examines the collaborative roles of various government entities, presenting a comprehensive view of the NSNP's design and operations. By exploring these dimensions, the literature review lays a critical foundation for the study, shaping both the methodological approach and analytical framework.

School-based feeding interventions are not unique to South Africa. The United States, for instance, institutionalised such efforts as early as 1946 with the nationwide introduction of school lunch schemes (Gunderson, 2011). Two decades later, the Child Nutrition Act of 1966 broadened these efforts to include breakfast, summer food services, special milk initiatives, and maternal-child nutrition programmes (Drake, Woolnough, Bundy & Burbano, 2016). The driving force behind these interventions was the proven link between proper nutrition and the cognitive and physical development essential for academic success (Martin, Booth, Laird, Sproule, Reilly, and Saunders, 2018; Hargreaves, Mates, Menon, Alderman, Devakumar, Fawzi, Greenfield, Hammoudeh, He, Lahiri, and Liu, 2022).

International Cases Informing the NSNP

This section examines school feeding case studies from selected regions across Asia and Africa, offering comparative insights. These include both developed and developing country examples, helping to contextualise the implementation of school feeding programmes globally.

In Asia, Thailand launched its School Lunch Program in 1992, aiming to combat child malnutrition while instilling healthy dietary practices (Ahmed & Babu, 2017). Despite its effectiveness, it struggled with consistent coordination and financial limitations (Drake et al., 2016). On the African continent, Namibia's School Feeding Programme, introduced in 1992, has been cited as a model intervention. It provided regular meals to disadvantaged pre- and primary school pupils, helped reduce absenteeism, and improved academic concentration and achievement (Adair, Keylock & Berger, 2017). A major strength of this programme lies in its solid planning, timely payments to service providers, and the careful selection of competent contractors (Drake et al., 2016), all of which contribute to its success.

Historical Context and Origins of the NSNP

Post-apartheid South Africa undertook significant reforms in the education sector, one of which was the establishment of the NSNP to address widespread hunger and malnutrition among learners (Ndilele, 2017; Tshisikhawe, Runhare, & Litshani, 2024; Mazenda, Monedi, Sari, & Huni, 2025). The programme was formally initiated in 1994 by the Mandela administration, representing a landmark move in the government's poverty alleviation strategy (Adelman, Alderman, Gilligan & Lehrer, 2008). The initiative was grounded in extensive evidence linking child nutrition with academic performance and cognitive development. Poor dietary intake is known to impede intellectual capacity and school performance, whereas children with access to nutritious meals tend to demonstrate better focus, mental acuity, and academic success (Jomaa, McDonnell & Probart, 2011; Best, Neufingerl, van Geel, van den Briel & Osendarp, 2010).

Moreover, beyond its educational impact, the NSNP has served broader developmental goals. School feeding is viewed as an investment in human capital, with long-term economic benefits that include enhanced earning potential (Glewwe, Jacoby, & King, 2001). Initially rolled out in primary schools located in economically marginalised districts, the programme reached around 2.5 million learners in its first year (DBE, 2020). Since then, its coverage has expanded to include all learners in quintiles 1 to 3 schools—essentially the most disadvantaged 60% of the school population. By 2020, approximately 9.6 million children were beneficiaries (DBE, 2020). The growth of the NSNP demonstrates its centrality in South Africa's social development and education strategies (Vermeersch & Kremer, 2005).

Expansion and Adaptation over Time

The NSNP has undergone several stages of evolution, adjusting to changing societal and educational needs. While the programme was initially designed for primary schools, by 2004 it had extended to include secondary schools, reflecting an intensified effort to tackle food insecurity holistically (DBE, 2013). According to DBE (2013), this expansion symbolises an evolving recognition of the symbiotic relationship between nutrition, education, and community empowerment. What was once a basic feeding initiative has transformed into a comprehensive development intervention (Berejena, Kleynhans & Vibetti, 2020; Government of South Africa, 2025). A noteworthy development has been the inclusion of nutrition education, which aims to instil lasting healthy habits in children (Van den Berg & Parry, 2012; Ramugondo, Mushaphi & Mabapa, 2021). Furthermore, Garcia, Coelho & Bogus (2017) assert that school food gardens have been introduced as both educational tools and sources of food. These gardens equip learners, parents, and educators with agricultural skills while enhancing food security at the household level (Richter, Harris, Paine, Hawkesworth, & Lindley, 2014).

By 2020, the NSNP had reached millions, with a primary focus on learners in no-fee public schools, but also extending support to other quintiles where resources allowed (DBE, 2020). Its broader reach has had a marked impact on reducing the effects of poverty, poor nutrition, and hunger on children's education (Case, Menendez, & Ardington, 2005). Taken together, these milestones reflect the programme's success in adapting to South Africa's diverse socio-economic realities and in reinforcing children's rights to food and education.

Institutional Framework and Operational Dynamics

The execution of the NSNP is characterised by a multi-tiered governance model involving collaboration among national, provincial, and district authorities (Nomatshila, Apalata, & Mabunda, 2021; Pitseng, 2022). At the national level, the Department of Basic Education (DBE) is responsible for overall coordination, policy direction, and performance monitoring (DBE, 2013). Provinces, through their respective education departments, are responsible for implementing the programme based on localised contexts and needs (Knipe, 2022). This decentralised approach enables flexibility and responsiveness to the specific socio-economic conditions within each region (Wildeman & Nomdo, 2007). District offices play an integral role in operationalising the programme, including budgeting, procurement, and oversight functions (Reyneke, 2020). Local procurement of food is encouraged to stimulate economic activity and create employment in nearby communities (DBE, 2013). This aligns the NSNP with broader developmental strategies, including the Integrated School Health Programme, which integrates nutrition with other learner welfare services (Shung-King, Orgill & Slemming, 2018).

Equally critical is the system of monitoring and evaluation (M&E), which ensures transparency and ongoing refinement of the programme. Regular audits, nutritional assessments, and performance reviews are key to identifying challenges and enhancing service delivery (DBE, 2013; Reyneke, 2020). These M&E mechanisms support a feedback loop that helps align implementation with policy goals.

In conclusion, the NSNP represents a complex yet well-coordinated intervention designed to promote educational access and nutritional well-being among South Africa's youth (Mafugu, 2021). The collaboration across government tiers ensures effective service delivery, while embedded evaluation systems maintain accountability and facilitate continuous improvement.

CONCEPTUAL FRAMEWORK

This section discusses the conceptual framework that guides this study. The main concepts that underpin the study are presented in the following sections:

Nutrition Programme

To gain a clear understanding of the nutrition programme, it is essential to define the term 'nutrition'. Nutrition is the totality of the processes involved in the intake and utilisation of food substances to achieve growth, repair, healing, and maintenance of the human body (Drake et al., 2016). Ingestion, digestion, absorption, and assimilation are all involved in the process. Several essential nutrients are required by the body to support effective growth and development in children. These nutrients are essential in fighting diseases and also enhance cognitive development in learners, thereby facilitating and ensuring quality education by improving children's learning capacity and addressing nutritional deficiencies (Drake et al., 2016). The nutrition programme is very significant as it encourages regular attendance by learners within schools and ensures punctuality (Sanousi, 2019). Gresse, Nomvete, and Walter (2017) also note that the nutrition programme helps alleviate short-term hunger by providing food that supplies 30% of the child's daily energy requirements.

National School Nutrition Programme

The NSNP was developed by the government to ensure the general well-being of schoolchildren, particularly within primary schools (Gresse et al., 2017). The programme aims to provide proper nutrition to the children, which also contributes to their overall well-being. Undernutrition in early childhood is most severe in rural regions and among children whose parents have a low educational level, little or no money, or live in poor environmental conditions (Gresse et al., 2017). This prompted the researcher to conduct this study to help improve the NSNP and yield better results in enhancing the nutrition of primary school children. The nutritional support of the NSNP could be beneficial in enhancing dietary diversity, general nutritional health, and encouraging more balanced meals later in life.

Theoretical Framework

This concept was first introduced by Najam in 1995, who identified the 5-C protocol, which encompasses content, context, commitment, capacity, and clients (Cloete et al., 2018). The major rationale of the theory is to analyse a programme implementation based on the 7Cs. Brynard added the sixth century, communication, in 2005, and Cloete added the seventh century, coordination. Cloete et al. (2018) postulate that "depending on the specific implementation situation, each of the seven variables is linked to and influenced by the others, to varying extents." The policy may include provisions for implementation capacity.

Additionally, the challenges or successes of policy implementation may be aligned with the institutional context of relevant stakeholders. In the absence of inefficiency or a lack of capacity, the commitment of implementers may close that gap only if there are no opposing actors in the implementation. This highlights the importance of effective communication, which requires that all stakeholders in the policy implementation process understand and accept the goals, objectives, roles, and responsibilities throughout the process. In this study, content refers to the goals of the NSNP and how it seeks to solve the perceived challenges. In addition, context encompasses the nature of the institutional context, the process through which the policy must be implemented, and its limitations. Commitment refers to the obligation of the ECDoE officials who are entrusted to implement the programme, and capacity is related to the administrative capacity of implementers to carry out the desired change. It is worth noting that when assessing the implementation of the NSNP, the research tests it against all 7Cs.

Legislative Framework

The constitution is the first piece of legislation that supports the NSNP among many others. Every piece of legislation created in the nation must comply with the Constitution because it is the supreme law of the land (Sanousi, 2019). Students have the right to basic nutrition under the constitution, as stated in Section 28(1)(c) (Republic of South Africa, 1996). However, Section 29(1)(a) addresses the right to access fundamental education (Republic of South Africa, 1996). Additionally, all children have the right to housing, clothing, and a healthy diet, as stated in Part 2,

Article 6 of the Children's Charter, which was adopted at the Summit on Family Life held on June 1, 1992, and is linked to the NSNP (Sanousi, 2019). According to Section 34 (1) of the South African Schools Act of 1996, the state is responsible for funding public schools from public revenue in an equitable manner, ensuring that learners' rights to education are properly exercised and that previous inequitable educational provisions are rectified (Sanousi, 2019).

RESEARCH METHODOLOGY

This study employed desktop research. It involved the review of literature from various published articles, journals, internet sources and dissertations (Oyelana, 2024). The researchers also used their experiential knowledge in public administration, and government publications to discuss issues pertaining to the implementation of the National School Nutrition Programme in the Education Districts in Eastern Cape. The data was then analysed, organised, and discussed in themes using thematic analysis. The researchers also analysed several articles published in peer-reviewed journals relevant to National School Nutrition Programme in South Africa. As this review was performed chronologically, the researchers had to plan, effectively execute, and systematically analyse the results based on the hermeneutic framework. The study employed relevant literature, incorporates the analysis and interpret the results obtained from that literature to discuss the findings. A methodological investigation was conducted between 2 February 2025 and 29 July 2025. The study utilised published materials available in electronic bibliographic databases and various websites and disciplines databases, namely the Applied Social Online Index and Abstracts; Africa Journal Online.

A brief description of Joe Gqabi Education District

To effectively present the NSNP implementation in the Joe Gqabi Education District, it is necessary to briefly discuss the socio-economic conditions in the District, located in the Eastern Cape. According to Ndilele (2017), Joe Gqabi Education District is a rural area characterised by underdevelopment and poverty, which can be attributed to the legacy of apartheid and the history of racial oppression. A great number of citizens in that area are unemployed, and there is a high level of alcohol and substance abuse, leading to social conditions that negatively affect the general behaviour of learners. A report by ECDoE AR (2020–2021) revealed that Joe Gqabi Education District is one of the 12 education districts in the Eastern Cape Province. The district has faced its fair share of challenges stemming from the poverty prevalent in the Eastern Cape Province. Within this district, there are high levels of poverty and unemployment, and hunger is the order of the day in many families (ECDoE AR, 2020–2021). In this section, the researcher endeavoured to find out how the National School Nutrition Programme is being implemented in the Joe Gqabi Education District.

FINDINGS AND DISCUSSION

Implementation of the National School Nutrition Programme in the Joe Gqabi Education District

The implementation of the National School Nutrition Programme (NSNP) in the Joe Gqabi Education District is overseen by the Eastern Cape Department of Education in partnership with the national Department of Basic Education, which mainly serves a coordinating function (ECDoEAR, 2020–2021). However, findings indicate that the programme is being undermined by unethical practices among some individuals involved in meal service (Mafugu, 2021; Nkosi, 2023). These include instances of theft and corrupt behaviour, which result in meals not reaching the intended learners, thereby compromising the programme's purpose (Transparency International, 2023).

According to Sanousi (2019), the NSNP is built around three core pillars: the provision of daily nutritious meals to learners; nutrition education aimed at promoting healthier lifestyle choices; and the development of school food gardens where learners, educators, and parents participate in growing food, thereby supporting household food security in the long term. Observations in the Joe Gqabi District revealed that many schools show high levels of learner participation in these interventions. This is particularly evident in the upkeep of school vegetable gardens, which are supported by well-maintained inventories of agricultural tools listed in school asset registers (ECDoEAR, 2020–2021).

Optimal Implementation of the NSNP in Rural Districts

The NSNP is widely recognised as a poverty reduction initiative that improves the nutritional status and learning environment for children, especially in under-resourced areas like Joe Gqabi. The programme's impact would be more significant if it were integrated with other developmental initiatives, such as replacing unsafe mud school structures with proper infrastructure. Nonetheless, one of the recurring issues identified in the programme is the employment status of the monitors tasked with overseeing daily operations. These monitors are often employed on a temporary basis, resulting in job insecurity, low morale, and inconsistent implementation (Shisana et al., 2013). Research by Ndilele (2017) highlights the need to consider more stable and long-term employment options for these critical personnel. Furthermore, Qila and Tyilo (2014) argue that for the NSNP to be more effective, particularly in the Joe Gqabi Education District, increased budget allocations are necessary to enhance the nutritional quality of meals provided.

In addition, Mafugu (2021) notes a lack of robust accountability systems involving key stakeholders such as School Governing Bodies (SGBs) and parents. To ensure effectiveness and sustainability, establishing dedicated monitoring and evaluation teams within the district is essential. These teams would be responsible for overseeing all aspects of the programme—from meal distribution to food garden management—ensuring greater transparency and coordination.

CONCLUSION

A key finding from the study is that the successful implementation of the NSNP depends heavily on active participation from all stakeholders. As education is a collective responsibility, the involvement of parents, educators, learners, and community members in the Joe Gqabi Education District is vital for sustaining the programme's impact in rural Eastern Cape schools. It has been noticed that this program has been ineffective in some schools or destabilised by some individuals injecting some unethical behaviours in meal services. As a result, theft and highly corruptible practices have always been the mother of the day.

RECOMMENDATIONS

Drawing on the findings of this research, several recommendations are proposed:

Strengthen Accountability: It is essential to establish clear and transparent accountability mechanisms. These should not only protect the reputation of the Department of Education but also ensure that all learners consistently receive nutritious meals.

Review and Monitor Suppliers: The Department of Education should reassess the list of suppliers to ensure food quality meets health and safety standards. Regular quality inspections should be conducted, and service-level agreements must include enforceable penalties for non-compliance.

Promote Stakeholder Engagement in Food Gardens: School communities should be encouraged to take collective ownership of food gardens. Teachers, learners, and parents must work together to manage and maintain these gardens. To foster continued interest and engagement, schools could compete for recognition or awards based on garden productivity and innovation.

Institutionalise Monitoring and Evaluation: Each education district should establish a permanent team tasked with regularly monitoring the implementation of the NSNP. This team should be equipped to evaluate all facets of the programme, including nutrition education, food quality, and garden effectiveness.

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Auditing Artificial Intelligence in Public Management: A Framework for Accountability, Transparency, and Ethical Governance

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ABSTRACT: The integration of Artificial Intelligence (AI) in public management has transformed governmental operations, decision-making processes, and service delivery mechanisms. However, this technological adoption introduces unprecedented challenges in accountability, transparency, bias mitigation, and ethical governance. This article proposes a comprehensive framework for auditing AI systems in public sector contexts, addressing both technical and governance dimensions. Through systematic literature review and analysis of emerging regulatory frameworks, we identify critical audit domains including algorithmic transparency, data governance, decision explicability, bias detection, and compliance verification. The study examines case implementations in public procurement, social services, and administrative decision-making, drawing insights from international experiences and regulatory developments. Key findings reveal that effective AI auditing requires multi-dimensional approaches combining technical validation, ethical assessment, legal compliance verification, and stakeholder engagement. The proposed framework establishes methodological guidelines for internal auditors, external oversight bodies, and governance structures, emphasizing risk-based auditing strategies aligned with public sector accountability principles. This research contributes to the emerging discourse on AI governance in public administration by providing practical audit methodologies adaptable to diverse governmental contexts while maintaining democratic values and citizen protection standards.

KEYWORDS: Artificial Intelligence Auditing, Public Management, Algorithmic Accountability, AI Governance, Public Sector Technology, Transparency

1. INTRODUCTION

The proliferation of Artificial Intelligence (AI) technologies in public management represents one of the most significant transformations in contemporary governance. Governments worldwide are deploying AI systems across diverse functions including public procurement evaluation, benefit eligibility determination, risk assessment for regulatory compliance, predictive policing, resource allocation, and citizen service delivery (Wirtz et al., 2019; Veale et al., 2018). These implementations promise enhanced efficiency, data-driven decision-making, cost reduction, and improved service quality. However, the opacity of AI algorithms, potential for embedded biases, accountability gaps, and limited explainability raise fundamental questions about democratic governance, citizen rights, and public trust (O'Neil, 2016; Eubanks, 2018).

Recent high-profile cases have demonstrated the risks of inadequately governed AI in public sector applications. Algorithmic systems deployed for welfare benefit assessments have been found to perpetuate discriminatory outcomes, predictive policing algorithms have reinforced racial profiling patterns, and automated decision systems have produced unexplained denials of citizen applications (Eubanks, 2018; Richardson et al., 2019).

This article develops a comprehensive framework for auditing AI systems deployed in public management contexts. The research objectives include: (1) identifying critical dimensions requiring audit scrutiny; (2) proposing methodological approaches for technical and governance auditing; (3) examining regulatory frameworks and compliance requirements; (4) analyzing practical implementation challenges and risk mitigation strategies; and (5) establishing guidelines adaptable to diverse governmental contexts.

2. METHODOLOGY

This research employs a multi-method approach combining systematic literature review, comparative regulatory analysis, and framework development.

2.1 Literature Review Protocol

A systematic literature review was conducted following PRISMA guidelines covering publications from January 2015 to December 2024. The initial search yielded 847 potentially relevant sources. After screening, final inclusion involved 127 sources demonstrating direct relevance to AI auditing frameworks.

2.2 Comparative Regulatory Analysis

Regulatory frameworks were analyzed across multiple jurisdictions including the European Union, United Kingdom, United States, Canada, Peru (Law 32069), and emerging Latin American frameworks.

3. THEORETICAL FOUNDATIONS

Understanding AI system characteristics is fundamental to developing appropriate audit methodologies. AI technologies exhibit distinct properties demanding specialized scrutiny including algorithmic opacity, dynamic learning, data dependencies, and probabilistic decision-making.

4. CRITICAL AUDIT DIMENSIONS

Based on literature synthesis and regulatory analysis, we identify six critical dimensions: (1) Algorithmic fairness and bias detection; (2) Legal compliance and regulatory conformity; (3) Transparency and explainability; (4) Accountability structures and human oversight; (5) Data governance and privacy protection; and (6) Performance monitoring and risk management.

5. PROPOSED AUDIT FRAMEWORK

The comprehensive framework is structured in five phases: (1) Pre-implementation assessment evaluating purpose legitimacy and impact; (2) Technical validation examining algorithms and training data; (3) Governance compliance verification assessing legal compliance and accountability; (4) Operational monitoring tracking performance and bias; and (5) Periodic comprehensive review conducting holistic reassessment.

6. IMPLEMENTATION CHALLENGES

Practical implementation encounters multiple obstacles including technical complexity exceeding auditor expertise, proprietary algorithm opacity limiting access, resource constraints, rapidly evolving technology, and organizational resistance. Strategic mitigation includes specialized training, contractual disclosure requirements, risk-based prioritization, and flexible framework design.

7. CASE ANALYSIS

Framework application is illustrated in three public sector domains: (1) Public procurement evaluation systems where Peru's Law 32069 establishes comprehensive regulations; (2) Social benefit eligibility determination involving fairness analysis and due process compliance; and (3) Regulatory compliance risk assessment requiring calibration and fairness verification.

8. DISCUSSION

The analysis reveals fundamental tensions between AI technological capabilities and public sector accountability requirements. Key governance implications include redefining transparency in algorithmic contexts, balancing innovation and precaution through risk-based approaches, institutional capacity development, dynamic governance frameworks, and ethical dimensions beyond legal compliance.

9. CONCLUSIONS

This article developed a comprehensive framework for auditing AI systems in public sector contexts. Key conclusions include: First, effective AI auditing requires multi-dimensional approaches integrating technical analysis, governance assessment, ethical evaluation, and stakeholder engagement. Second, AI's distinctive characteristics demand specialized audit methodologies. Third, risk-based prioritization is essential. Fourth, transparency requirements must be reframed for AI contexts emphasizing outcome-oriented accountability. Fifth, clear accountability structures maintaining human authority remain essential. Sixth, continuous monitoring supplements periodic comprehensive audits. Seventh, institutional capacity development represents an essential prerequisite.

The proposed framework offers adaptable guidance applicable across diverse governmental contexts. As AI deployment accelerates, robust auditing mechanisms become increasingly critical for ensuring technological advancement aligns with democratic values, legal requirements, and public interest.

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Integrated Anti-Corruption Auditing (IAA): A Strategic Tool in the Fight Against Corruption in Latin American Public Entities

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ABSTRACT: Corruption in public procurement represents one of the most significant challenges facing Latin American governments, generating substantial economic losses and undermining citizen trust in public institutions. This article examines the Integrated Anti-Corruption Auditing (IAA) approach as an innovative methodology that combines financial, compliance, operational, and forensic auditing dimensions to provide comprehensive evaluation of anti-corruption controls in public entities. Through systematic literature review and case study analysis, particularly examining Brazil's ALICE platform implementation in public procurement, this research demonstrates how IAA transcends traditional auditing by integrating multiple disciplinary perspectives and leveraging advanced technologies such as artificial intelligence. The findings reveal that IAA enables early detection of corruption patterns, strengthens institutional accountability, and fosters a culture of transparency. The article proposes key recommendations for effective IAA implementation in Latin American public entities, emphasizing the critical importance of auditor independence, technological capacity building, and coordination among oversight bodies.

KEYWORDS: integrated auditing, anti-corruption, public procurement, Latin America, forensic auditing, transparency

INTRODUCTION

Corruption constitutes a systemic problem that undermines economic development, erodes social trust, and weakens democratic institutions throughout Latin America. According to international estimates, corruption costs the region between 2% and 5% of GDP annually, with public procurement being one of the sectors most vulnerable to corrupt practices. Recent scandals such as Operation Car Wash (Lava Jato) in Brazil, the Odebrecht case affecting multiple countries, and various procurement irregularities have highlighted the urgent need for more robust and comprehensive mechanisms to prevent, detect, and sanction corruption.

In this context, Integrated Anti-Corruption Auditing (IAA) emerges as an innovative response that transcends traditional auditing approaches. Unlike conventional audits that focus on isolated aspects such as financial compliance or operational efficiency, IAA proposes a holistic methodology that simultaneously integrates multiple dimensions: financial, compliance, operational, performance, and forensic auditing. This comprehensive approach enables more effective identification of corruption schemes, evaluation of control system effectiveness, and generation of actionable recommendations for strengthening institutional integrity.

The relevance of IAA in the Latin American context is particularly significant given the region's institutional and legal characteristics. Most countries have implemented anti-corruption legal frameworks aligned with international conventions such as the Inter-American Convention against Corruption and the United Nations Convention against Corruption. However, enforcement has been partial and inconsistent. IAA offers a practical tool for operationalizing these normative commitments through systematic and evidence-based evaluation.

This article aims to analyze IAA's conceptual foundations, examine its practical application in public procurement in Latin America, and propose guidelines for its effective implementation. The central research question is: How can Integrated Anti-Corruption Auditing contribute to strengthening transparency and accountability in Latin American public entities, particularly in public procurement?

LITERATURE REVIEW

The Concept of Integrated Anti-Corruption Auditing

IAA is defined as a systematic and comprehensive methodology that combines multiple auditing dimensions to evaluate the effectiveness of anti-corruption measures in public organizations. Unlike traditional approaches that examine specific aspects in isolation, IAA integrates financial auditing (verification of accounting accuracy and compliance with financial regulations), compliance auditing (evaluation of adherence to anti-corruption laws and policies), operational auditing (analysis of internal control efficiency), and forensic auditing (investigation of fraud indicators and corrupt schemes).

The theoretical foundation of IAA draws on multiple disciplinary traditions. From an institutional perspective, IAA aligns with principal-agent theory, which recognizes information asymmetries between citizens (principals) and public officials (agents), creating opportunities for

opportunistic behavior. IAA seeks to reduce these asymmetries through systematic information generation on public resource management. From a public management standpoint, IAA connects with New Public Management approaches emphasizing transparency, accountability, and results-based management.

Corruption and Public Procurement in Latin America

Public procurement represents between 10% and 20% of GDP in Latin American countries, making it strategically important for economic development and service delivery. However, this sector is particularly vulnerable to corruption due to several factors: complexity of procurement processes, discretionary authority of officials, asymmetric information between buyers and suppliers, and insufficient oversight mechanisms.

Common corrupt practices in public procurement include bid rigging, over-invoicing, artificial contract splitting to avoid controls, nepotism in contractor selection, and receipt of kickbacks. These practices not only generate direct economic losses but also undermine service quality, distort market competition, and erode citizen trust in government.

Various studies have documented the pervasiveness of corruption in Latin American public procurement. Research on Operation Car Wash revealed systematic corruption schemes involving billions of dollars in inflated contracts. Similar patterns have been identified across multiple countries in the region, suggesting that corruption in procurement is not merely isolated incidents but often involves organized networks.

The Role of Supreme Audit Institutions

Supreme Audit Institutions (SAIs) play a crucial role in preventing and detecting corruption. The Inter-American Convention against Corruption explicitly recognizes the importance of strengthening SAIs as control bodies responsible for overseeing public spending and compliance with regulations. However, research has shown that SAIs' effectiveness varies considerably across Latin America, depending on factors such as legal independence, technical capacity, available resources, and political will to act on audit findings.

Recent studies analyzing Brazilian SAIs' anti-corruption role have produced mixed results. While some research demonstrates that random audits can reduce corruption and increase electoral accountability, other studies reveal that audit institutions themselves may be captured by political or economic interests, limiting their anti-corruption effectiveness. This underscores the importance of not only having audit mechanisms but ensuring they operate with genuine independence and adequate capacity.

Technology and Innovation in Anti-Corruption Auditing

Technological advancement has opened new possibilities for anti-corruption auditing. Artificial intelligence, big data analytics, and machine learning enable processing vast amounts of procurement data to identify suspicious patterns that would be difficult to detect through traditional manual methods. Electronic procurement platforms, when properly designed, can enhance transparency by making information publicly accessible and facilitating monitoring by oversight bodies and civil society.

Brazil's ALICE platform (Analyzer of Bids, Contracts, and Notices), developed by the Office of the Comptroller General, exemplifies technology application in anti-corruption auditing. This system uses artificial intelligence algorithms to continuously analyze federal procurement and automatically generate alerts about potential irregularities. Recent research shows that ALICE implementation is associated with increased procurement transparency and reduced corrupt practices.

MATERIALS AND METHODS

This research employs a qualitative methodology combining systematic literature review with case study analysis. The systematic review followed PRISMA guidelines, identifying relevant academic articles, institutional reports, and policy documents on anti-corruption auditing, public procurement, and oversight mechanisms in Latin America. Databases consulted included Scopus, Web of Science, SciELO, and institutional repositories of international organizations such as UNODC, OAS, World Bank, and IDB.

Search terms included combinations of keywords such as 'integrated audit,' 'anti-corruption,' 'public procurement,' 'Latin America,' 'forensic audit,' and 'transparency.' The initial search yielded 247 documents, which were filtered based on relevance, quality, and recency. After applying inclusion and exclusion criteria, 68 documents were selected for in-depth analysis.

In addition to literature review, a detailed case study was conducted on Brazil's ALICE platform implementation in federal public procurement. This case was selected for several reasons: it represents an innovative example of technology integration in anti-corruption auditing, has been operating for several years allowing impact evaluation, documented implementation has been subject to academic research, and Brazil has been regional leader in anti-corruption innovations.

Case study analysis examined ALICE's technical characteristics, implementation processes, results achieved, identified challenges, and lessons learned. Primary information sources included official Office of the Comptroller General reports, academic studies evaluating ALICE's impact, specialized press articles, and comparative analyses with similar initiatives in other countries.

The research also incorporated comparative analysis of anti-corruption legal and institutional frameworks in five Latin American countries: Brazil, Mexico, Colombia, Chile, and Peru. These countries were selected to represent regional diversity in terms of governance levels, legal systems, and anti-corruption approaches.

RESULTS

Key Components of Integrated Anti-Corruption Auditing

Analysis reveals that effective IAA comprises five fundamental components that must be comprehensively integrated:

First, corruption risk assessment, which involves systematically identifying and prioritizing areas most vulnerable to corrupt practices. This includes analyzing institutional context, identifying critical points in processes, evaluating existing control effectiveness, and mapping potential perpetrators and opportunities. Risk assessment should be dynamic and regularly updated based on new information and detected patterns.

Second, control system evaluation, which examines whether anti-corruption controls are adequately designed and effectively operating. This involves reviewing policies and procedures, analyzing organizational structure and segregation of duties, evaluating monitoring and supervision

mechanisms, and assessing training and awareness programs. Control evaluation should address both preventive controls (designed to prevent corruption) and detective controls (designed to identify corruption when it occurs).

Third, forensic analysis and fraud investigation, which utilizes specialized techniques to detect corruption indicators. This includes analyzing financial data and transactions for anomalies, reviewing documents and contracts for irregularities, interviewing key actors, and applying forensic techniques such as benford analysis and data mining. Forensic analysis should be both reactive (responding to corruption allegations) and proactive (systematically searching for suspicious patterns).

Fourth, technology and data analytics, which leverages digital tools to enhance audit efficiency and effectiveness. This includes implementing electronic procurement systems, using artificial intelligence algorithms to detect patterns, applying big data analytics to large datasets, and developing dashboards and visualizations for monitoring. Technology integration enables continuous auditing, automatic alert generation, and correlation analysis that would be impossible manually.

Fifth, reporting and follow-up, which ensures audit findings translate into concrete actions. This involves preparing clear and evidence-based reports, communicating findings to relevant authorities, monitoring implementation of recommendations, and coordinating with investigative and sanctioning bodies. Effective reporting should balance technical detail with accessibility for non-specialist audiences and include specific recommendations with implementation timelines.

Case Study: Brazil's ALICE Platform in Public Procurement

The ALICE platform (Analyzer of Bids, Contracts, and Notices) represents an innovative application of IAA in Brazilian federal public procurement. Developed by the Office of the Comptroller General beginning in 2017, ALICE uses artificial intelligence algorithms to continuously analyze procurement data and automatically generate alerts about potential irregularities.

ALICE operates by integrating data from various government systems, including ComprasNet (the federal electronic procurement platform), the Integrated Financial Management System, and supplier registration databases. The system processes millions of transactions monthly, applying over 40 different algorithms designed to detect corruption patterns such as: price manipulation, unjustified contract amendments, artificial bid splitting, conflicts of interest among bidders, anomalies in payment patterns, and suppliers with suspicious characteristics.

When an algorithm detects a suspicious pattern, ALICE automatically generates an alert classified by risk level (high, medium, or low) and assigns it to the appropriate auditor for investigation. The system also provides auditors with analytical tools to examine transactions in detail, identify related patterns, and document findings.

ALICE impact evaluation shows significant results. According to Office of the Comptroller General reports, since implementation the platform has: generated over 50,000 alerts about potential irregularities, contributed to hundreds of investigations resulting in sanctions and asset recovery, prevented losses estimated at billions of reais through preventive action, and improved transparency by making procurement data publicly accessible through dashboards.

Recent academic research analyzing ALICE's impact found that alerts generated by the system are associated with approximately 20% increase in total procurement over the analyzed period, suggesting that ALICE has helped mitigate risk aversion among procurement officials who might otherwise avoid legitimate purchases for fear of being accused of irregularities. This finding is particularly relevant as it demonstrates that effective anti-corruption auditing can not only reduce corruption but also improve government operational efficiency.

However, ALICE implementation has also faced challenges. These include the need for significant initial investment in technological infrastructure, the requirement for specialized auditors capable of interpreting algorithms and conducting forensic investigations, resistance from some public officials who perceive the system as additional control that complicates their work, and the need to balance automation with human judgment in evaluating cases.

IAA Comparative Analysis in Latin America

Comparative analysis of five countries reveals significant variations in how anti-corruption auditing has been implemented. Brazil stands out for technology integration (exemplified by ALICE) and its active Supreme Audit Institution (TCU). Mexico has strengthened its anti-corruption legal framework through creation of the National Anti-Corruption System, though implementation challenges persist. Colombia has implemented beneficial ownership transparency initiatives in public procurement. Chile maintains relatively high governance standards with robust electronic procurement systems. Peru has made progress in transparency but faces challenges in institutional coordination.

Despite these differences, all countries face common challenges: limited technical and financial capacity of audit institutions, insufficient coordination among oversight bodies, political interference risks that compromise auditor independence, limited participation by civil society in monitoring, and difficulties in converting audit findings into effective sanctions.

Critical Success Factors

Analysis identifies several factors critical for successful IAA implementation: legal and political independence of audit institutions, adequate technical capacity and continuous training for auditors, advanced technological infrastructure, strong legal frameworks supporting auditor actions, effective coordination mechanisms among oversight bodies, citizen and civil society participation in monitoring, transparency in audit processes and results, and political will to act on audit findings.

These factors are interdependent and mutually reinforcing. For example, technological infrastructure is most effective when combined with adequate auditor capacity and strong legal frameworks that support technology use in investigations.

DISCUSSION

Results demonstrate that Integrated Anti-Corruption Auditing represents a significant advance over traditional auditing approaches, offering a more comprehensive and effective methodology for addressing corruption in Latin American public entities. IAA's integrative nature addresses several limitations of conventional audits, which often focus on isolated aspects and may miss systemic corruption patterns that emerge across multiple dimensions.

The ALICE case in Brazil is particularly instructive, demonstrating how technology integration can significantly enhance anti-corruption auditing capacity. The system's ability to process large data volumes, identify suspicious patterns, and generate automatic alerts enables more efficient and effective auditing than would be possible through traditional manual methods. Moreover, ALICE's impact on reducing procurement officials' risk aversion is an unexpected positive outcome, suggesting that well-designed anti-corruption systems can simultaneously reduce corruption and improve government efficiency.

However, it is important to recognize technology limitations. While artificial intelligence tools can identify patterns and generate alerts, human judgment remains essential for interpreting results, considering context, and making final decisions. Additionally, algorithm effectiveness depends on data quality and system design, which can be manipulated if controls are inadequate.

Comparative analysis reveals that while all Latin American countries face corruption challenges in public procurement, successful approaches vary by institutional context and available resources. This suggests that there is no one-size-fits-all solution and that IAA implementation must be adapted to each country's specific circumstances. However, the identified success factors provide useful guidance for designing country-specific strategies.

A critical finding is the importance of auditor independence. Without genuine autonomy from political and economic pressures, even the most sophisticated audit techniques will be insufficient to combat corruption. This aligns with prior research demonstrating that SAIs' effectiveness depends heavily on their institutional independence and organizational capacity.

Another important insight is the need for coordination among different oversight actors. Corruption in public procurement often involves complex networks spanning multiple institutions and sectors. Effective response requires collaboration among audit institutions, prosecutors, judiciary, and civil society organizations. The lack of such coordination, identified as a common challenge across countries studied, represents a significant obstacle to IAA effectiveness.

Research also highlights the importance of transparency in audit processes. Making audit findings publicly accessible not only facilitates civil society monitoring but can also deter potential corrupt actors who know their actions may be exposed. Electronic platforms allowing citizen access to procurement data and audit reports are valuable tools in this regard.

Finally, it is important to acknowledge this research's limitations. Analysis focused primarily on public procurement, which while critical is only one of many areas vulnerable to corruption. Additionally, reliance on available literature and secondary data means that some nuances of implementation and local context may not be fully captured. Future research could benefit from in-depth field studies and interviews with auditors and other key stakeholders.

CONCLUSION

Integrated Anti-Corruption Auditing emerges as a powerful strategic tool in the fight against corruption in Latin American public entities. By integrating multiple auditing dimensions and leveraging advanced technologies, IAA enables more effective detection of corruption patterns, more comprehensive evaluation of control systems, and more evidence-based recommendations for strengthening institutional integrity.

Brazil's ALICE platform experience demonstrates IAA's practical potential. Technology integration has significantly enhanced audit capacity, enabling processing of large data volumes and identification of suspicious patterns that would be difficult to detect manually. Results achieved, including thousands of irregularity alerts and prevention of significant losses, validate this innovative approach.

However, IAA is not a panacea. Its effectiveness depends on several critical factors: auditor independence, adequate technical and financial capacity, strong legal frameworks, coordination among oversight bodies, and political will to act on audit findings. Without these enabling conditions, even the most sophisticated audit techniques will have limited impact.

For Latin American countries seeking to strengthen their anti-corruption capacity, this research offers several key recommendations:

First, invest in technological infrastructure and auditor capacity development to enable IAA implementation. This includes acquiring data analytics tools, training auditors in forensic techniques and technology use, and developing electronic systems facilitating data integration and analysis.

Second, strengthen legal frameworks protecting auditor independence and supporting their actions. This includes guaranteeing organizational autonomy, protecting auditors from political retaliation, and establishing clear mechanisms for following up on audit recommendations.

Third, promote coordination among oversight bodies through formal cooperation mechanisms, information sharing, and joint action protocols. Effective anti-corruption response requires collaboration across multiple institutions.

Fourth, foster transparency by making audit processes and findings publicly accessible. This facilitates civil society monitoring and strengthens accountability.

Fifth, learn from successful experiences in other countries while adapting approaches to local context. Regional cooperation and knowledge exchange can accelerate IAA adoption and improvement.

Combating corruption in public procurement and other areas requires sustained long-term commitment involving not only audit institutions but also political leadership, judiciary, civil society, and private sector. IAA is a valuable tool in this effort, but its success ultimately depends on comprehensive commitment to integrity and accountability throughout society.

Future research should explore IAA application in other sectors beyond procurement, evaluate long-term impact of technology-based initiatives like ALICE, and examine cultural and institutional factors influencing IAA effectiveness in different Latin American contexts. Only through continued learning and adaptation can the region build truly effective defenses against corruption.

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Analysing the Global Publication of E-Government During the Period 2003-2023 Using A Scientometric Approach

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ABSTRACT: Numerous countries have undergone strategic transformations by integrating new information and communication technologies intensively. This paper critically examines and delineates research contributions in the realm of e-Government, aiming to pinpoint future areas of interest and potentially valuable methodologies. Taking a critical stance, this analysis explores the implications of e-government models on public-sector management, underscoring the strategic use of information and communication technologies. The goal is to identify key research areas and methodologies with the potential to enhance the effectiveness of e-Government initiatives. This study employs diverse scientometric approaches, focusing on 5,540 articles, as research objects extracted from the Scopus database spanning from 2003 to 2023. Leveraging the information visualization software VOSviewer, we delve deeper into the literature data, uncovering insights into publications, citations, subject areas, countries, keywords, and topic clusters. The results of the scientometric analysis shed light on several research gaps, underscoring specific areas that demand attention in future research, particularly within developing countries. The trend of research tends to increase every year although it had a significant decline in 2015. The most cited documents are related to e-Government, emphasizing the critical intersections between e-Government initiatives and analytical factors such as citizen trust, information and communication technologies (ICT), social media, transparency, and digital image analysis. The four fields that dominate the research area are social sciences, computer science, business, management and accounting, and engineering. The United States of America is the most productive country while The United Kingdom is the most citations. Through an exhaustive exploration of current literature, this study provides an updated and concise summary of the knowledge structure and evolutionary path in the field. The findings reveal a developmental shift from basic automation to advanced neural network platforms, with a distinct focus on transformative technologies such as cloud computing, big data, blockchain, artificial intelligence, machine learning, and the internet of things (IoT). This comprehensive overview highlights the key technological advancements shaping the landscape and emphasizes the critical elements contributing to the field's progression.

KEYWORDS: e-government, software VOSviewer, information and communication technologies (ICT), Scopus database

1. INTRODUCTION

E-Government, also referred to as electronic government and its many synonyms or near synonyms such as e-gov, digital government, online government, or transformational government, involves the utilization of internet technology as a medium for sharing information, delivering services, and conducting interactions with citizens, businesses, and various governmental entities (Grigalashvili, 2023). E-Government is the electronic provision of governmental information and services round the clock, seven days a week and it has made an essential change in the whole society's structure, values, culture, and the ways of conducting business by utilizing the potential of ICT as a tool in the daily work (Alshehri & Drew, 2023) (Holden et al., 2003). At present, the development of research and practice on e-Government has been growing over time since its inception in the 1980s (Curtin et al., 2004).

In the early years, the concept e-Government was initiated by NPR “National Performance Review” under the Clinton administration in the United States (Chung, 2020), and arrived in Asia in the 1990s (Warf, 2016a). This research supports government innovation through the application of information technology and seeks to implement various reforms in government functions in various sectors. International research on e-Government is now more focused on several key topics, such as government transparency, technological innovation and modernization, organizational and institutional transformation, and the digital divide and resistance to change. (Rodríguez Bolívar et al., 2016). To build an effective system for evaluating e-government policies, attention is paid to interoperability, ensuring different organizations and stakeholders can integrate easily. This also includes reviewing the institutional and organizational changes that governments need to make when adopting new technologies, with ongoing evaluation as a basis for better decision-making. In addition, researchers are beginning to investigate the role of e-participation in environmental management (Qi et al., 2018). To build public trust and, in turn, encourage the use of e-government services, recent research on e-government has increasingly highlighted issues related to security and privacy. (Kanaan et al., 2023). In certain areas, such as encouraging citizen participation in public affairs, improving information transparency, accountability, public data disclosure, and critical analysis and discussion of e-government initiatives, research is increasingly focused on the differences between developed and developing countries. Future e-government research will continue to evolve and influence practices by utilizing technology, and focusing on specific audiences and key issues.

E-Government is a crucial topic, especially with the continuous development of new technologies, which have a significant impact on the role of government and how governments interact with society (Welch, 2021). These new technologies are driving major changes in governance, as they are now an integral part of everyday life. These changes include aspects such as democracy, accountability, service delivery and policy evaluation. (Griffin et al., 2007). Several experts have explored the status of e-government in various countries through comparative research methods. Barney Warf studied the history, politics, impact, and geographical spread of e-government. (Warf, 2016b). Mi'rojul Huda and Novy Setia Yunas studied how Indonesia's e-Government system developed to address the growing demands of modernization and globalization. (Huda & Yunas, 2016). Nahleen Ahmed assessed the state of e-Government in several countries, including the US, UK, Singapore, and Canada. This analysis, which focused on aspects such as data collection, online service delivery, and interaction, highlighted both the strengths and weaknesses of each country's e-Government initiatives. Overall, research on e-Government is vital for government efforts to develop more efficient and effective service delivery systems. It also promotes inclusivity and equality within society. By gaining a deeper understanding of e-Government, we can enhance our knowledge and create new opportunities to address society's diverse needs.

Studies have indicated that e-Government enhances public satisfaction with services. (Kuswati et al., 2022) It promotes sustainable development. (Dhaoui, 2022). The enhancement of public service delivery through digital platforms not only meets the needs of citizens effectively but also fosters long-term societal growth and prosperity, aligning with principles of sustainability and progress. While e-Government offers numerous potential benefits, its implementation can be challenging and demands careful planning and preparation. (Muhammad & Hromada, 2023). To effectively implement this transformative governance approach, it is crucial to have a deep understanding of the concept of e-Government and the extensive research that underpins it.

Scientometric analysis is a method used to track the growth of e-Government research. This approach is highly effective for understanding the progression of e-Government studies. As stated by Price (1963), scientometrics is the study of science itself, employing a systematic approach to examine the historical, current, and future directions of a research field. (Price, 1963). Through scientometric analysis, researchers can pinpoint emerging areas of study, significant academic publications, current research trends, and the extent to which research contributes to advancing educational practices. (Olawumi & Chan, 2018). Moreover, scientometrics is a quantitative method that employs mathematical models, cluster visualization, and analytical algorithms to evaluate, map, and uncover structural trends within a specific field of study. (Saka & Chan, 2019). By utilizing scientometric analysis, researchers and educators can establish more effective and efficient priorities for research and development.

This study will use scientometric analysis to examine the number of publications, subject areas, journals that publish them, and the most active institutions in the field of differentiated education. Additionally, text mining algorithms will be employed to analyze article content in order to identify key themes, concepts, and research questions. This approach will help us understand how the field has evolved over time, including the emergence of new research topics, the prevalence of certain subjects, and the impact of prominent researchers and journals. (Mingers & Leydesdorff, 2015). The study will also explore the global distribution of publications on differentiated teaching, including the countries where the research is conducted and published. This will help identify language or geographic disparities in the research and provide insights into the global scope of the field. (Serenko, 2021). Furthermore, this study will explore collaboration patterns among institutions across different research fields, identifying the most productive organizations and countries. It will also analyze citation counts, h-index, and other scientific impact metrics to assess the influence of research in the field of differentiated education.. This will assist in determining the most important papers and journals in the subject as well as the extent and significance of e-Government research. Overall, this study will offer a thorough assessment of the state of e-Government today highlighting important topics, scholarly works, and journals while pinpointing areas in need of more investigations.

In order to obtain the most-up-to-date knowledge both domestically and internationally, numerous academic institutions and businesses continue to conduct e-Government research. This study brings a better understanding of e-Government and paves the way for further research. In particular, it explains the geo-dimensionality and evolution of e-Government and the direction has taken over the past two decades. The study also gives an idea utilization of multiple theories combined with e-Government by authors in different contexts and domains. In addition, the study opens up new theoretical avenues for researchers by highlighting numerous keywords that existing authors have studied in recent years. Driven by the core objective, we propose the following research questions to be addressed in the study:

RQ1. What is the e-Government research trends?

RQ2. What are the various fast-growing subject areas within e-Government over two decades?

RQ3. Which are the predominant institutions, publications, sources, countries, and research areas on e-Government?

RQ4. What opportunities can be explored in future research in this area?

2. RESEARCH METHODOLOGY

The relevant articles for this study were retrieved from the Scopus database. The detailed inclusion and exclusion criteria for article selection are shown in Table 1. We used the Scopus database because of its wide coverage of publishers, and high-impact journals, and is well-established. In addition, the database also offers comprehensive coverage of multidisciplinary

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Articles used updated e-Government
	Publication Time frame: 2003–2023
	Language: English
	Document Type: Journal Articles
	Publication Stage: Final
	Database: Scopus
Exclusion criteria	
	Articles before the ten-year update [1992–2002]
	Articles excluded outside the time frame
	Non-English articles
	Article in press
	Conference proceedings, Books, Early access, corrections

journals and references, making it effortless to navigate and access manuscripts from diverse geographic regions (Burnham, 2006). Another main reasons for using Scopus are that it offers valuable features such as the ability to export document attributes in an Excel spreadsheet format and provides an extracted file format compatible with network data analysis software like VOSviewer (Faisal et al., 2021).

A keyword search was performed to identify e-Government studies published between 2003 and 2023, primarily with the intention of examining the last two decades of e-Government research and charting when e-Government research began to peak during this period. The search was undertaken on 1 Oktober 2023, and as the flexible retrieval conditions, “e-Government” OR “electronic government” OR “e-gov” OR “digital government” OR “online government” OR “transformational government” were used to extract publications that contained any of these terms in their titles, abstracts, or keyword lists of the publications. To answer the research questions, the inclusion of these document types was needed, resulting in the selection of a total of 18,413 papers from Scopus repositories. All papers were in English and included journal articles, conference papers, books, book chapters, editorials, and other grey literature. The results are shown in Fig.1.

Scopus

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Advanced query ☐

TITLE-ABS-KEY ("E-Government" OR "electronic government" OR "e-gov" OR "digital government" OR "online government" OR "transformational government") AND PUBYEAR > 2002 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE , "English"))

[Save search](#) [Set search alert](#) [Edit in advanced search](#) [Show less](#)

Documents Patents Secondary documents Research data

18,413 documents found [Analyze results](#)

Refine search

Search within results

Filters [Clear all](#)

Year [Clear](#)

☐ All [Export](#) [Download](#) [Citation overview](#) [More](#) [Show all abstracts](#) Sort by [Date \(newest\)](#) [Grid](#) [List](#)

	Document title	Authors	Source	Year	Citations
Article • Open access					
1	The role of the Internet in later life autonomy: Silver surfers in Spain	Llorente-Barroso, C., Sánchez-Valle, M., Viñarás-Abad, M.	Humanities and Social Sciences Communications, 10(1),	2023	6

Figure 1. Scopus Documents Found

The extracted Scopus repository, containing 18,413 documents, was exported to a comma summative value (.csv) format with detailed publication information, study content including study keywords or subject areas, and scientometric analysis indicators. These documents underwent a rigorous screening process for completeness (e.g., availability of author details, abstract, organization name, on-road e-Government) and duplicity. This iterative screening process resulted in the final selection of 5,540 publications, reflecting the complexity of the task due to the high volume of initially identified publications.

The chosen publications were sorted based on their attributes, as mentioned earlier. All publications were then analysed against the individual as well as a combination of the attributes. Author affiliation information as recorded in Scopus repositories was considered as the most recent, also noted the types and locations of these affiliations from Scopus, considering the headquarters as the geographical location when an organization had multiple branches or campuses.

The organizations were categorized into four types: (a) Research and Education, including universities, colleges, and academic institutes; (b) Research and Business, encompassing private entities involved in consultancy or the manufacturing and distribution of goods and services; (c) Research and Government, which includes public authorities and research bodies; and (d) Others, such as research branches of private entities. Following this, a variety of scientometric analysis metrics were generated to examine the extracted results, as detailed below:

Citation analysis: A fundamental concept in scholarly research, operates on the foundational premise that citations serve as signposts guiding researchers towards valuable sources. These references, meticulously documented and strategically employed, function as a gauge of the visibility and influence of scholarly endeavours, encompassing aspects such as the authors' prowess, collaborative efforts, publication titles, affiliating institutions, geographic origins, disciplinary domains, research spheres, and even sources that may non-indexed (Tomaszewski, 2023). By examining precise, quantifiable elements of scientific literature at a given moment in time, this mapping aids in producing a visual representation of the connections between various research papers (Nicolaisen, 2010). Citations are essential for connecting various research publications. They display the number of times a document has been cited across all of the papers in a specific source (Cobo et al., 2011). Citations give researchers the chance to incorporate the ideas of other academics into their own works, enhancing them and helping to build the intellectual basis for their particular field of study (Mou et al., 2019).

Over the past two decades, citations have aided us in developing a visual depiction of the larger framework of e-Government research. Each research publication is represented by a circular node in the illustrations, and the size of these circles is directly correlated with the number of citations each study has received. We used the layout technique that Van Eck and Waltman painstakingly built in 2009 to produce this illuminating graphic, which was effortlessly included into the open-source program VOSviewer. One paper's citation style is shown by the lines joining the circles. If there are circles without lines connecting them, it indicates that none of the articles have cited them. The absence of a line, however, does not imply that these publications have not been cited at all; rather, it indicates that they have not been cited in the context of this specific network study.

Cluster analysis: Clustering is a common practice in scientometrics, frequently employed to categorize research domains, scientific disciplines, or various components of analysis. One notable application involves the grouping of research publications into clusters by assessing their interconnections within a citation network, as demonstrated (Šubelj et al., 2016). In the specific context of our research, we employed co-occurrence analysis of "all keywords (index and author)" with the assistance of VOSviewer to identify hidden research clusters within the final "on-road e-Government publication database."

3. RESULTS

3.1 General Observation

The dataset used in this study consisted of 5,540 scholarly publications published between 1 January 2003 and 1 October 2023. These publications were sourced from 195 countries and involved 5,101 authors, 2,968 organizations, and 3,452 publishing sources

Table 2. Statistical information on the data.

Domain	Specifics
Data Source	Scopus bibliographic repository
Covered period	From 1 January 2003 to 1 October 2023
Number of publications	5,540
Covered country contexts	195
Number of authors	5,101
Number of universities	2,968
Number of publishing sources	3,452

As seen in Figure 2, the number of e-Government publications has increased over time, where exponential growth was observed from 2016 when it first reached above the 300s ($n = 301$) and over 6 years then increased to the 400s in 2022 ($n = 460$). The number of publications between 2013 to 2023 accounts for 70.2% of the total publications in the database. The surge in interest surrounding e-Government in all sectors is the result of a convergence of influential factors in recent years.

Technological advances, especially in e-Government and learning, has led to the development and use of more advanced applications for public services. These advancements are in line with the growing availability of data throughout project cycles, providing a basis for insights in e-Government (Malodia et al., 2021). E-Government has the potential to enhance efficiency, predict and mitigate risks, and address deficiencies effectively. With the increasing complexity of modern issues and society's demand for innovative solutions, e-government is well-positioned to handle these challenges. The success of e-Government in various sectors, government initiatives, research advancements, and the pursuit of a competitive edge have prompted industries to adopt e-Government as a transformative tool for progress.

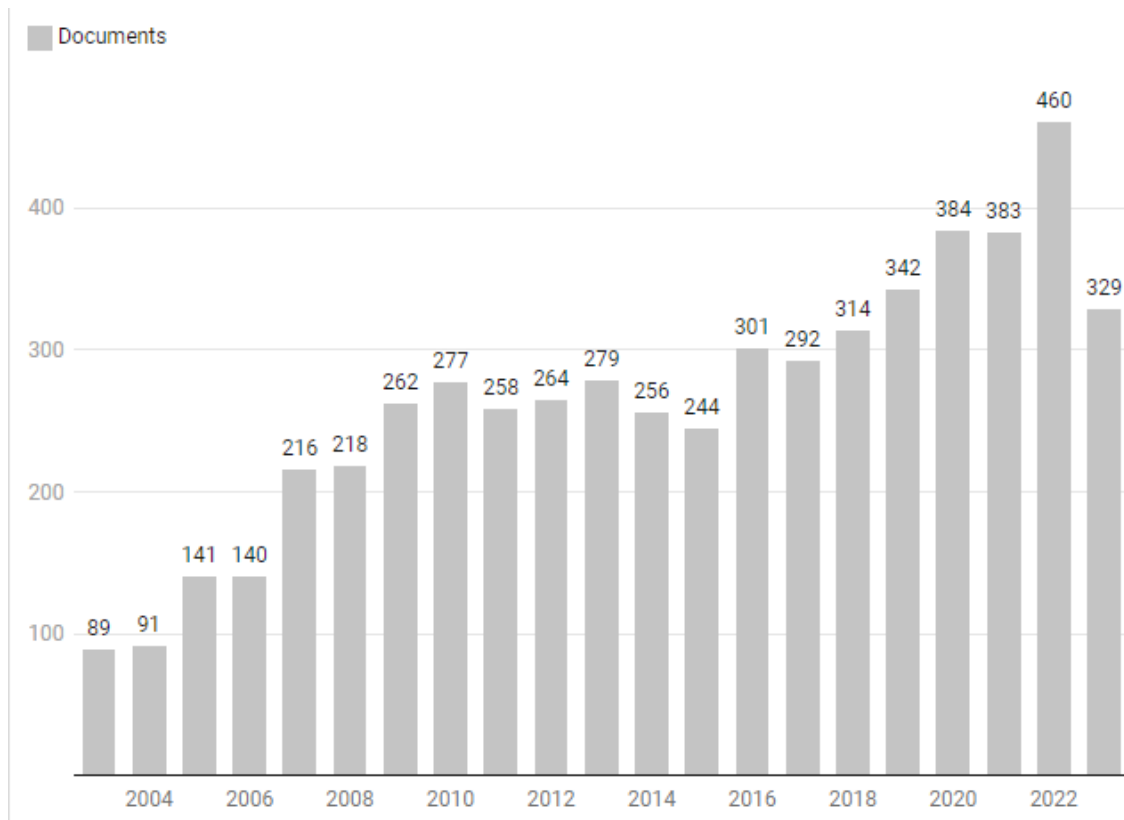


Figure 2 Publication growth trends.

The 18,413 publications before do exclude consisted of fourteen different types (Table 3): 8,059 conference proceedings (43.77%), 6,144 journals (33.37%), 2,511 book series (13.64%), 1,618 books (8.79%), and 80 trade journal (0.43%). To type of documents, this study only processes data in the type of journal articles written in English.

Table 3. Publications volume according to source and document types

Source Types	Conference Proceeding	Journal	Book Series	Book	Trade Journal	Total
Number of Papers	8059	6144	2511	1618	80	18,413
%	43.77	33.37	13.64	8.79	0.43	100

Document Types	Number of Papers	%	Document Types	Number of Papers	%
Conference Paper	8632	46.88	Editorial	148	0.80
Article	5970	32.42	Note	20	0.11
Book Chapter	1731	9.40	Erratum	10	0.05
Retracted	888	4.82	Short Survey	5	0.03
Conference Review	476	2.59	Data Paper	2	0.01
Review	355	1.93	Letter	1	0.01
Book	174	0.94	Undefined	1	0.01

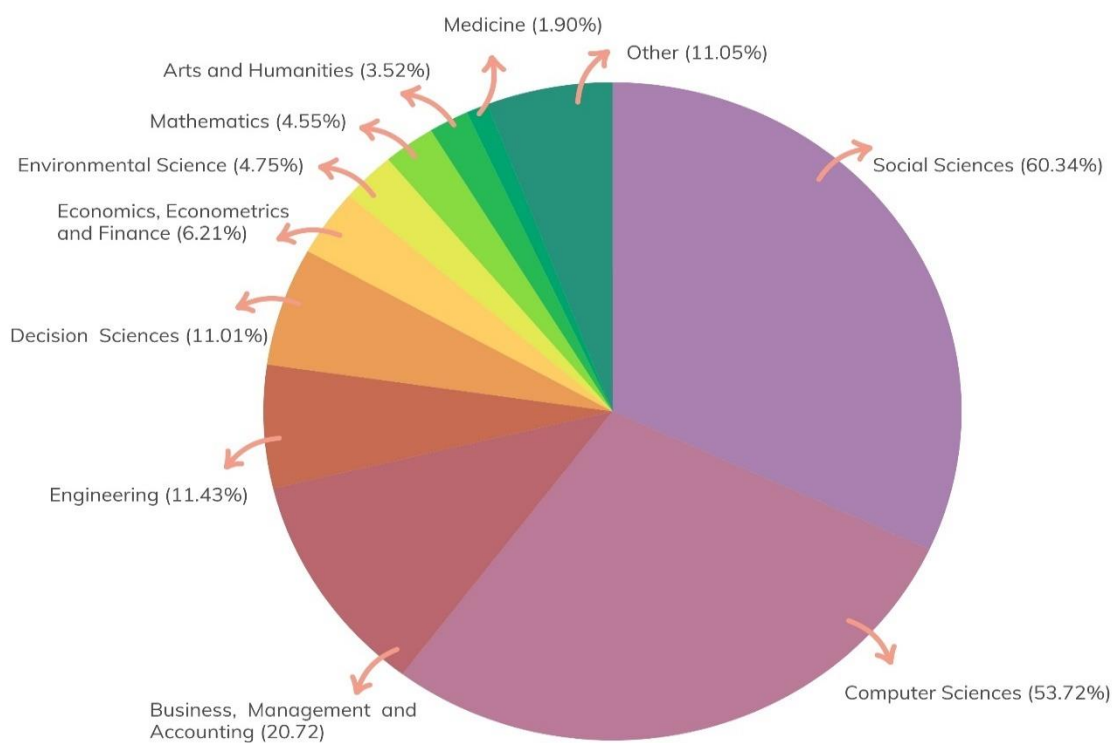


Figure 3. Documents by Subject Areas

The major subject areas of selected publication are Social Sciences ($n = 60.34\%$), Computer Science ($n = 53.72\%$), and Business, Management and Accounting ($n = 20.72\%$) (Figure 3). Based on the countries selected for e-Government, United States ($n = 1,016$), United Kingdom ($n = 522$), China ($n = 436$), Malaysia ($n = 269$), India ($n = 257$), Australia ($n = 235$), Spain ($n = 225$), Indonesia ($n = 218$), South Korea ($n = 193$), Greece ($n = 185$) are the top ten productive counties, which, respectively, account for 18.34%, 9.42%, and 7.87% of the total publications (Figure 4).

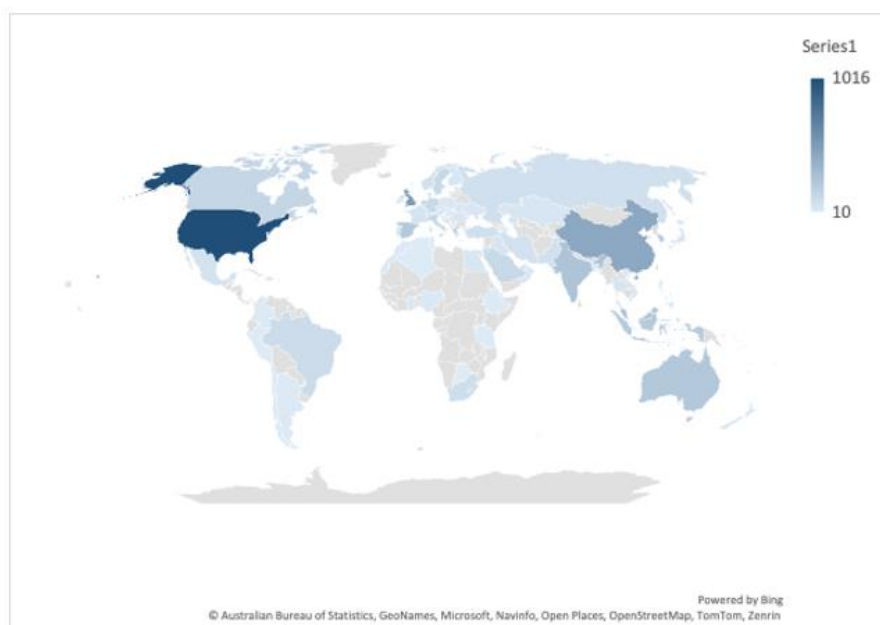


Figure 4. Top highest publishing countries

Based on the literature selected for e-Government, Vishanth Weerakkody, Yogesh K. Dwivedi, and Marijn Janssen emerge as the three most productive authors, with contributions of 3.15%, 2.90%, and 2.90%, respectively. Interestingly, these three authors are affiliated with the University of Bradford and Swansea University, which are based in United Kingdom. Furthermore, these three authors' specific focus and expertise are in information systems and digital transformation.

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Table 4. Top-10 most published authors

Rank	Author	Affiliation	Country	Count	Share
1	Vishanth Weerakkody	University of Bradford	United Kingdom	49	3.15%
2	Yogesh K. Dwivedi	Swansea University	United Kingdom	45	2.90%
3	Marijn Janssen	Delft University of Technology	Netherlands	45	2.90%
4	Zahir Irani	University of Bradford	United Kingdom	32	2.06%
5	Christopher G. Reddick	The University of Texas at San Antonio	United States	32	2.06%
6	Paul T. Jaeger	University of Maryland	United States	30	1.93%
7	J. Ramon Gil-Garcia	State University of New York Albany	United States	24	1.54%
8	Isaac Kofi Mensah	Fujian Jiangxia University	China	24	1.54%
9	Luis Felipe Luna-Reyes	State University of New York Albany	United States	19	1.22%
10	Nripendra P. Rana	College of Business and Economics	Qatar	18	1.16%

Notably, among the top 10 most productive authors, there are from United Kingdom and United States and one are from Netherlands, China and Qatar. For a comprehensive list of the top 10 most productive authors, their affiliated universities, and their respective contribution shares, refer to Table 4.

Table 5. Top-10 most published universities

Rank	Affiliation	Country	Count	Share
1	Brunel University London	United Kingdom	98	3.30%
2	Delft University of Technology	Netherlands	64	2.16%
3	State University of New York Albany	United States	56	1.89%
4	Brunel Business School	United Kingdom	52	1.75%
5	Universiti Utara Malaysia	Malaysia	46	1.55%
6	The University of Texas at San Antonio	United States	42	1.42%
7	Universiti Teknologi MARA	Malaysia	38	1.28%
8	National Technical University of Athens	Greece	36	1.21%
9	National University of Singapore	Singapore	36	1.21%
10	University of Maryland, College Park	United States	35	1.18%

Among the top institutions, Brunel University London originating from the United Kingdom, assumes a preeminent position, exhibiting the highest scholarly contribution with a count of ($n = 98$). Following suit, the Delft University of Technology in the Netherlands follows closely with a commendable count of ($n = 64$), while State University of New York Albany from United States holds a notable standing with ($n = 56$), as delineated in Table 5. This discernible trend underscores the active engagement of diverse nations in advancing the discourse on e-Government. Furthermore, the prevalence of such global collaboration signifies an escalating interest in harnessing the potential of e-Government to augment various facets of public services. This collaborative endeavor not only fosters innovative solutions but also amplifies the efficacy of e-Government applications, thereby propelling advancements in its utilization.

Table 6. Top-10 publication outlets

Rank	Publishing Source	Subject Area	Count	Citations	Share
1	Government Information Quarterly	Social Sciences	416	38,469	12.05%
2	Electronic Government	Computer and Social Sciences	335	4,872	9.70%
3	International Journal of Electronic Government Research	Computer and Social Sciences	206	2,417	5.97%
4	Transforming Government People Process and Policy	Computer, Decision and Social Sciences	184	5,076	5.33%
5	Information Polity	Computer and Social Sciences	105	2,711	3.04%

6	International Journal of Electronic Governance	Computer and Social Sciences	92	574	2.67%
7	International Journal of Public Administration	Computer and Social Sciences	69	1,734	2.00%
8	Sustainability Switzerland	Energy, Environmental and Social Sciences	63	750	1.83%
9	Journal of Theoretical and Applied Information Technology	Computer Sciences and Mathematics	60	329	1.74%
10	Electronic Journal of Information Systems in Developing Countries	Computer Sciences	54	1,844	1.56%

Prominently, Government Information Quarterly stands out as the leading source, with 416 publications, representing 12.05% of the total publications in this paper (Table 6). This source focuses on research related to e-Government, covering areas such as open data, machine learning, and advanced computational techniques. Following closely is Electronic Government, a prominent journal with 335 publications, making up 9.70% of the overall output. Third, International Journal of Electronic Government Research published 206 papers, representing 5.97% of the total papers used in this paper. These three prolific publishing sources collectively highlight the strong research landscape in this field. Other journals, such as Transforming Government People Process and Policy ($n = 184$), Information Polity ($n = 105$), International Journal of Electronic Governance ($n = 92$), and International Journal of Public Administration ($n = 69$), demonstrate significant contributions to e-Government research.

All of the publishing sources ($n = 10$) focus on specific social sciences disciplines. This indicates a strong emphasis on applying e-Government in various social areas. Combine with Computer science is also a prominent subject area ($n = 8$), which indicates a significant interest in utilizing e-government in computer science applications related to technology. Lastly, subject areas such as Decision Sciences, Energy, Environmental Sciences, and Mathematics are represented by single publishing sources. This indicates a growing trend of integrating e-Government with those aspects.

3.2 Academic Influence Analysis

3.2.1 Citation Analysis by Publication

As shown in Table 7, Cartel and Bélanger (2005) review paper examines the factors influencing citizen adoption of e-government initiatives. The study aims to develop a comprehensive model by integrating constructs from the Technology Acceptance Model, Diffusions of Innovation theory, and web trust models. Overall, the research focus revolves around understanding and identifying the factors crucial for citizens to adopt e-government initiatives, with a specific emphasis on creating services that align with citizen needs and preferences. The integration of established theoretical frameworks contributes to a holistic understanding of the adoption process (Carter & Bélanger, 2005).

Ranked second among the top-10 most cited publications is Bertot et al. (2005). This publication explores the potential impacts of information and communication technologies (ICTs), with a specific emphasis on e-government and social media, on cultural attitudes about transparency specifically e-government and social media, in shaping cultural attitudes toward transparency (Bertot et al., 2010). Additionally, the study seeks to contribute insights into whether these technologies can bring about substantive social change in how transparency is perceived and embraced within a given society.

With a focus on real-world advancements and applications, Lu et al. (2015) provide a thorough analysis of the current trends in recommender system. With an emphasis on useful advancements and applications in a variety of fields, the paper's main goal is to perform an extensive and educational analysis of the current trends in recommender systems. According to Lu et al. (2015), the goal is to provide professionals and researchers in this subject with useful insights and assistance.

The top ten highly cited research articles are shown in Table 7, together with details on the authors, the year of publication, the research emphasis, and the number of citations. The results reveal that the most influential publications primarily around the themes of citizen-centred e-Government services and the factors influencing citizen adoption. The field of e-Government exhibits a diverse range of research focus areas, with particular attention given to social media, trust in technologies, and smart city initiatives. The aforementioned underscores the complexity of questions and research in the e-Government space, stressing the importance of investigating social media usage, building confidence in technology, and developing smart city ideas.

Table 7. Top-10 most cited publications.

Rank	Publication Title	Author	Research Focus	Year	Citation
1	The utilization of e-government services: Citizen trust, innovation and acceptance factors	Carter L.; Bélanger F.	Adoption; Citizen trust; Diffusion of Innovation theory; E-government; Technology acceptance model	2005	1,561
2	Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies	Bertot J.C.; Jaeger P.T.; Grimes J.M.	E-government; ICT; Social media; Transparency	2010	1,528
3	Recommender system application developments: A survey	Lu J.; Wu D.; Mao M.; Wang W.; Zhang G.	E-commerce; E-government;	2015	1,127

			E-learning; personalization; system	E-service Recommender system		
4	E-Government and the Transformation of Service Delivery and Citizen Attitudes	West D.M.	Content Analysis of E-Government websites		2004	1,049
5	Context Camera Investigation on board the Mars Reconnaissance Orbiter	Malin M.C.; Bell III J.F.; Cantor B.A.; Caplinger M.A.; Calvin W.M.; Clancy R.T.; Edgett K.S.; Edwards L.; Haberle R.M.; James P.B.; Lee S.W.; Ravine M.A.; Thomas P.C.; Wolff M.J.	Data assimilation; data set; design; digital image; Mars; pixel; planetary atmosphere; planetary surface; satellite imagery		2007	975
6	Trust and electronic government success: An empirical study	Teo T.S.H.; Srivastava S.C.; Jiang L.	E-government; Intention to continue; IS success model; Public sector; Quality; Trust in technologies		2008	924
7	From e-government to we-government: Defining a typology for citizen coproduction in the age of social media	Linders D.	Coproduction; Crowdsourcing; E-Government; Government 2.0; Government as a platform; Open government; Social media		2012	910
8	Trust and risk in e-government adoption	Bélanger F.; Carter L.	Adoption; Disposition to trust; E-government; Electronic government; Perceived risk; Trust		2008	849
9	Governing the smart city: a review of the literature on smart urban governance	Meijer A.; Bolívar M.P.R.	Collaborative governance; e-government; smart city; urban governance		2016	846
10	E-government research: Reviewing the literature, limitations, and ways forward	Yildiz M.	E-government; Public administration and management		2007	742

3.2.2 Citation Analysis by University

As delineated in Table 8, universities from the United Kingdom and United States dominate the list ($n = 6$), with Brunel University holding the top positions, respectively. Delft University of Technology from Netherlands attains the second position and is distinguished by the highest volume of published documents ($n = 29$), indicating significant research impact. University of Granada from Spain occupies the third position. Notably, Universities from Spain and Netherlands, such as University of Zaragoza and Erasmus University Rotterdam are also represented in the top 10, showcasing their contributions to the research in the given field. These findings underscore the considerable influence of the United Kingdom, the United States, the Netherlands, and Spain on the landscape of e-Government research, with discernible repercussions extending to research initiatives in other nations. Furthermore, the inclusion of universities from Asia in the ranking further amplifies the panorama of international collaboration and collective research endeavors in the realm of e-Government.

Table 8. Top-10 most cited universities

Rank	University	Country	Count	Citations
1	Brunel University	United Kingdom	21	1,310
2	Delft University of Technology	Netherlands	29	1,064
3	University of Granada	Spain	6	1,037
4	Swansea University	United Kingdom	14	812
5	Department of Accounting and Finance, University of Zaragoza	Spain	5	562
6	University of Texas	United States	6	409
7	Iowa State University	United States	5	378
8	Florida State University	United States	6	270
9	University of Boswana	United Kingdom	7	261
10	Erasmus University Rotterdam	Netherlands	5	213

3.2.3 Citation Analysis by Country

Table 7 presents a comparison of the top 10 most cited countries in e-Government research in terms of documents citations, and total link strength. The United States emerges as the most influential country with a significantly higher citation count than any other country. United Kingdom and Netherlands are ranked second and third, respectively, with different citation numbers. The total link strength indicates the strength of a country's academic relationships with other countries. For instance, China has a total link strength of 109,138, which signifies a wider academic network (in terms of citation) with other countries compared to Netherlands ($n = 58,536$). Figure 5 depicting the citation network through a geographical lens entails the representation of nations as circles, each symbolizing a distinct country, wherein the magnitude of the circles corresponds to the citation count associated with the publications originating from that particular nation. The interconnecting lines between these circles serve as visual indicators of the scholarly interdependence existing between pairs of countries, with shorter lines symbolizing a heightened level of academic interconnectedness. The chromatic variation among the circles is indicative of the scientific communities to which they align, wherein countries sharing the same colour are indicative of profound connections within the realm of citations, thereby signifying a cohesive academic community.

Table 9. Top-10 most cited countries.

Rank	Country	Documents	Citations	Total link strength
1	United States	1,023	48,141	268,086
2	United Kingdom	526	21,503	184,352
3	Netherlands	171	8,892	58,536
4	Australia	236	7,824	77,614
5	Spain	228	7,604	72,403
6	China	449	6,971	109,138
7	South Korea	194	6,016	66,689
8	Taiwan	131	4,994	51,574
9	Canada	145	4,573	52,702
10	Greece	186	3,893	32,425

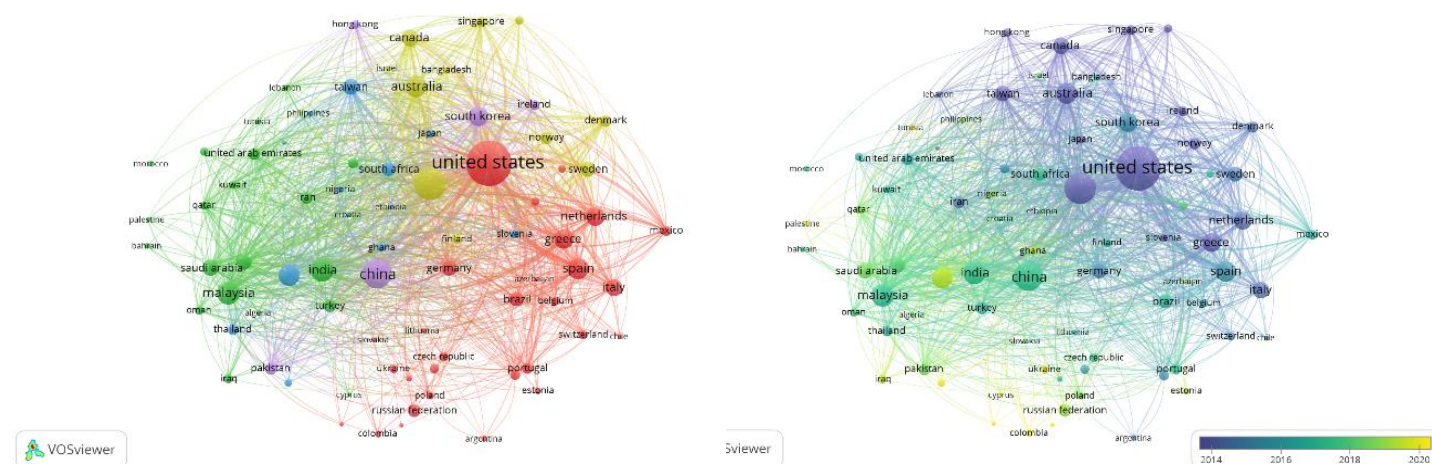


Figure 5 Citation network map by country

In light of the visual representation elucidated in Figure 5, it becomes evident that the foremost three nations in terms of citation counts hail from disparate citation communities, despite being closely interconnected through citations. Furthermore, an absence of conspicuous regional patterns, such as shared continental affiliations among the citation communities within the network, is discernible. These observations underscore a noteworthy inference: over the preceding two decades, research endeavours in the domain of e-Government have not been subject to dominance by any particular subject or cohesive group. Instead, global academia has sustained a palpable level of interest and scholarly exchange in this realm. This revelation holds substantive implications for stakeholders across the spectrum of research, policymaking, and industry practice. It posits that e-Government stands as a subject of universal interest for the global academic community, underscoring the imperative of international collaboration for the advancement of this field.

3.3 Trending and Relevant Topics for Future Research e-Government

3.3.1 Trending topics

In the following, data is presented regarding trending topics for the e-Government theme. Figure 6 depicts the findings of the analysis.

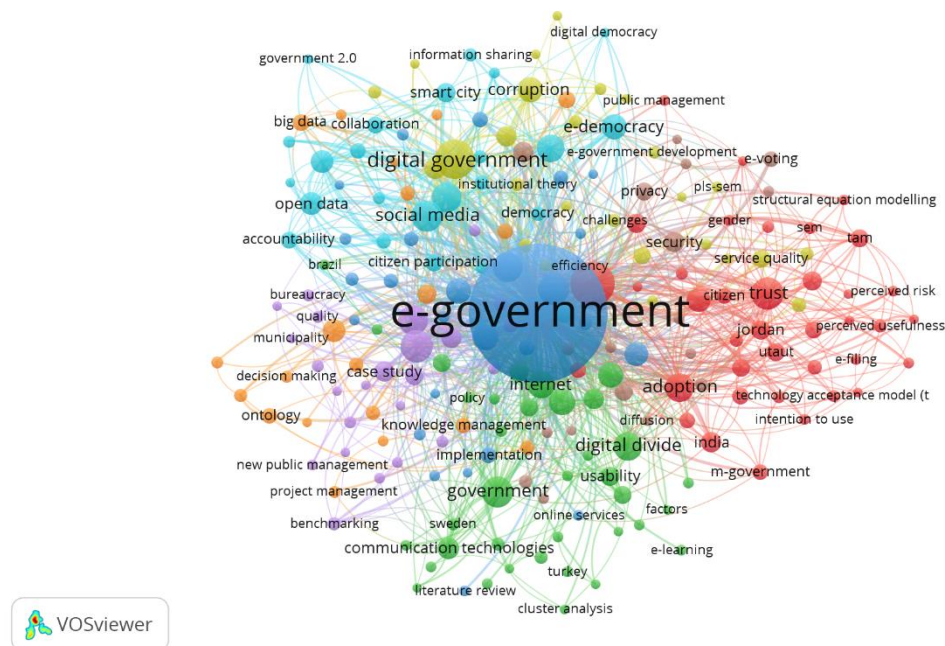


Figure 6. Network Visualization of Author Keyword Articles

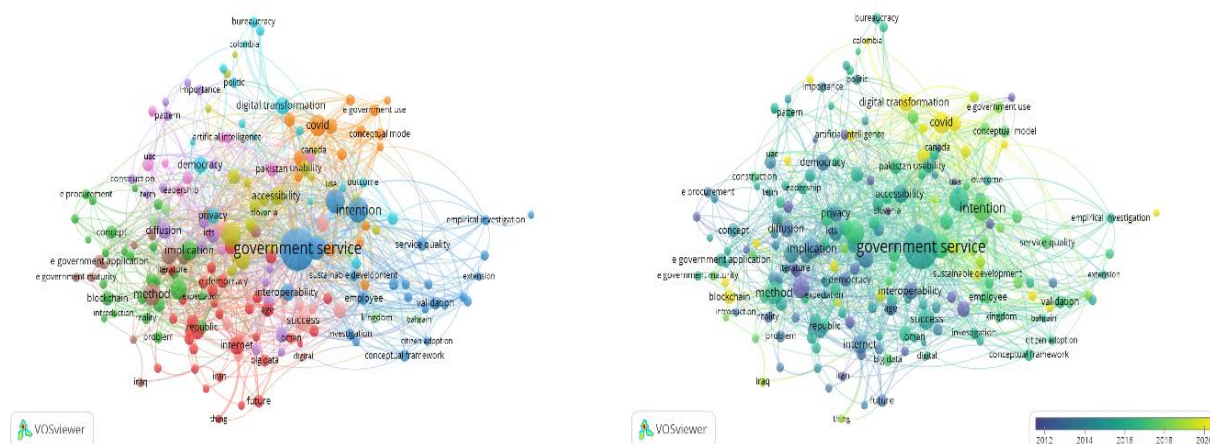


Figure 7. Research cluster network and overlay map by keyword occurrences.

Referring Figure 6, by utilizing frequency and link strength analysis of 11,461 extracted keywords from e-Government database. The keywords were then filtered to meet a minimum threshold of fifteen occurrences, resulting in a total of 214 keywords. The analysis identified eight distinct clusters in the existing e-Government research. The following outlines these clusters:

- **Cluster 1: Technology Adoption** –e.g., intention to use, citizen satisfaction, m-government, and acceptance
- **Cluster 2: Digital Divide** –e.g., developing countries, public sectors, information society, public sector, and digital inclusion.
- **Cluster 3: ICT** –e.g., service delivery, e-governance, and e-services
- **Cluster 4: Corruption** –e.g., digitalization, government effectiveness, digital economy, and digital transformation
- **Cluster 5: Public Administration** –e.g., new public management, local government, bureaucracy, and public services
- **Cluster 6: Social Media** –e.g., smart city, transparency, crowdsourcing, open data, and citizen participation
- **Cluster 7: Interoperability** –e.g., interoperability, big data, artificial intelligence, web services, and machine learning
- **Cluster 8: Cloud Computing** –e.g., authentication, identity management, e-commerce, privacy, risk and security

Figure 6 exhibits the research clusters network map, where each circle represents a keyword, and the size of the circle signifies the occurrence frequency of this keyword. The colour of circles manifests the research clusters of keywords and the distance between circles demonstrates the strength of correlation and similarity between the keywords. The map indicated that: (a) The distributions of Cluster 1 and 8 highly are overlapping, showing that these two clusters are closely connected; (b) Cluster 3 is distributed on the middle of the cluster network map, which takes on the role of connection with each cluster; (c) Cluster 6 and 2 contains various coloured circles from different clusters, which reflects that it has various connections with other clusters; (d) Clusters 4 and 5 are relatively independently distributed, which means these clusters have weak ties with other clusters.

Table 10. Top-10 occurrence keywords in e-Government literature (2003-October 2023).

Rank	Keywords	Occurrences	Total link strange	Cluster
1	Trust	152	436	1
2	Public Administration	148	339	5
3	Social Media	143	355	6
4	ICT	137	357	3
5	E-Governance	135	280	3
6	Transparency	134	395	6
7	Local Government	127	307	5
8	Adoption	126	343	1
9	Digital Divide	125	266	2
10	E-Participation	109	271	6

Table 10 provides a list of the top ten occurrence keywords and shows the occurrences, total link strength, and subordinate clusters. The list excludes the search keywords and other alternative keywords—e.g., ‘e-government’, ‘electronic government’, ‘digital government. A set of exclusion criteria can reduce the redundancy on the list and help to identify the research trends of e-Government research, i.e., identify the specific research clusters or extended research orientations. The most frequent keyword ‘Trust’ and “Public Administration” have the strongest total link strength, indicating that trust and public administration have emerged in e-Government and have been the most popular trend that attracting significant interests from various organisations (Choi et al., 2021). Four out of the top ten occurrence keywords (the 3rd, 6th, and 10th rank keywords) are categorised as Cluster 6 –appears to emphasize aspects of community engagement, the use of technology to enhance urban life, and transparency in governance and decision-making. The sum of the total link strength of these keywords ranks on the list, which reveals the existing e-Government research kept a relatively strong connection with social media, and technology adoption cluster. Besides, no keyword categorized to Cluster 4 is on the list, which means the Corruption cluster is not a popular extended research orientation for e-Government.

3.3.2 Emerging Trends of e-Government Research

Based on the top ten occurrence keywords list created between 2003 and 2023 (Table 10) ‘Trust’, ‘Public Administration’, ‘Social Media’ and ‘ICT’ holds the top spot of both lists by an overwhelming advantage, namely, the most frequent occurrences and the strongest total link strength. It means that during the last two or three years, that emerging keyword has been extensively mentioned in numerous e-Government publications.

In the publication year (average) visualisation of the research clusters network map (Figure 8), the circle and its size represent the keyword and its occurrence frequency, respectively. The line between each circle represents the academic relevancy between pairs of keywords; a shorter line between two circles represents closer academic relevancy between the two keywords. The colour of circles represents the chronological order of the keyword's average publication year from early (dark coloured) to recent (light coloured) times.

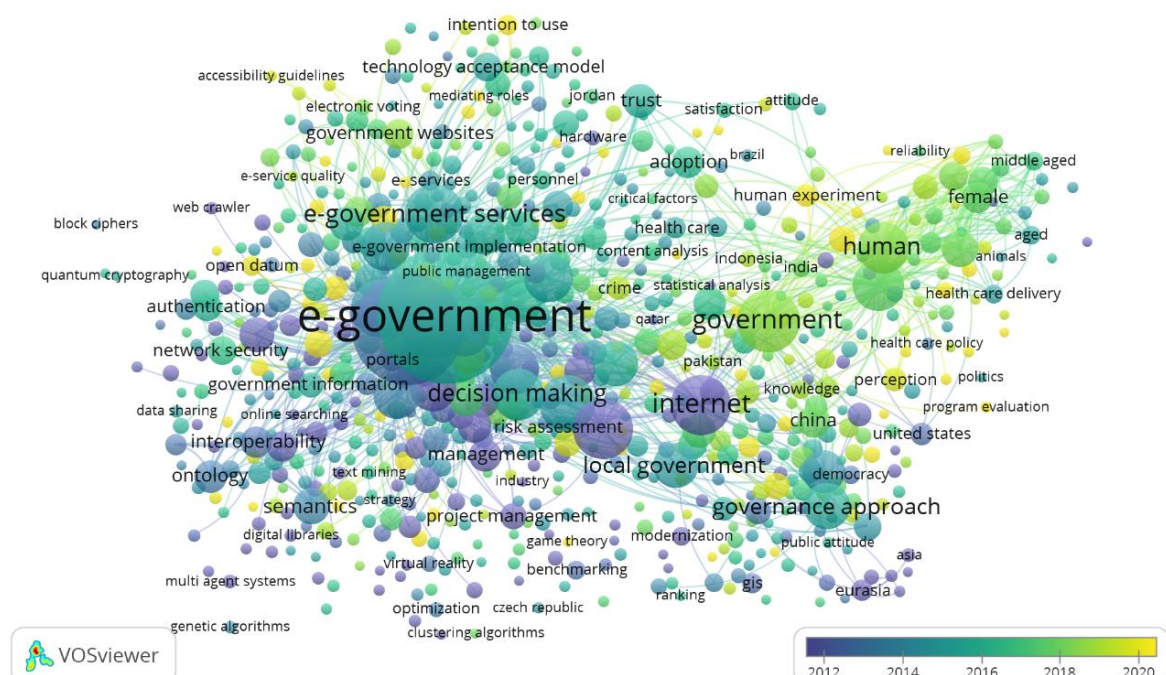


Figure 8. e-Government research clusters network map (by keyword occurrences and average publication per year).

Based on the map, 'government data processing' is denoted by a larger size circle and 'blockchain and open data' with the lightest colour, which means this keyword only arose in very recent years but has already received significant interest from researchers. Within this cluster, other emerging keywords that have close academic relevancy with the lightest colour are machine learning, digitalization, cloud computing, the internet of things, digital literacies, mediating roles, and intention to use. This points out that with the emerging combination of those keywords and e-Government, researchers did not just only focus on the technical advance, but also started to be concerned about the potential issues posed by these emerging technologies, e.g., the issue of cyber security. Besides, the embedding of open data provides e-Government with a direct link with government data processing, which may be one of the most promising research orientations and has a broad application view in the future.

The colours of circles categorised to the clusters 6 and 7 are relatively lighter and contain some circles with the lightest colour. It means these two clusters are the relatively new research orientations of e-Government, and more new research topics have emerged within these two clusters in recent years, such as mobile applications, electronic health record, sustainability, tax systems and panel data. An interesting finding is the aforementioned emerging topics all have a direct link with the cluster 6 and 7, addition keywords machine learning, digitalization, cloud computing, the internet of things, digital literacies, mediating roles, and intention to use, which means these new advances of other e-Government research clusters may be closely associated with the emergence of that technology. Furthermore, apart from the search keywords (e-Government and its alternative), these are the keywords that have direct links with all other clusters. Therefore, blockchain, IoT, cloud computing, machine learning, and digitalization has potential to become a new hub in e-Government research by establishing the links between all clusters, which may contribute to the reintegration of existing dispersed e-Government clusters.

4. DISCUSSION

This study conducted a scientometric analysis from phase lenses to map over two decades of e-Government research. The study analysed a total of 5540 literature pieces published between January 2003 and October 2023 (spanning over two decades), intending to gain a clearer understanding of the historical clusters and research clusters in e-Government.

The scientometric analysis disclosed that: (a) Literature on e-Government has experienced steady growth during the last two decades; (b) Machine learning, IoT, AI, blockchain, cloud computing, and big data are seen as the key to enabling digital technologies; and exhibit the highest potential for e-Gov adoption.

The identified research clusters in e-Government domain encompass various areas, including open data, artificial intelligent, cloud computing, big data, machine learning, social media, corruption, and smart city. These keywords have expanded the research scope beyond their primary focus and have led to the emergence of new directions in the field. The subsequent overview presents the key findings based on the key research based on the potential keywords.

Table 11. Search terms related to publications on e-Government.

Keywords	Affiliation
Corruption	A critical analysis of corruption's adverse consequences on the effectiveness and transparency of government systems was the most used keyword. Promoting citizen trust, improving the general efficacy of public services, and guaranteeing the responsible and moral application of technical innovations in governance all depend on addressing corruption in the execution of e-government initiatives. Corruption entails trust, criminality, and transparency. (M. Ali et al., 2021; Ibrahimy et al., 2023; Martins et al., 2023). By reducing the likelihood of corruption and encouraging honesty in e-government procedures, scholars may help create strong frameworks that enable governments to use digital technologies to advance society (Sheryazdanova et al., 2016; Balashov et al., 2020).
Open Data	The interplay among open government data, open data practices, and co-creation processes in e-government research highlights the significance of collaborative governance models, data-driven decision-making, and citizen participation. (Xiao et al., 2023). Aspects of data security, such as how governments safeguard individual privacy and control security threats related to open data release, are also discussed in relation to open data. (Esposito et al., 2023). Furthermore, there are many different aspects of open data and e-government that attract public attention, including social impact, empowerment, usability, feedback mechanisms, and awareness. (Lu et al., 2023).
Smart City	A smart city is a multifaceted idea that may be examined from several angles (Kuzior et al., 2023). One of the main topics is the incorporation of smart technologies into city governance. Researchers can assess how well digital solutions improve public services, citizen participation, and general governance efficiency by looking into how e-government practices are integrated into smart city programs. (Shan et al., 2021; Anthopoulos et al., 2022). Smart cities can also talk about how technology can boost economic competitiveness, encourage company innovation, and provide new job possibilities through a thriving business ecosystem. (Ishkineeva et al., 2015; Anas & Cahyawati, 2023).
Artificial Intelligent	In e-Government research, artificial intelligence is essential because it improves decision-making, allocates resources optimally, and boosts public service effectiveness. Artificial Intelligence (AI) techniques provide cutting-edge approaches to threat mitigation by

	utilizing strong data security protocols and complex anomaly detection. (Al-Besher & Kumar, 2022). Forward-thinking governance, which is distinguished by intelligence and creativity, is envisioned as a step up from traditional e-government in response to the quick development of digital technologies. This evolution looks for creative ways to improve government operations' connectedness, transparency, and citizen participation. (Ruvalcaba-Gomez & Cifuentes-Faura, 2023; van Noordt & Tangi, 2023; Zuiderwijk et al., 2021).
Social Media	Comprehending the influence of social media is crucial. Social media, frequently mentioned in the e-Government and governance pillar, involves dynamic communication channels that play a pivotal role in shaping public opinion and facilitating citizen engagement (Wang & Chen, 2022). The use of social media helps to becomes integral to developing strategies that harness its potential for enhancing government-citizen interactions, promoting transparency, and fostering a more participatory governance model (Bhatia & Mabillard, 2022).
Blockchain	A secure and distributed electronic system for e-governance based on blockchain technology has been proposed (Kamal & Fareed, 2022). Blockchain, as a recent area of study, signals substantial shifts in the delivery of public services, holding the promise to enhance both the transparency of public administration and the trust citizens place in governmental services (Cagigas et al., 2022).
Digitization	The level of digitization in each country is assessed according to its infrastructure. The quality of the data available from the public administration, and e-government development in terms of online services (Splendore, 2016). Unfortunately, E-government is seldom a focal point during the initial stages of digitization, particularly in developing countries where the primary emphasis of the government lies in swiftly promoting digital adoption rather than establishing robust governance structures (Ramadani et al., 2022). Digitization, while offering numerous benefits, can sometimes introduce complexities and administrative challenges. Therefore, the recognition of the importance of reducing these administrative burdens becomes integral to optimizing the user experience and achieving the goals of digitization in public sector practices (Hagen, 2023).
Big Data	In realizing good governance, the government must develop public service innovations through Big Data (Anwar et al., 2022). The integration of large-scale data analytics requires substantial investments in technology infrastructure, skilled personnel, and comprehensive data governance frameworks. Proficient big data management enhances both human and system capabilities, fostering improved smart service performance; however, the direct influence of human capabilities alone may not be significant enough to fully realize the envisioned improvements sought by the government in the context of big data utilization (Alaoui et al., 2021; A. Zhang & Lv, 2021).
Cloud Computing	In the landscape of e-government research, the predominant focus has historically centered on advancing cloud computing and exploring its potential application for service delivery (Karim, 2022). Governments, recognizing the allure of cloud computing, are increasingly drawn to its capabilities in enhancing service delivery, productivity, transparency, and cost reduction (Abied et al., 2022). A solution to long-standing problems is being offered to governments by the increase in public participation on social media platforms. The availability of IT infrastructure and a shift in government advisers' perspectives toward the best possible policy implementation are driving the current development of cloud-based e-governance. This series of events highlights how the landscape is changing and how social media insights, cloud technologies, and changing governmental viewpoints all work together to influence the direction of contemporary e-governance tactics. (Singh et al., 2020).

These keywords make it possible to identify the main potential and difficulties related to e-Government study. The study's conclusions have significant ramifications for the e-government industry and offer practical suggestions. First, it is important to recognize that the body of literature on e-government has steadily grown over the last 20 years. This acknowledgement ought to be a crucial beginning point, encouraging important players in the e-government space to remain watchful and adaptable to the ever-changing terrain to technological developments. By keeping up with the most recent e-government trends and research advancements, the industry may strategically position itself for expansion and innovation.

Second, in the context of e-government, it becomes imperative to prioritize the integration of essential enabling technologies. Fundamental pillars including big data, deep learning, and machine learning have emerged as crucial elements in supporting effective digital transformation projects. Adopting these technologies can provide the sector with data-driven insights, predictive capabilities, and improved decision-making to effectively handle the complex issues that modern e-government frameworks face. The opportunities that follow demonstrate how revolutionary these technologies can be for the field of e-government:

- *Utilizing advanced algorithms*, in a short amount of time, e-government systems can examine several design configurations. This guarantees ideal system architecture, improving e-government solution design accuracy and efficiency. (Bansal et al., 2022).
- E-government may encounter *scheduling and planning challenges*. Dynamic schedules can be created by strategically analysing past project data and current development. These flexible timelines take into account unforeseen circumstances and possible delays, guaranteeing the prompt and effective execution of e-government projects. (Gong et al., 2020; Malodia et al., 2021).
- *Proactive risk assessment*, allows for more informed decision-making based on project specifications and previous data. By reducing possible risks, this guarantees the successful implementation and seamless operation of e-government projects. (Ali et al., 2020; Zefferer et al., 2023).
- It is possible to identify irregularities and departures from design standards in the e-government space by utilizing *visual recognition algorithms*. This guarantees standard compliance, which aids in the creation of reliable and secure e-government solutions. (Zhang et al., 2022).
- *Systematic analysis of requirements*, availability, and restrictions facilitates optimal resources in the e-government context. By doing this, waste is reduced and resources are better used for the efficient deployment and upkeep of e-government systems. (Glyptis et al., 2020).
- Information exchange is more efficient when *data integration* processes in e-government systems are streamlined. This makes it easier for departments or agencies to work together, guaranteeing a unified and well-coordinated strategy for providing e-government services. Increased cooperation helps e-government programs make better decisions and be more effective overall. (Haryanto, 2023).
- Sustainable practices must be incorporated into the design and functionality of e-government platforms. This entails determining and reducing the environmental impact of technology use. Eco-friendly e-government initiatives are facilitated by tactics like efficient energy use, cutting down on electronic waste, and implementing eco-friendly procedures. Along with supporting global sustainability goals, this also improves e-government projects' standing as socially conscious undertakings. (Firmandayu & Elfaki, 2023; Han et al., 2023).

The results of the study highlight the significant potential for using state-of-the-art technology in these fields, demonstrating their capacity to improve compliance measures, optimize resource allocation, and streamline operations within e-government projects. It is possible to improve economic outcomes and strengthen social and governance standards at the same time by strategically aligning innovative technology with sustainability goals (Nham et al., 2023; Martins & Veiga, 2022; ElMassah & Mohieldin, 2020). Moreover, taking advantage of the many benefits that come with implementing cutting-edge technologies, especially in the early stages of e-government's development and deployment, can result in notable improvements in overall performance. In the end, the e-government industry may improve execution while reducing mistakes and delays by utilizing cutting-edge technological solutions for effective strategic planning, risk assessment, and real-time monitoring.

Despite the difficulties mentioned, the industry has a lot of opportunities thanks to the use of innovative technology and the dedication to sustainable practices in e-government. The fields of planning, design, implementation, and general administration could undergo radical changes if these technology innovations and moral precepts are adopted. The advantages of cutting-edge technology, such as automation, data-driven decision-making, and complex analytics, may result in improved productivity, cost-effectiveness, and operational efficiency. At the same time, implementing sustainable practices has the potential to maximize resource use, reduce environmental impact, and promote beneficial social outcomes. The e-government industry can steer toward a more sustainable future by proactively addressing issues and leveraging the connections between cutting-edge technology and sustainability. This strategic strategy aligns efforts with a commitment to social and environmental responsibility in addition to economic viability. By working together, this integrated approach advances the overall goals of sustainable development and creates the framework for the formation of more sustainable urban futures.

5. CONCLUSION

This research conducts an extensive scientometric analysis of 5,540 e-government-related publications from the previous 20 years, with a focus on sustainability and various implementation stages. This study provides a current and concise summary of the field's knowledge structure and evolutionary trajectory by carefully reviewing the body of extant literature. With a strong focus on cloud computing, big data, blockchain, artificial intelligence, machine learning, big data, and the internet of things (IoT), the results show a transition from basic automation to complex neural network platforms.

Although this study provides a solid basis, there are many facets of e-government that require more investigation. Future research could focus on addressing the issues that have been identified, such as determining whether deploying technology in the e-government sector is cost-effective, guaranteeing equitable and universal access to solutions, and addressing problems with data integration and interoperability. It should also explore the legal implications that technology adoption may bring about in relation to standards, ethics, contracts, cybersecurity, intellectual property ownership, liability, data privacy, employment impact, transparency, and the changing legal environment. Research should also look into the possible ethical and societal repercussions of e-government technology adoption, including how it may affect employment and the function of human workers in an increasingly automated environment. In order to make decisions in sustainability-related fields more accurate and efficient, future research could concentrate on improving models and algorithms. Additionally, it would be beneficial to develop thorough frameworks and rules for integrating sustainability concepts with technology in a smooth manner throughout all e-government phases. Scholars may keep developing the area and paving the way for effective and sustainable e-government activities in the future by following these research avenues.

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Digital Competencies and Use of Digital Tools for Learning: A Focus on Library and Information Science Postgraduate Students in South-South, Nigeria

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ABSTRACT: This study examined the digital competencies and use of digital tools for learning among postgraduate students of Library and Information Science (LIS) in South-South, Nigeria. The specific objectives were to determine: (1) the extent of digital competencies of LIS postgraduate students, (2) the extent of their use of digital tools for learning, and (3) the relationship between digital competencies and the use of digital tools for learning. A descriptive research design was adopted to describe and analyse existing conditions without manipulation of variables. The population comprised 161 postgraduate students across three public universities—Delta State University, Abraka (64), Ambrose Alli University, Ekpoma (26), and Ignatius Ajuru University of Education, Port Harcourt (71). A census sampling technique was employed, including the entire population. Data were collected using a structured questionnaire titled *Competencies and Use of Digital Tools for Learning Questionnaire (CUDTLQ)*, adapted from Tzafilkou et al. (2022) and Rafiq et al. (2024). Expert validation established content validity, while a test–retest reliability coefficient of 0.87 confirmed internal consistency. The instrument used a five-point Likert scale, and data were analysed using mean, standard deviation, and linear regression at a 0.05 significance level. Findings revealed that the aggregate mean score for digital competencies was 2.75 (SD = 1.28), below the criterion mean of 3.00, indicating low competence. Similarly, the extent of digital tool usage was low, with an aggregate mean of 2.49 (SD = 1.29). However, regression analysis showed a very strong, significant relationship between digital competencies and digital tool use ($R = .989$, $R^2 = .979$, $F(1,125) = 5711.187$, $p < .05$), indicating that 97.9% of the variance in tool use was explained by digital competence. The study concluded that low digital competencies limit postgraduate students' effective use of digital tools. It recommends that universities integrate mandatory digital literacy training, hands-on workshops, and blended learning modules to enhance postgraduate students' digital competence and overall learning outcomes.

KEYWORDS: Digital competence, Digital literacy, Digital tools, Library and Information Science, Postgraduate students, South-South Nigeria, Technology-enhanced learning

INTRODUCTION

The use of digital tools has become an essential part of postgraduate education, transforming how students access information, conduct research, and collaborate with peers and lecturers. These tools, ranging from advanced software, online databases, collaborative platforms and virtual learning environments, offer postgraduates the resources and flexibility needed to manage their complex academic tasks. The necessity for digital tools in postgraduate education is occasioned by the growing volume of research activities. Means et al. (2014) posited that digital technologies enable more flexible and personalised learning environments, which are essential for postgraduate students who often balance rigorous academic demands with professional responsibilities. Digital tools offer immediate access to vast resources, facilitating efficient information retrieval and management.

Additionally, digital tools support various learning styles and needs, allowing for more inclusive and adaptive educational practices (Garrison & Vaughan, 2014). The use of digital technologies not only enhances academic performance but also prepares students for the technological demands of their future careers. The introduction of digital tools in postgraduate education addresses the growing need for more efficient and effective ways to handle the demanding nature of advanced studies. Traditional methods of learning and research often fall short when dealing with the vast amount of information and the high level of collaboration required in postgraduate programmes (Abd Majid et al., 2025).

The use of digital tools by postgraduates for learning holds numerous benefits to the students, institutions, and society at large, but for postgraduates to leverage these digital tools, studies have indicated that several factors could inhibit postgraduates from favourably deploying

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these digital tools, among which include postgraduate students' digital competencies. Digital competence refers to the ability to use digital technologies effectively and responsibly, and scholars from both Nigeria and around the world provide varied definitions that highlight different aspects of these essential skills (Ajegbomogun et al., 2022). Ferrari (2013) defined digital competence as the combination of knowledge, skills, and attitudes required to use digital technologies in a confident, critical, and creative way. This definition emphasises not only the technical skills necessary to access, manage, and evaluate information but also the critical thinking and creativity needed to effectively use technology in various contexts. Ferrari's perspective underscores the importance of both the practical application of digital tools and the ability to think critically about their use.

The European Framework for Digital Competence (DigComp) offered a structured approach, defining digital competence as encompassing five key areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. This framework provides a comprehensive view of digital competence, covering everything from handling and analysing data to creating content and ensuring online safety. It highlights the multifaceted nature of digital competence, which includes technical skills as well as the ability to collaborate and solve problems in a digital environment (European Commission, 2017). In Nigeria,

Bawden (2014) defined digital competence as the ability to use digital tools to find, evaluate, create, and communicate information effectively. This definition focuses on the practical aspects of digital literacy, emphasising the essential skills required to interact with and manage information in a digital environment. Bawden's perspective highlights the importance of being able to effectively handle and communicate information using digital technologies. Martin (2015) described digital competence as the capacity to use digital technologies across various contexts, including personal, educational, and professional domains. This definition broadens the scope of digital competence, underscoring its relevance beyond academic settings and highlighting its importance in personal and professional life. Martin's perspective reflects the idea that digital skills are crucial for various aspects of modern life.

Statement of the Problem

In today's technology-driven academic environment, digital tools have transformed how students access, process, and share information for learning and research. Tools such as online databases, digital libraries, reference management software, learning management systems (LMS), and collaborative platforms like Google Workspace and Microsoft Teams enable efficient access to vast information resources and promote interactive and self-directed learning. Effective use of these tools requires strong digital competencies, including information literacy, technical proficiency, critical thinking, and adaptability to emerging technologies. In postgraduate education—where research and innovation are central—these competencies are essential for academic success and lifelong learning.

However, preliminary interactions with Library and Information Science (LIS) postgraduate students and lecturers in universities across the South-South region of Nigeria reveal disparities in awareness, access, and effective use of digital tools. Many students still rely on traditional learning methods and show limited proficiency in advanced digital applications for research. Challenges such as inadequate institutional support, poor digital infrastructure, and a lack of structured digital literacy programmes further hinder effective utilisation. Existing studies affirm these concerns. Okiki and Asiru (2018) found that postgraduate students in Nigerian universities exhibit low proficiency in using online research tools due to limited digital skills, while Adebayo and Omotayo (2021) reported that inconsistent digital literacy training and underuse of digital platforms negatively affect LIS students' research engagement.

These issues highlight the urgent need to assess the digital competencies and utilisation of digital tools among LIS postgraduate students in the South-South region. Understanding these factors is vital to designing interventions that enhance digital literacy and learning outcomes. Hence, this study focuses on Digital Competencies and Use of Digital Tools for Learning: A Focus on Library and Information Science Postgraduate Students in South-South, Nigeria.

Research Questions

The following research questions guided this study

1. What is the extent of digital competencies of postgraduate students of library and information science in South-South, Nigeria?
2. What is the extent of the use of digital tools for learning among postgraduate students?
3. What is the relationship between digital competencies and the use of digital tools for learning by postgraduate students?

LITERATURE REVIEW

This section of the article presents the review of current relevant literature that aligns with the specific objectives of the study, which are presented as follows:

Digital Competencies of Postgraduate Students

The increasing integration of digital tools in education necessitates that postgraduate students develop a set of digital competencies to effectively engage in and enhance their learning experiences. In today's educational landscape, digital tools such as learning management systems (LMS), virtual libraries, and various online collaboration platforms have become integral to the academic process (Redecker, 2017). The transition towards digital learning environments has been accelerated by advancements in technology and the growing demand for flexible learning solutions that cater to diverse student needs (Carretero, Vuorikari, & Punie, 2017). These digital competencies are not just about technical proficiency but encompass a range of skills and knowledge areas essential for navigating, utilising, and benefiting from digital technologies. According to JISC (2015), digital competencies include the ability to manage digital identities, participate in online communities, and leverage digital tools for both learning and research purposes. These competencies enable students to access information efficiently, collaborate with peers and instructors, and produce digital content that meets academic standards (Wheeler, 2015). Moreover, they are critical for fostering lifelong learning and adaptability in an increasingly digital world (Ng, 2015).

The need for digital competencies among postgraduate students is underscored by the evolving nature of research and academic work, which increasingly relies on digital tools for data collection, analysis, and dissemination (Aesaert et al., 2017). As postgraduate studies often

involve complex and self-directed research activities, students must be adept at using digital tools to enhance their productivity and achieve academic success. Furthermore, possessing these competencies ensures that students are prepared for the digital demands of the contemporary workforce, where digital literacy is often a prerequisite (van Laar et al., 2017). Digital competence is the ability to effectively and responsibly use digital technologies, tools, and resources to access, evaluate, create, and transmit information (Kiryakova & Kozhuharova, 2024). It covers a range of knowledge, skills, and attitudes related to the effective use of digital technologies in various contexts, including education. Digital competence is based on skills in ICT to use computers to create, retrieve, assess, present, and exchange information and to communicate and participate in networks using the services and mechanisms of the internet including digital and ICT literacy, and competencies in the use of digital tools and resources (Spante et al., 2018). Digital competencies include digital literacy, experience using educational software and platforms, and the ability to seamlessly integrate ICT into learning activities.

Johnson et al. (2019), in their study titled "Assessing Technical Skills among Postgraduate Students in Digital Learning Environments," aimed to evaluate the technical proficiency of postgraduate students in using digital learning tools. The cross-sectional survey, which included 500 postgraduate students from various universities, revealed that 75% of students reported proficiency in basic computer operations ($p < 0.01$), while 60% demonstrated advanced skills in software applications ($p < 0.05$). The findings indicated that while the majority of students possessed basic technical skills, fewer had advanced technical competencies. The study concluded that there is a need for enhanced technical training to improve postgraduate students' ability to utilise digital tools effectively and recommended incorporating such training into postgraduate curricula.

Use of Digital Tools for Learning among Postgraduate Students

In the ever-changing world of higher education, postgraduate students' educational experiences now revolve around digital tools. These tools improve learning processes' efficacy and efficiency in addition to making a wide range of information easier to access. Digital technology's widespread adoption has resulted in the development of several tools for postgraduate study, ranging from data analysis and content creation to research and collaboration. Based on recent research, this review looks at the different kinds of digital tools used by grad students and talks about how they affect learning.

Learning Management Systems (LMS) such as Moodle and Blackboard are among the primary digital tools used by postgraduate students. They provide a centralized platform for accessing course materials, submitting assignments, engaging in discussions, and monitoring academic progress. According to Alraimi et al. (2015), the adoption of LMS significantly enhances students' learning experiences by offering a structured and interactive environment, with 70% of respondents reporting improved engagement and academic performance. Key features contributing to this improvement include centralized access to learning resources, streamlined assignment submission and grading, and interactive discussion forums that promote collaboration and continuous communication between students and instructors, fostering a more engaging and efficient learning experience.

Oluwadamilola and Nwachukwu (2019) conducted a study on Digital Literacy Skills and Use of E-Resources by Postgraduate Students in Nigerian Universities to examine digital literacy levels, frequency of digital tool use, and challenges faced by postgraduate students. Using a descriptive survey of 250 students from three South-West universities, data were collected through a structured questionnaire and analysed using mean scores and frequency counts. Findings revealed moderate digital literacy but low usage of digital tools, with limited internet access and inadequate training as major challenges. Unlike their study, the present research focuses on South-South Nigeria and includes institutional factors and digital competencies.

Relationship Between Digital Competencies and the Use of Digital Tools for Learning by Postgraduate Students

The level of digital competencies among postgraduate students plays a critical role in determining their ability to effectively use digital tools for learning. Tzafilkou et al. (2022) confirmed that digital competence significantly influences postgraduate students' engagement and success in utilising online learning platforms. Their study emphasised that students with stronger digital skills were more adept at navigating and maximising the benefits of digital learning environments. Similarly, Getenet et al. (2024) found that postgraduate students with higher levels of digital literacy and positive attitudes toward technology were more confident in using digital tools, which led to better learning outcomes.

Further supporting this relationship, Hidayat-Ur-Rehman (2024) demonstrated that digital competence is a key predictor of effective smartphone-based learning among postgraduate students. His study showed that students with advanced digital skills were able to leverage mobile technologies for formal learning activities more efficiently than their less digitally competent peers. Zhang et al. (2024) also highlighted that self-regulated learning in digital environments is highly dependent on students' digital competencies. Their findings indicated that postgraduate students with strong digital abilities and self-regulation skills were more successful in using artificial intelligence (AI) powered educational tools.

Nguyen and Adelusi (2024) stressed that digital competencies are pivotal in empowering postgraduate students to maximize institutional digital resources, noting that students with stronger digital skills were better able to navigate complex learning management systems. Nguyen and Adelusi further stated that enhancing digital competencies directly correlates with improved learning outcomes and technology adoption rates. Similarly, Littlejohn et al. (2016) observed that students with advanced digital competencies demonstrated stronger self-regulated learning behaviours, enabling them to independently manage digital learning tasks and explore digital platforms more effectively.

METHODOLOGY

The study adopted a descriptive research design, considered appropriate because it enabled the researcher to describe and analyse the existing state of digital competencies and the use of digital tools for learning without manipulating any variables. According to Creswell and Creswell (2023), descriptive research is suitable for studies aimed at systematically presenting facts about a population or phenomenon as they exist in their natural setting, thereby providing a factual and comprehensive understanding of current conditions. Quantitative data were collected using a structured questionnaire administered to postgraduate students of Library and Information Science (LIS) in selected public universities across the South-South region of Nigeria. This design facilitated the assessment of variables such as students' digital competencies (technical, problem-solving, and critical thinking skills) influencing the use of digital tools, and the extent of digital tool utilisation for learning and research.

The population of the study consisted of all 161 postgraduate students of LIS in public universities offering postgraduate programmes in Delta, Edo, and Rivers States. These included Delta State University, Abraka (64 students), Ambrose Alli University, Ekpoma (26 students), and Ignatius Ajuru University of Education, Port Harcourt (71 students). Given the small and manageable population size, the census sampling technique was employed, involving the entire population of 161 students. This ensured full representation and enhanced the reliability and generalisability of the findings.

Data were collected using a self-structured questionnaire titled “Competencies and Use of Digital Tools for Learning Questionnaire (CUDTLQ)”. The instrument was adapted from validated scales, including the Students’ Digital Competence Scale (Tzafilkou et al., 2022) and Digital Tools and Online Learning Scale (Rafiq et al., 2024), with necessary modifications to align with the study objectives. It comprised two sections: Section A (digital competencies) and Section B (use of digital tools for learning). A five-point Likert scale ranging from Very High Extent (5) to Very Low Extent (1) was used.

To ensure validity, the questionnaire was reviewed by experts in the Department of Library and Information Science, Delta State University, Abraka. Their input helped refine the items for clarity, accuracy, and content relevance. The reliability of the instrument was tested using the test–retest method of questionnaire administration. Twenty-five copies were administered twice, two weeks apart, to LIS postgraduate students of Nnamdi Azikiwe University, Awka, and analysed using Pearson’s Product-Moment Correlation Coefficient, which yielded a reliability coefficient of 0.87, confirming high internal consistency.

For data collection, the researcher and three trained assistants personally distributed the questionnaires to respondents at their respective institutions and retrieved them immediately after completion to ensure a high response rate. Data obtained were analysed using both descriptive and inferential statistics. Mean and standard deviation addressed research questions on digital competencies and digital tool usage. Regression analyses were used to answer the research question on the relationship between competencies and use of digital tools at a 0.05 level of significance. Interpretation of results for competencies and use of digital tools followed the mean range of 1.00–1.50 (Very Low Extent), 1.51–2.50 (Low Extent), 2.51–3.50 (Moderate Extent), 3.51–4.50 (High Extent), and 4.51–5.00 (Very High Extent).

RESULTS

Research Question One: What is the extent of digital competencies of postgraduate students of library and information science in South-South, Nigeria?

The data in Table 1 provide an answer to this research question.

Table 1: Extent of Digital Competencies of Postgraduate Students

S/N	Statement on Digital Competencies	VHE	HE	ME	LE	VLE	$\bar{x}$	St.d	Dec.
1	How proficient are you in setting up and maintaining digital devices	22	19	33	16	37	2.79	1.45	Not Accepted
2	How effectively do you communicate and collaborate with peers and instructors using digital platforms	31	22	41	12	21	3.24	1.37	Accepted
3	How competent are you in using specialized software	18	23	39	21	26	2.89	1.32	Not Accepted
4	How well can you critically analyze and synthesize information from digital sources to create academic content	16	19	18	40	34	2.55	1.36	Not Accepted
5	How skilled are you in creating original digital content	15	18	27	38	29	2.62	1.30	Not Accepted
6	How easily can you learn and adapt to new digital tools	10	9	52	18	38	2.49	1.21	Not Accepted
7	How proficient are you in organizing digital data	9	21	46	10	41	2.58	1.29	Not Accepted
8	How competent are you in conducting comprehensive online research using academic search engines	11	6	75	3	32	2.69	1.16	Not Accepted
9	How effectively can you troubleshoot and resolve issues that arise when using digital tools?	13	17	67	17	13	3.00	1.05	Accepted
10	How well do you engage in collaborative learning activities using digital platforms	12	18	47	10	40	2.62	1.32	Not Accepted
N	127	Criterion Mean	3.00	Aggregate Mean	= 2.75	St.d	= 1.28		

As revealed in Table 1, the aggregate mean of 2.75 is lower than the criterion mean of 3.00, which signifies that the extent of digital competencies of postgraduate students of Library and Information Science in South-South, Nigeria is generally low. This implies that while students demonstrate some competence in communication and collaboration with peers and instructors ($\bar{x}$ = 3.24, St.d = 1.37), and troubleshooting ($\bar{x}$ = 3.00, St.d = 1.05), they face significant challenges in most other areas of digital competency, limiting their overall effectiveness in the use of digital tools for learning.

Research Question Two: What is the extent of the use of digital tools for learning among postgraduate students?

The data in Table 4.8 provide an answer to this research question.

Table 2: Extent of Use of Digital Tools for Learning

S/N	Statement on Use of Digital Tools	VHE	HE	ME	LE	VLE	$\bar{x}$	St.d	Dec.	
1	I use Learning Management Systems (e.g., Moodle, Blackboard, Canvas) to access course materials and submit assignments	11	10	23	35	48	2.22	1.27	Not Accepted	
2	I use video conferencing tools (e.g., Zoom, Microsoft Teams, Google Meet) for attending online classes, seminars, or group meetings	10	11	31	30	45	2.30	1.26	Not Accepted	
3	I use reference management tools (e.g., EndNote, Zotero, Mendeley) to organise and cite academic sources in your research	15	13	33	25	41	2.50	1.35	Not Accepted	
4	I access e-books (e.g., JSTOR, ProQuest, Google Scholar) for your academic studies	17	19	28	31	32	2.67	1.36	Not Accepted	
5	I use collaborative document editing tools (e.g., Google Docs, Microsoft Word Online) to work on group projects or share documents with peers	16	15	30	38	28	2.63	1.30	Not Accepted	
6	I use online presentation tools (e.g., PowerPoint, Prezi, Canva) to create and deliver presentations for your coursework	21	10	27	40	29	2.64	1.36	Not Accepted	
7	I use digital note-taking applications (e.g., OneNote, Evernote, Notion) to organise my study materials and lecture notes	10	11	30	33	43	2.31	1.24	Not Accepted	
8	I engage with virtual learning environments (e.g., Coursera, edX, Khan Academy) to supplement my coursework?	18	13	37	39	20	2.76	1.25	Not Accepted	
9	I use multimedia creation tools (e.g., Adobe Creative Suite, iMovie, Audacity) to produce videos, podcasts, or graphics for your assignments	13	18	27	37	32	2.55	1.29	Not Accepted	
10	I use task management and productivity apps (e.g., Trello, Asana, Todoist) to plan and manage my academic workload	11	10	27	37	42	2.30	1.25	Not Accepted	
N	127	Criterion Mean	3.00	Aggregate Mean = 2.49						St.d = 1.29

As revealed in Table 2, the aggregate mean of 2.49 is lower than the criterion mean of 3.00, which signifies that the extent of use of digital tools for learning among postgraduate students of Library and Information Science in South-South, Nigeria is generally low. This implies that although students make some effort to access e-books ($\bar{x} = 2.67$, St.d = 1.36), engage with virtual learning environments ($\bar{x} = 2.76$, St.d = 1.25), and use collaborative or presentation tools ($\bar{x} = 2.63$ –2.64), their overall adoption and effective use of digital tools for academic purposes remain inadequate. This low utilization suggests that limited digital competencies and weak institutional support (as seen in previous findings) may be contributing factors to the underuse of available digital tools.

Research Question Three: What is the relationship between digital competencies and the use of digital tools for learning by postgraduate students?

Table 3: Linear Regression on Relationship between Digital Competencies and the Use of Digital Tools for Learning

Model	R	R ²	Sum of Squares	Df	F	Mean Square	Sig.
Regression			19687.095	1	5711.187	19687.095	.000 ^b
Residual	.989 ^a	.979	430.889	125		3.447	
Total			20117.984	126			

The data presented in Table 3 indicate a very strong relationship between digital competencies and the use of digital tools for learning by postgraduate students. The regression model produced an R value of .989 and an R² value of .979, which shows that about 97.9% of the variance in the use of digital tools is explained by students' digital competencies.

Furthermore, the regression was found to be statistically significant, with $F(1,125) = 5711.187$, $p = 0.000$; $p < 0.05$. This means that the model significantly predicts the use of digital tools for learning. Since the significance value ($p = 0.000$) is less than the 0.05 threshold, the null hypothesis which states that there is no significant relationship between digital competencies and the use of digital tools for learning by postgraduate students is rejected. Therefore, it is concluded that digital competencies statistically and significantly influence the use of digital tools for learning by postgraduate students in South-South, Nigeria.

DISCUSSION OF THE FINDINGS

This section of the study is focused on the discussion of the findings in line with the research questions and hypotheses in chapter one of this study, which are presented as follows:

Extent of Digital Competencies of Postgraduate Students

The finding from research question one revealed that the extent of digital competencies of postgraduate students of Library and Information Science in South-South, Nigeria is generally low. The finding implies that there is a pressing need for targeted digital literacy training and continuous professional development. Strengthening students' digital skills will not only enhance their effective use of digital tools for learning but also better prepare them as future information professionals capable of thriving in technology-driven library and information service environments.

This finding aligns with the work of Adewuyi and Ayodele (2022), who reported that poor digital literacy significantly hindered e-learning adoption among postgraduate students in federal universities in South-West Nigeria. Their study showed that although students had a moderate level of digital literacy, it directly influenced their uptake of e-learning technologies. The similarity between both studies emphasizes the persistent challenge of digital competence as a determinant of students' ability to maximize learning technologies.

Similarly, Smith and Brown (2021) found that while postgraduate students were comfortable using basic digital tools, only half demonstrated proficiency with more complex applications. This mirrors the present finding that postgraduate students exhibit low digital competencies, suggesting that many remain unprepared to fully exploit advanced digital platforms that enhance research and learning outcomes.

However, the current study's finding contrasts with that of Chukwu and Adebayo (2021), who discovered that postgraduate students in Nigerian private universities possessed high levels of digital competencies and were actively engaged in blended learning. The disparity may be attributed to institutional differences, such as variations in ICT infrastructure, training opportunities, and digital culture between private and public universities. Whereas private institutions may provide stronger institutional support and digital training, the students in South-South Nigeria, as revealed in the present study, still struggle with inadequate competencies.

Extent of Use of Digital Tools for Learning

The output from research question three revealed that the extent of use of digital tools for learning among postgraduate students of Library and Information Science in South-South, Nigeria is generally low. The generally low use of digital tools for learning among postgraduate students highlights the need for deliberate integration of digital technologies into teaching, research, and library services, ensuring that future information professionals develop the practical experience and confidence required to operate effectively in today's technology-driven information landscape.

This finding is consistent with the study by Oluwadamilola and Nwachukwu (2019), which reported that postgraduate students in South-West Nigeria demonstrated moderate digital literacy skills but made limited use of e-resources. Only 32% of respondents indicated frequent use of digital tools for academic purposes, citing challenges such as limited internet access and inadequate training. Like the present study, their findings highlight a persistent gap between access to digital tools and their effective utilization in postgraduate education.

Similarly, Okafor and Ezeanya (2022) found low levels of awareness and adoption of digital tools among postgraduate students in South-South Nigeria, with only 35% of respondents reporting frequent use. Their study identified digital skills, institutional encouragement, and perceived ease of use as major influencing factors, reinforcing the present finding that the use of digital tools among postgraduate students remains generally low in the region.

However, the present study contrasts with the work of Tenopir et al. (2015), who reported extensive use of online databases and digital libraries by postgraduate students, with 90% of respondents identifying these resources as crucial for their research. The difference may be explained by contextual variations: Tenopir et al. focused on postgraduate students in settings where institutional support, internet access, and training opportunities were more readily available, while the current study highlights challenges unique to South-South Nigeria, such as infrastructural deficits and low institutional integration of digital tools.

Relationship between Digital Competencies and Use of Digital Tools

The results from research question four and hypothesis one indicated that digital competencies statistically and significantly influence the use of digital tools for learning by postgraduate students in South-South, Nigeria. The finding implies that strengthening postgraduate students' digital competencies through targeted training and support will directly enhance their effective use of digital tools for learning, thereby improving research productivity, academic performance, and readiness for professional practice in the digital-driven library and information science field.

This finding aligns with the study by Okiki (2011), who reported that postgraduate students at the University of Lagos with moderate ICT competencies were more likely to use digital tools for academic purposes compared to their less competent peers. However, Okiki also noted that despite moderate competence levels, actual utilisation of digital tools remained below expectation, suggesting that competence is a key but not exclusive determinant of use. The similarity lies in confirming that digital competencies are directly tied to the effective use of digital tools for postgraduate learning.

Similarly, Ilomäki et al. (2016) in Finland found that postgraduate students who demonstrated high digital competencies showed significantly greater engagement with digital learning tools ($R = 0.68$). Their study underscores the same relationship as observed in the present research: that strong digital competencies enable postgraduate students to more actively and effectively integrate digital technologies into their learning practices. While their context differs geographically and methodologically, both studies reinforce the central role of digital competence in digital tool utilisation.

Conversely, the present finding contrasts with Olatokun (2009), who discovered that despite high levels of access to ICTs among postgraduate students in Southwestern Nigeria (70%), effective utilisation for academic learning was relatively low (55%). This suggests that access to digital tools and even a baseline level of competency may not automatically translate to high levels of use. Factors such as institutional

support, cultural attitudes, or motivation could explain why competence did not lead to optimal tool usage in Olatokun's study, whereas in the present study, digital competencies significantly predicted usage.

CONCLUSION

Based on the findings of this study, it can be concluded that postgraduate students of Library and Information Science in the region possess a generally low level of digital competencies. This suggests that many students lack adequate technical, problem-solving, and critical-thinking skills required to effectively engage with digital learning platforms and resources. Furthermore, the study established that the extent of use of digital tools for learning among these students is also low, indicating limited integration of available digital technologies in their academic and research activities.

However, a significant positive relationship was found between digital competencies and the use of digital tools for learning. This implies that students who possess higher digital skills are more likely to effectively utilise digital tools for research, collaboration, and learning enhancement. The result underlines the crucial role of digital competence as a determinant of effective digital tool utilisation among postgraduate students.

RECOMMENDATIONS

Based on the findings of the study on digital competencies and the use of digital tools for learning by postgraduate students in South-South, Nigeria, the following recommendations are made:

1. To address the low digital competencies of postgraduate students, universities and faculty in Library and Information Science should organise regular digital literacy workshops and hands-on training sessions, focusing on technical, research, and problem-solving skills. These should be implemented through collaboration with ICT experts and embedded into the postgraduate curriculum to ensure consistent skill acquisition.
2. To increase the extent of digital tool usage among postgraduate students, lecturers and academic advisors should deliberately integrate digital tools into teaching, assignments, and research activities, while providing students with guided practice. This should be reinforced by continuous monitoring and feedback mechanisms to encourage regular use of digital resources.
3. Since digital competencies significantly influence the use of digital tools for learning, universities should establish compulsory digital skills development modules as part of postgraduate programmes. These modules should be delivered through blended learning approaches, combining classroom instruction with practical exercises on real academic platforms and research databases.

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Rückenfigur and the Western Gaze: An Art Historical Study of the Figure Seen from Behind

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ABSTRACT: The motif of the Rückenfigur—a figure shown from behind, facing into the pictorial space—has become almost synonymous with Caspar David Friedrich and German Romantic landscape painting. Yet as a compositional device and as a visual problem, the Rückenfigur has a deeper, more complex genealogy within Western art. From early experiments in Giotto's frescoes to the domestic interiors of Vermeer and the erotic nudes of Velázquez and Ingres, painters repeatedly turned figures away from the viewer to organise space, withhold narrative information, and complicate the act of looking. In the nineteenth century, Friedrich's landscapes codified the Rückenfigur as a privileged site for negotiating the sublime, the relation between subject and nature, and the temporality of viewing. Subsequent artists—Gustave Caillebotte, Vilhelm Hammershøi, Andrew Wyeth, Edward Hopper and others—reworked this motif in urban, domestic, and psychologically charged contexts, shifting its meaning from Romantic immersion in nature toward alienation, introspection, and modern subjectivity.

This article traces the Rückenfigur as a Western art-historical phenomenon, moving from early antecedents to Romantic codification and modern transformations. Alongside close readings of selected paintings, it draws on theories of spectatorship and embodiment to argue that the Rückenfigur functions as a privileged device for staging the spectator's position and for exploring the tension between identification and distance. Finally, the essay briefly considers the survival of this motif in photography, film, and contemporary art, suggesting that the figure seen from behind remains a powerful means of thinking about seeing, subjectivity, and the limits of representation.

KEYWORDS: Rückenfigur, Caspar David Friedrich, Romantic sublime, Spectatorship, Embodiment, Modern subjectivity, Western painting

1. INTRODUCTION: Turning Away in Order to Look

The Rückenfigur—literally “back-figure” in German—is now a familiar term in art history. It refers to a figure whose back faces the viewer, placed in the foreground of an image while gazing into the depicted world. The viewer is invited, at least ostensibly, to “stand behind” this figure and share its view. The device is closely associated with German Romantic painting and particularly with the landscapes of Caspar David Friedrich, yet scholarship has shown that the motif predates Romanticism and reappears across media and periods.

At one level, the Rückenfigur might seem a simple compositional solution: the back figure points our gaze into depth, activating perspective and narrative. But it also raises more difficult questions. Does the figure really serve as our surrogate, inviting identification and immersion? Or does its turned back assert a barrier, reminding us that what it sees is not fully accessible to us? Art-historical debates often turn on this ambiguity: some authors describe the Rückenfigur as a transparent stand-in for the beholder, while others insist that it stages second-order observation, making us aware that we are looking at someone else who looks.

The aim of this article is to give an art-historical account of the Rückenfigur within Western painting, without recourse to cross-cultural comparison. The essay proceeds in four main movements. First, it traces early Western antecedents in Giotto, Dürer, Vermeer, Velázquez, and Ingres, where figures seen from behind serve to structure space and to withhold narrative information. Second, it examines Friedrich's Romantic codification of the motif as an emblem of the sublime, drawing on influential analyses of the artist and his use of the “halted traveller.” Third, it follows the motif into modernity, focusing on urban and domestic Rückenfiguren in Caillebotte, Hammershøi, Wyeth, and Hopper. Fourth, it mobilises phenomenological and spectator-theoretical perspectives to argue that the Rückenfigur has become a key device for thinking about embodiment, spectatorship, and the ethics of looking. A brief concluding section gestures toward the motif's contemporary afterlives in photography and film. Throughout, the Rückenfigur is treated not as a mere iconographic type, but as a reflective tool: a means by which Western painters have interrogated what it means to look, to be looked at, and to be latecomers in front of images and histories that precede us.

2. EARLY ANTECEDENTS: GIOTTO TO INGRES

Although the term Rückenfigur is German and Romantic, the compositional device of turning figures away from the viewer appears much earlier. Recent summaries of the motif's history often begin with Giotto's Lamentation (The Mourning of Christ) (c. 1304–1306), in the Scrovegni Chapel, Padua (Fig. 1). Several mourners sit or kneel at the lower edge of the fresco, presenting their backs or three-quarter backs to the viewer, forming a visual barrier and a spatial threshold between us and the dead Christ. Their hunched shoulders and concealed faces create a zone of emotional opacity: grief is indicated, but not legible as individual expression. At the same time, these figures help articulate depth; their turned bodies anchor the foreground and direct the eye toward the central event.

Figure 1

Giotto di Bondone, Lamentation (The Mourning of Christ), c. 1304–1306, fresco, Scrovegni Chapel, Padua, Italy. Public domain image.

In early modern art, artists continued to experiment with figures seen from behind. Albrecht Dürer's engraving *Four Naked Women* (1497) shows one woman with her back completely turned, while the others form a tightly closed circle around a skull on the floor. The back figure here is less a surrogate for the viewer than a device for protecting a secret narrative space from our gaze. Her turned body participates in a choreography of concealment; what matters is precisely what we are not allowed to see.

Johannes Vermeer's *The Art of Painting* (c. 1666–1668) offers another important precedent (Fig. 2). The painter is seen only from behind as he paints Clio, the muse of history, in a meticulously ordered studio. The painting within the painting shows Clio in profile, yet Vermeer's painter remains a Rückenfigur for us. We are denied access to his facial expression, perhaps even to his identity. The viewer thus occupies an oblique position: we observe a privileged relationship between artist and model that we can never fully enter. The Rückenfigur here signals both proximity (we are inside the studio) and irreducible distance (we can never take the painter's place).

Figure 2

Johannes Vermeer, *The Art of Painting*, c. 1666–1668, oil on canvas, Kunsthistorisches Museum, Vienna, Austria. Image reproduced from a public domain source or museum image policy as applicable.

In seventeenth-century Spain, Diego Velázquez's so-called *Rokeby Venus* (c. 1648–1651) developed a different use of the back figure (Fig. 3). Venus lies on her stomach, her naked back exposed to the viewer, facing a mirror held by Cupid. Formally this is a kind of Rückenfigur: the viewer sees the back and must rely on a mediated reflection to glimpse the face. But whereas Giotto's mourners and Vermeer's painter conceal narrative or professional interiority, Velázquez's nude plays with erotic distance. The back both exposes and protects; the reflected face is small, blurred, and arguably less important than the elongated, tactile expanse of the spine. In this instance, the Rückenfigur thematises desire and the limits of possession: the viewer can look, but not touch, and can never fully command the reflected gaze.

Figure 3

Diego Velázquez, *The Rokeby Venus* (Venus at Her Mirror), c. 1648–1651, oil on canvas, The National Gallery, London, United Kingdom. Image in the public domain.

By the early nineteenth century, the motif had also entered the domain of neoclassical and Romantic nude painting. Jean-Auguste-Dominique Ingres's *Valpinçon Bather* (1808) places a seated nude woman with her back turned to the viewer at the centre of the composition (Fig. 4). Her smooth, idealised back is meticulously modelled, bathed in soft light. While the setting is interior and the mood quiet, the logic is similar to Velázquez: the back is a surface that invites contemplation yet denies full access to the subject's interiority. The viewer's desire is channelled into an almost sculptural appreciation of form, while the absent face reinforces an asymmetry between seeing and being seen.

Figure 4

Jean-Auguste-Dominique Ingres, *The Valpinçon Bather*, 1808, oil on canvas, Musée du Louvre, Paris, France. Image in the public domain.

In these early examples, the back figure is not yet a Romantic wanderer confronting an abyssal landscape. But the compositional logic is already in place: turned bodies create thresholds, screens, and mediations. They can protect secrets, stage professional distance, or eroticise the act of looking. The Rückenfigur is emerging as a figure of partial access—a device that structures not only space, but also the ethics and politics of what is shown and withheld.

3. CASPAR DAVID FRIEDRICH AND THE ROMANTIC CODIFICATION OF THE RÜCKENFIGUR

It is in the work of Caspar David Friedrich (1774–1840) that the Rückenfigur becomes a central, almost emblematic, device. Friedrich's landscapes—*Wanderer above the Sea of Fog* (c. 1817), *Two Men Contemplating the Moon* (c. 1819–1820), *Moonrise by the Sea* (1822), *Chalk Cliffs on Rügen* (1818), *Woman at the Window* (1822)—are populated by solitary or paired figures seen from behind, facing a sea of fog, a nocturnal sky, or a distant moon. Among these works, *Wanderer above the Sea of Fog* has become perhaps the most iconic representation of the Rückenfigur (Fig. 5).

The painting shows a male figure standing on a rocky outcrop, his coat buffeted by the wind, looking out over a swirling sea of mist. The landscape is vast yet ambiguous, its forms partly dissolved into fog. The figure's posture is upright, almost heroic, but he is also precariously balanced. We can imagine ourselves standing in his place, yet his central placement and distinctive silhouette resist full substitution. The painting dramatises the Romantic problematic inherited from Kant's theory of the sublime: nature appears overwhelming, yet the moral subject stands above it in thought. The Rückenfigur here is not merely a compositional pointer; it is the hinge between finite, embodied perception and the mind's capacity to conceive of infinity.

Figure 5

Caspar David Friedrich, *Wanderer above the Sea of Fog*, c. 1817–1818, oil on canvas, Hamburger Kunsthalle, Hamburg, Germany. Image in the public domain.

In works such as *Two Men Contemplating the Moon* and *Moonrise by the Sea*, Friedrich multiplies the Rückenfigur, inviting us into a chain of gazes: we look at the figures, who look at the moon or horizon, which in turn seems to gaze back only metaphorically. The very act of contemplating

nature becomes a theme for the painting; the Rückenfigur is not a transparent mediator but a visible sign of reflection. Joseph Leo Koerner has argued that Friedrich's paintings can be read as allegories of beholding: they picture the act of looking at pictures through the inserted back figures, who become "halted travellers" within both the landscape and the history of art.

Recent scholarship has nuanced this account, emphasising the social and communal dimensions of Friedrich's landscapes as well as their religious and political resonances. The Rückenfigur can be understood not only as a solitary seeker of the sublime, but also as a member of a community, a citizen, or a believer, whose stance toward nature and history is inflected by Protestant theology, nationalist discourse, and the aftermath of the Napoleonic Wars. Yet the central point remains: in Friedrich, the Rückenfigur crystallises Romantic anxieties about access to nature, the role of the solitary subject, and the temporality of the sublime. It also codifies a grammar of looking that subsequent artists could adopt, adapt, or contest. An important contrast arises with works like *Woman at the Window*, where Friedrich undermines the typical promise of the Rückenfigur. A woman—modelled by the artist's wife—stands with her back to us, gazing out of a window. We see only a portion of the outside world: the masts of ships, perhaps, but no grand vista. The painting converts the Rückenfigur from a figure of open access to a sign of closed interiority, suggesting a private, perhaps inaccessible, inner life rather than cosmic sublimity. In this sense, Friedrich himself already anticipates later domestic and psychological uses of the motif.

4. URBAN WINDOWS AND DOMESTIC INTERIORS: CAILLEBOTTE AND HAMMERSHØI

The nineteenth century did not merely inherit Friedrich's Rückenfigur; it transformed it in response to the rise of the modern city and the changing conditions of everyday life. The figure seen from behind becomes less a Romantic seeker of transcendence and more a spectator of urban spectacle, domestic routine, or opaque social relations.

Gustave Caillebotte's *Young Man at His Window* (1876) is a canonical post-Friedrich Rückenfigur (Fig. 6). A male figure—often identified as the artist's brother René—stands at a window, back turned to the viewer, looking out onto a Parisian street. The interior furnishings, clothing, and architecture situate the figure within a bourgeois milieu, while the cityscape outside appears both alluring and inaccessible. The figure's posture is less heroic than Friedrich's wanderer; he is a flâneur, an observer of traffic and pedestrians, but also, perhaps, a prisoner of his own social position. The Rückenfigur here articulates the threshold between private interior and public exterior, mediating the spectator's relation to urban modernity.

Figure 6

Gustave Caillebotte, *Young Man at His Window*, 1876, oil on canvas, Musée d'Orsay, Paris, France. Image in the public domain.

Caillebotte's painting belongs to a broader nineteenth-century fascination with windows and balconies. These architectural elements become privileged sites for negotiating the relation between self and world. The back figure facing the window stands in for the modern viewer whose access to the world is increasingly framed—literally and metaphorically—by architectural apertures, pictorial devices, and eventually photographic and cinematic screens. The Rückenfigur mediates between the safety of the domestic interior and the dynamism of the street, dramatising both curiosity and withdrawal.

In the early twentieth century, Vilhelm Hammershøi's domestic interiors in Copenhagen radicalise this logic. Paintings such as *Interior with Young Woman Seen from the Back* (c. 1903) repeatedly show the artist's wife, Ida, turned away from us, standing or seated in sparsely furnished rooms, often facing a door, window, or empty wall (Fig. 7). The palette is reduced to greys and muted browns; the compositions are austere, almost minimalist. The works are haunted by a tension between closeness and inaccessibility: we are imagined to stand just behind Ida, yet we are denied any facial expression, any clear narrative.

Figure 7

Vilhelm Hammershøi, *Interior with Young Woman Seen from the Back*, c. 1903, oil on canvas, Ordrupgaard, Charlottenlund, Denmark. Image in the public domain or reproduced according to museum policy.

If Friedrich's Rückenfigur stages Romantic access to the sublime in nature, Hammershøi's domestic Rückenfigur maps a sublimity of inner life and mental space. The turned back becomes a sign of psychological interiority rather than religious transcendence. The viewer is invited to imagine, but never to verify, the thoughts and feelings of the figure. In this sense, the motif becomes a visual analogue for modernist concerns with subjectivity, interiority, and the opacity of other minds.

The urban and domestic Rückenfigur thus reconfigures the relationship between viewer, figure, and environment. We no longer stand with the wanderer on a mountain peak; we hover in doorways, hallways, balconies, and living rooms. The sublime has moved from mountains and seas to streets and interiors, yet the structural role of the back figure—as a hinge between our view and the depicted world—remains.

5. MODERN SOLITUDE: WYETH AND HOPPER

Twentieth-century Western painting continues to exploit the Rückenfigur to stage solitude, longing, and estrangement. Two artists are particularly instructive: Andrew Wyeth and Edward Hopper.

Wyeth's *Christina's World* (1948) is not always discussed explicitly under the rubric of Rückenfigur, but it clearly participates in the same logic (Fig. 8). A young woman, her back turned partially toward us, lies in a field facing a distant farmhouse. Her thin arms brace her against the ground; her body appears both determined and frail. The vast field around her, rendered in subdued earth tones, recalls Romantic landscapes, yet the mood is ambiguous: we are unsure whether she is moving toward the house or trapped in an impossible effort. The figure from behind is not a generic surrogate; she is a particular person whose disability and biography complicate any easy projection. The viewer is drawn into her line of sight but also confronted with her limitation. The Rückenfigur becomes a vulnerable body rather than a heroic silhouette, and the field, instead of promising transcendence, suggests the stubborn materiality of distance.

Figure 8

Andrew Wyeth, *Christina's World*, 1948, tempera on panel, The Museum of Modern Art, New York, United States. © The Andrew Wyeth Estate/Artists Rights Society (ARS), New York (permissions may be required for reproduction).

Edward Hopper's paintings, though less systematically reliant on figures seen strictly from behind, repeatedly show figures turned away or in profile, absorbed in their own thoughts and resistant to our gaze. In works like *Morning Sun* (1952) or *Hotel Room* (1931), women sit on beds or chairs, looking out of windows or into space. Even when we see parts of their faces, the logic is Rückenfigur-adjacent: the figures are mentally elsewhere, aligned with a view or thought that we cannot fully share. Hopper's art has been read as a meditation on modern loneliness, the fragmentation of urban life, and the opacity of others. The partial or turned-away figure is central to this effect.

Phenomenologically, these modern Rückenfiguren intensify the tension between identification and separation. We are repeatedly placed behind or beside figures whose absorption in their own world both invites and resists our own absorption. The device thus becomes an instrument for exploring what has been called the "uncanniness of the ordinary": the fact that even banal scenes of looking and sitting contain unfathomable depths of experience.

6. RÜCKENFIGUR, EMBODIMENT, AND SPECTATORSHIP

Up to this point, the essay has traced the Rückenfigur historically. In this section, I turn more explicitly to the question of spectatorship and embodiment, drawing on phenomenological and critical theories of viewing to articulate what is at stake in the figure seen from behind.

Maurice Merleau-Ponty's phenomenology of perception emphasises that vision is always embodied; the seer is also visible, anchored in a particular point of view. The Rückenfigur makes this fact visible within the painting: we see a body that sees, but from a position that cannot coincide exactly with our own. The motif therefore stages a structural asymmetry: we look at someone looking. The painting acknowledges, and thematises, the embodied nature of perception.

For Paul Crowther, visual art is grounded in what he calls "embodied imaging"—the capacity of images to articulate the structures of lived experience, including spatial orientation and bodily presence. The Rückenfigur exemplifies this: it gives a body to the act of looking, inscribing the viewer's potential position into the pictorial field. But crucially, this inscription is never perfect. The back figure is both us and not-us; we can align ourselves with it imaginatively, yet we remain outside the picture plane.

Theorists of images and spectatorship have also underlined the active role of the viewer. W. J. T. Mitchell argues that images "address" us, soliciting our responses and constructing implied beholders. In paintings with Rückenfiguren, this implied beholder is doubled: the Rückenfigur itself is a kind of internal spectator, whose relation to the scene becomes the model (or counter-model) for our own. In this sense, the motif stages "spectatorship within the picture," making visible the mediations that usually remain implicit.

Jacques Rancière's concept of the "emancipated spectator" further complicates the picture. For Rancière, modern aesthetics disrupts the traditional hierarchy between active makers and passive viewers, insisting that spectators are already interpreters, translators, and co-producers of meaning. The Rückenfigur participates in this redistribution of roles: it does not tell us what to see; rather, it presents another spectator whose act of viewing may differ from ours. Facing the back of Friedrich's wanderer or Hammershøi's Ida, we are compelled to imagine their experience without ever fully knowing it. Our own viewing becomes an interpretive, speculative act.

Film and media theory have recognised similar dynamics. Vivian Sobchack, in her phenomenology of film experience, emphasises the reciprocity between viewer and screen: the film "sees" us as we see it. In cinema, the back-turned figure has become a standard trope for staging reflective or contemplative subjectivity, as when a character stands at a window or cliff edge, seen from behind, while the camera lingers. The Rückenfigur thus traverses media, carrying with it the same fundamental problem: what does it mean to see someone seeing?

What emerges from these theoretical engagements is that the Rückenfigur is not simply a stylistic flourish. It is a visual articulation of what one might call "second-order spectatorship": the viewer is asked to behold a beholder, to confront the limits of identification, and to inhabit a space of interpretive uncertainty. This is true in Giotto and Vermeer, in Friedrich and Hammershøi, and in countless modern appropriations.

7. CONTEMPORARY AFTERLIVES: PHOTOGRAPHY, FILM, AND VISUAL CULTURE

Although this article focuses on painting, it would be incomplete not to acknowledge the motif's persistence in contemporary visual culture. Photographers often speak of using a Rückenfigur composition to invite viewers into a scene: a person seen from behind anchors the foreground while indicating the direction of interest in the background. Artistic photography has long exploited the erotic and voyeuristic dimensions of the back figure, from early nudes to contemporary fashion images. The immediacy and potential intrusiveness of the photographic gaze can intensify the oscillation between identification and distance that the motif already encodes.

In film, as noted above, the figure seen from behind has become a cliché for introspection, melancholy, or decision. A protagonist standing at the edge of a city rooftop, or looking out over the sea, signals reflection and uncertainty without revealing specific facial expressions. The Rückenfigur motif thus survives as a flexible visual shorthand for complex emotional states, precisely because it withholds direct access to the face.

At the level of popular culture, the Rückenfigur has become almost ubiquitous: countless posters, advertisements, and social media images show individuals (often women) seen from behind, looking out over city skylines, beaches, or mountain vistas. This ubiquity risks flattening the motif into mere convention. Yet it also attests to the enduring power of the basic structure: a body that looks, a world that stretches out before it, and a viewer positioned just behind, caught between alignment and distance.

8. CONCLUSION: THE ETHICS OF BEING BEHIND

If we step back from this historical survey, a number of threads come into focus. First, the Rückenfigur has a longer Western history than the canonical association with Friedrich might suggest. From Giotto's mourners and Vermeer's painter to Velázquez's *Venus and Ingres's* *Bather*, the turned back has served as a means of structuring space, protecting secrets, and complicating the viewer's access to the scene. Romanticism did not invent the back figure; it intensified and theorised it.

Second, Friedrich's landscapes codified the Rückenfigur as a central Romantic device, linking it to the discourse of the sublime and to anxieties about belatedness and mediation. The figure seen from behind became an emblem of the modern subject in nature: at once aspiring to transcendence and aware of its own finitude. Later painters extended this motif into the interiors of the modern city and the psychological spaces of the home, while twentieth-century artists such as Wyeth and Hopper used it to crystallise modern solitude and the fragility of the individual.

Third, theoretical perspectives from phenomenology, image theory, and spectatorship studies help explain why the Rückenfigur is so resilient. By presenting us with another spectator inside the picture, the motif forces us to confront the embodied, partial, and mediated nature of our own viewing. It is an image of someone else's view that we can never fully occupy, and thus a reminder of the limits of empathy and identification.

Finally, the Rückenfigur raises ethical as well as aesthetic questions. To stand behind someone is to be both close and distant, supportive and potentially intrusive. In an age saturated with images of backs—tourists at viewpoints, subjects in advertising, anonymous figures in news photographs—the old Romantic question of who may look at what, and under what conditions, acquires new urgency. The art-historical study of the Rückenfigur in Western painting is therefore not merely an exercise in stylistic genealogy. It is also a way of thinking about how images teach us to inhabit our own position as viewers: not as omniscient observers, but as belated, partial participants in visual worlds that always exceed us.

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A Theoretical Framework for Integrating Artificial Intelligence in Teaching Based on the TPACK Model: A New Approach and Implications for Developing Teacher Competence

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ABSTRACT: The rapid development of artificial intelligence in recent years has brought about significant changes in the field of education, particularly in instructional design, the organization of teaching activities, and assessment. Given the growing need for innovation in teaching methods and the development of teacher competencies in the context of digital education, the establishment of a systematic and scientific theoretical framework for integrating AI into teaching has become increasingly urgent.

This paper aims to analyze the role of artificial intelligence in modern education, clarify the theoretical foundations of the Technological Pedagogical Content Knowledge (TPACK) model, and examine its recent extensions in response to emerging technologies. On this basis, the study proposes a theoretical framework for integrating artificial intelligence into teaching grounded in the TPACK model, emphasizing the interaction among content knowledge, pedagogical knowledge, technological knowledge, and AI-specific competencies.

The proposed framework highlights not only the role of AI as a teaching tool but also its function as a catalyst for pedagogical innovation, personalized learning, and enhanced teaching effectiveness. Furthermore, the paper discusses key implications for teacher competency development, including the cultivation of digital pedagogical thinking; the capacity to design teaching activities supported by AI applications; the ability to assess learning processes in AI-enhanced environments.

The findings contribute to strengthening the theoretical foundation for AI integration in teaching through the TPACK approach, while also offering practical directions for teacher training and professional development in the context of ongoing digital transformation in education.

KEYWORDS: Artificial intelligence in education , TPACK model , AI-TPACK, Teacher competence , Digital transformation in education

INTRODUCTION

The rapid development of artificial intelligence (AI) is bringing about profound changes across multiple fields, with education being among the sectors most directly and rapidly affected. AI tools and platforms have created new opportunities for teaching and learning, ranging from the personalization of learning processes to supporting assessment, instructional design, and learning analytics. In this context, the need to innovate teacher competencies has become increasingly urgent, as the effective application of AI in teaching requires not only technological knowledge but also the ability to integrate technology with content knowledge and pedagogical knowledge in a coherent and scientifically grounded manner.

Although a growing body of research has examined the application of AI in classroom settings, much of this work continues to adopt fragmented and isolated approaches. As a result, the central issue, how to integrate AI into teaching strategies in ways that generate genuine educational value, remains insufficiently addressed. The absence of a robust theoretical framework for AI integration in teaching often leads to inconsistent implementation, an overemphasis on technology, or a disconnect between content knowledge and pedagogical knowledge.

Within this context, the Technological Pedagogical Content Knowledge (TPACK) model, widely regarded as a foundational framework for technology-integrated teaching, offers a useful lens for explaining how AI can be effectively incorporated into educational practice. However, the traditional TPACK model does not fully capture the complexity of AI-driven teaching environments, thereby necessitating the expansion and reconfiguration of its knowledge components to accommodate the distinctive characteristics of artificial intelligence technologies.

Accordingly, this paper aims to develop a theoretical framework for integrating AI into teaching based on the TPACK model, with the goal of clarifying the knowledge structure required of teachers when applying AI in instructional activities. Building on this framework, the paper proposes a novel approach to AI integration in teaching and discusses its implications for teacher competency development in the AI era. It is expected that this study will provide a solid theoretical foundation for pedagogical innovation, as well as for teacher education and professional development, within the context of the ongoing digital transformation of education.

THEORETICAL FRAMEWORK

Artificial Intelligence in Education

AI is driving significant transformations in education, as evidenced by the wide range of technological applications supporting teaching and educational management. AI has evolved from traditional computer-based technologies to intelligent systems such as robots, online platforms, and chatbots, enabling instructors to perform tasks related to management, grading, and the personalization of learning content more effectively (Chen, Chen, & Lin, 2020). Beyond improving the operation of educational systems, AI also directly influences the learning process through its capacity to enhance student engagement and improve academic performance. Recent studies support the claim that AI can positively affect learning outcomes when it is appropriately integrated into educational practice.

Sasikala and Ravichandran (2024) demonstrate that AI facilitates personalized learning, increases learner interaction, and supports learning progression, while also drawing attention to challenges related to privacy, ethics, and the reliability of algorithms. In the context of adaptive learning, Rekha et al. (2024) describes how AI systems track learning data in real time and dynamically adjust content and difficulty levels to align with individual learner progress, thereby enhancing engagement and learning outcomes.

The application of AI in educational measurement and evaluation has likewise attracted considerable scholarly attention. Yaneva and von Davier (2023) highlight the role of natural language processing (NLP) in automated scoring, feedback analysis, and question generation, while emphasizing the importance of ensuring fairness and validity in AI-based assessment practices. From the perspective of teacher professional development, Brandão, Pedro, and Zagalo (2024) argue that teachers need to be equipped with foundational AI knowledge, skills in using generative AI (GenAI), and the capacity to address ethical issues in order to guide students in the safe and responsible use of technology.

In addition, studies by Lampou (2023) and Walter (2024) indicate that AI contributes to pedagogical innovation by supporting lesson design, facilitating instruction for students with special educational needs, and enabling the provision of real-time feedback to improve teaching quality. At the theoretical level, Baker (2000) emphasizes the role of educational models in shaping the design of learning systems and stresses the need for close alignment among technology, curriculum, and educational agents. Empirical research by Grassini (2023), Zhu et al. (2025), and Létourneau et al. (2025) further provides evidence of the impact of AI and generative AI on learning outcomes, although the magnitude of this impact varies depending on learners' skills, implementation strategies, and educational contexts.

Overall, the literature indicates that AI offers substantial opportunities for innovation in teaching and teacher professional development. Artificial intelligence has become a central component of the digital transformation of education, driven by technologies such as machine learning, deep learning, and natural language processing that enable systems to simulate aspects of human cognition. Current applications of AI in teaching range from the design of digital learning materials and the assessment of learner competencies to learning analytics and the personalization of learning experiences. However, the literature consistently emphasizes that for AI to deliver genuine educational value, it must be integrated into pedagogical strategies rather than used merely as a technological add-on. This, in turn, requires teachers to understand not only how AI technology's function but also how to strategically leverage them in lesson design, the organization of learning activities, instructional decision-making, and the evaluation of student learning outcomes.

The TPACK Model and Recent Extensions

The Technological Pedagogical Content Knowledge (TPACK) framework was developed from Shulman's concept of Pedagogical Content Knowledge (PCK) by incorporating a technological dimension to address the demands of educational innovation in the digital era (Mishra & Koehler, 2006; Schmidt et al., 2009). The TPACK model conceptualizes teachers' professional knowledge as the integration of three core components: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) (Koehler et al., 2011; Mishra et al., 2010). The intersections among these components give rise to pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK), which together form the comprehensive TPACK framework representing the knowledge base required for effective technology-integrated teaching.

TPACK emphasizes not only teachers' familiarity with educational technologies but also their ability to meaningfully integrate technology into pedagogical strategies and subject matter instruction. This integration requires an understanding of how technological tools can support the representation of concepts, enhance pedagogical approaches, address learners' difficulties, and align with students' prior knowledge and cognitive processes. Accordingly, TPACK encompasses knowledge of learning theories and the pedagogical use of technology to design instructional activities that are responsive to learners' needs and abilities (Meredith et al., 2017).

A substantial body of empirical research has demonstrated that the development of TPACK can enhance teachers' instructional design skills, promote student interaction, and improve learning effectiveness across various subject areas, including mathematics, science, foreign languages, and early childhood education (Santos & Castro, 2020; Jammeh et al., 2023; Aldalalah et al., 2025). Effective TPACK development is commonly associated with sustained professional development initiatives, hands-on practice in technology-integrated lesson design, collaborative learning communities, and ongoing formative feedback (Tondeur et al., 2019; Anwar et al., 2025).

Despite its strengths, the implementation of TPACK faces persistent challenges, such as limited technological infrastructure, insufficient professional training, time constraints, and linguistic and cultural barriers, particularly in remote or multicultural educational settings (Vijayatheepan, 2025; Priyanda et al., 2025). In response to the rapid advancement of artificial intelligence (AI), recent research has sought to extend the TPACK framework to better reflect the realities of AI-enhanced teaching environments. Models such as AI-TPACK and Intelligent-TPACK explicitly incorporate AI-related technological knowledge and emphasize teachers' competencies in ethical judgment, critical evaluation, and responsible use of AI tools in education (Celik, 2022; Ning et al., 2024; Oved & Alt, 2025).

Longitudinal reviews and bibliometric analyses indicate that since its introduction, TPACK has become one of the most influential theoretical frameworks for technology integration in education, with widespread application across disciplines such as mathematics, language education, health sciences, and the humanities (Schmidt et al., 2009; Irwanto, 2021; Zou et al., 2022). The volume of TPACK-related research has increased steadily, reflecting its continued relevance in an era of digital transformation (Prasetya & Irwanto, 2025). Recent extensions of the model have

further incorporated contextual knowledge (XK), recognizing the significant influence of institutional, cultural, and curricular contexts on the effectiveness of technology integration, particularly in mathematics education (Li & Li, 2024).

At the same time, systematic reviews have identified several theoretical and methodological limitations of the TPACK framework, including challenges in measuring its components, conceptual overlap among knowledge domains, and a lack of long-term empirical studies examining its direct impact on student learning outcomes (Willermark, 2018; Karaduman & Akman, 2024). Nevertheless, TPACK continues to serve as a valuable foundation for the design of teacher education and professional development programs, especially when combined with collaborative models such as Lesson Study (Jiménez Sierra et al., 2023).

Overall, the integration of technology into teaching necessitates the intersection of three fundamental knowledge domains technology, pedagogy, and content. Despite ongoing debates and extensions, the TPACK framework remains a robust and widely adopted theoretical platform for supporting effective, context-sensitive, and innovative teaching practices in contemporary education.

Research Gaps on AI Integration in Teaching According to the TPACK Model

The integration of artificial intelligence into education presents substantial theoretical and practical challenges for the TPACK framework. Although recent studies have proposed extended models such as AI-TPACK, several critical research gaps remain unresolved.

First, existing theoretical frameworks tend to enumerate the required knowledge components such as AI-related technological knowledge, pedagogical knowledge, content knowledge, and ethical competence without adequately explicating the intrinsic relationships among these components or the mechanisms through which they interact in teaching practice. In addition, the measurement and evaluation of teachers' AI-TPACK competencies lack standardized instruments and widely accepted indicators, and the reliability and practical applicability of existing tools have yet to be sufficiently validated (Ning et al., 2024).

Second, most empirical studies have concentrated on teachers' cognitive, attitudinal, or technological competencies, while comparatively little attention has been paid to pedagogical integration, content-related decision-making, and, in particular, ethical competence in the use of AI. Many teachers continue to face difficulties in distinguishing between productive pedagogical support provided by AI and the risks of over-reliance on technology. Moreover, limited awareness of issues such as algorithmic bias, data security, and privacy remains a persistent concern (Celik, 2022; Feldman-Maggor et al., 2024).

Third, research on teacher professional development within the AI-TPACK framework remains limited in terms of scale, duration, and contextual diversity. Existing training programs often focus primarily on introducing AI tools rather than fostering teachers' capacities to integrate AI into lesson design, instructional decision-making, and student assessment. Furthermore, there is a notable lack of longitudinal studies examining the sustained impact of AI-TPACK-based professional development on teaching practices and student learning outcomes (Sun et al., 2022; Zulianti et al., 2024).

Finally, contextual factors including regional disparities, infrastructural conditions, policy support, and teachers' readiness to adopt AI have not been sufficiently addressed in current AI-TPACK research. This omission contributes to a persistent gap between theoretical models and classroom implementation, particularly in under-resourced or rural educational settings (Castro et al., 2025; Liu et al., 2025).

Overall, while research on AI in education is expanding rapidly, much of the existing literature continues to emphasize tool-based applications rather than elucidating the pedagogical mechanisms through which AI is integrated into teaching. Studies employing the TPACK framework frequently retain the traditional CK-PK-TK structure without clearly explaining how AI reshapes the nature and interaction of these knowledge domains. Moreover, although many studies highlight the potential benefits of AI for teaching, they often fail to articulate a coherent developmental pathway for enhancing teachers' professional competencies in AI-supported instruction. The most significant gap, therefore, lies in the absence of a comprehensive theoretical framework that systematically connects AI with the core components of TPACK and clarifies the implications of this integration for teacher professional competence. Addressing this gap necessitates the development and articulation of an AI-integrated theoretical framework grounded in TPACK, capable of clearly defining the knowledge structure required of teachers when applying AI in educational practice.

Theoretical Framework for Integrating AI into Teaching Based on the TPACK Model

Artificial Intelligence–Technological Pedagogical Content Knowledge (AI–TPACK) Framework

The theoretical framework proposed in this study aims to clarify the knowledge structure required of teachers when integrating artificial intelligence (AI) into teaching, building upon the foundational principles of the TPACK model. While TPACK emphasizes the intersection of content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK), the emergence of AI necessitates the expansion and reconceptualization of each knowledge component to reflect the distinctive characteristics of intelligent technologies capable of data analysis, learner interaction, and participation in the knowledge construction process. Consequently, restructuring TPACK toward AI integration is essential for strengthening teachers' instructional capacity in the era of artificial intelligence.

AI-Related Technological Knowledge (AI–TK)

Teachers' technological knowledge in AI-enhanced educational environments extends beyond the operational use of digital tools to encompass an understanding of the principles, capabilities, limitations, and ethical implications of AI technologies. AI–TK requires teachers to comprehend how AI supports learning analytics, personalizes instructional activities, provides real-time feedback, automates assessment processes, and facilitates digital classroom management. This component emphasizes teachers' responsibility to critically select, supervise, and regulate AI systems, rather than relying unreflectively on automated technologies.

Pedagogical Knowledge in an AI Environment (AI–PK)

In AI-integrated teaching contexts, pedagogical knowledge must be adapted to semi-automated learning environments. AI–PK reflects teachers' capacity to design and implement learning activities in which AI plays a supportive role in fostering learners' cognitive development, skills, and dispositions, while ensuring ethical and responsible technology use. Beyond organizing AI-supported learning tasks, teachers are expected to guide learners in interacting with AI systems critically, safely, and effectively, thereby enhancing instructional quality and learning outcomes.

AI-Supported Content Knowledge (AI–CK)

AI-supported content knowledge extends beyond mastery of subject matter to include the ways in which content is modeled, represented, and transformed into meaningful learning tasks through AI technologies. AI-CK highlights teachers' ability to leverage AI to expand content representation, simulate real-world phenomena, and efficiently construct learning scenarios that would otherwise require significant time, resources, or cost. This component also entails teachers' professional judgment in determining which aspects of subject content can be effectively supported by AI and which require direct human mediation.

AI-Integrated Pedagogical Content Knowledge (AI-PCK)

AI-PCK represents the integration of AI-CK and AI-PK, reflecting teachers' ability to select and apply pedagogical strategies that effectively deliver subject content with AI support. This knowledge component underscores teachers' capacity to design AI-enhanced learning activities that promote meaningful knowledge acquisition and application, while ensuring that learners engage with the underlying conceptual foundations rather than merely accepting AI-generated outputs.

AI-Related Technological Content Knowledge (AI-TCK)

AI-TCK refers to teachers' ability to select and apply AI technologies to design, simulate, and organize subject content in ways that surpass the capabilities of conventional digital tools. This includes using AI to model complex phenomena that would be time-consuming, labor-intensive, or costly to reproduce manually; analyze discipline-specific data; and create personalized learning materials aligned with learners' cognitive characteristics and learning pace.

AI-Related Technological Pedagogical Knowledge (AI-TPK)

AI-TPK reflects teachers' capacity to integrate AI into teaching strategies, instructional methods, and organizational forms of teaching. This component requires teachers to evaluate and select appropriate AI platforms in relation to specific pedagogical goals, learning contexts, and instructional scenarios. AI-TPK emphasizes that AI contributes educational value only when embedded within sound pedagogical reasoning, rather than being used as an isolated technological solution for discrete instructional tasks.

Artificial Intelligence–Technological Pedagogical Content Knowledge (AI-TPACK)

AI-TPACK emerges from the dynamic intersection of three core knowledge domains: AI-related technological knowledge (AI-TK), pedagogical knowledge in AI-enhanced environments (AI-PK), and AI-supported content knowledge (AI-CK). This integrated knowledge structure enables teachers not only to understand how AI technology's function but also to apply them meaningfully and responsibly within teaching practice. Unlike the original TPACK framework, which focuses on the general integration of digital technologies, AI-TPACK emphasizes the distinctive affordances of artificial intelligence such as data-driven analysis, adaptive interaction, and generative capabilities that fundamentally reshape how teachers conceptualize and enact technological, pedagogical, and content knowledge. As a result, AI-TPACK constitutes a reconfigured knowledge framework aligned with the demands of AI-driven educational environments.

The Significance of the AI-TPACK Theoretical Framework for Teaching

The proposed AI-TPACK theoretical framework provides a holistic perspective on the role of artificial intelligence in teaching by positioning AI not as an auxiliary or add-on component, but as an integral element of teachers' professional knowledge systems. This framework enables the systematic identification of the competency's teachers need to develop, clarifies how AI can be meaningfully integrated into instructional strategies, and supports the assessment of learners' progress within technology-enhanced learning environments. Consequently, the AI-TPACK framework serves as a robust theoretical foundation for pedagogical innovation and for the advancement of teachers' professional competence in the context of AI-driven education.

Implications for Teacher Competency Development

The AI-TPACK theoretical framework and the proposed approach to integrating artificial intelligence into teaching offer several important implications for the development of teachers' professional competencies in the context of digital transformation. These implications extend beyond the enhancement of technological skills to emphasize the coordinated development of content knowledge and pedagogical knowledge within AI-enhanced learning environments.

First, the development of teachers' instructional competence should prioritize the cultivation of digital pedagogical thinking. Teachers need to be able to identify the pedagogical value of AI in relation to specific content areas and instructional activities, rather than adopting AI in an ad hoc or trend-driven manner. Digital pedagogical thinking enables teachers to select appropriate instructional strategies and flexibly regulate the role of AI in teaching, thereby ensuring a balance between scientific rigor and humanistic values.

Second, teacher education and professional development programs should focus on building teachers' capacity to design AI-supported teaching and learning activities. The ability to design learning tasks is central to transforming AI from a technological tool into a pedagogical resource that enhances instructional effectiveness. This capacity involves analyzing learning objectives, determining the role of AI within the instructional process, establishing expectations and evaluation criteria, and developing instructional scenarios that anticipate and manage challenges arising during both AI-supported lesson design and AI-mediated student learning activities.

Third, greater attention should be given to strengthening teachers' capacity to assess learning processes in AI-enhanced environments. Beyond evaluating learning outcomes, teachers need to be able to interpret and utilize AI-generated feedback and learning analytics to monitor student progress, identify learning difficulties, address deviations from instructional goals, and adjust teaching strategies accordingly. Such assessment competence contributes to the development of teachers' professional critical thinking and supports more informed and reflective integration of AI into teaching practice.

Fourth, educational institutions and governing bodies play a crucial role in creating professional environments that support the development of AI-TPACK competencies. This includes establishing professional learning communities focused on AI-enhanced teaching, promoting experience sharing through practice-based collaboration, developing robust technical support systems, and implementing policies that encourage pedagogical innovation.

Finally, the innovation of teacher education and professional development programs represents a key implication of the AI-TPACK framework.

Professional learning initiatives should move beyond a narrow focus on technology use toward the systematic development of integrated AI-related teaching competencies grounded in a coherent theoretical framework. Training content should emphasize the interconnections among AI-related technological knowledge (AI-TK), pedagogical knowledge in AI-enhanced contexts (AI-PK), and AI-supported content knowledge (AI-CK), thereby positioning AI-TPACK as a core component of teachers' professional competence in the artificial intelligence era.

Within this framework, the capacity to apply AI in teaching is understood as the ability to design, organize, and evaluate AI-assisted teaching and learning processes based on clear pedagogical principles. Teachers are expected not only to select appropriate AI tools but also to position AI strategically within the sequence of learning activities. This includes identifying learning objectives that can be effectively supported by AI, selecting task types aligned with specific content components, and designing open-ended learning activities that encourage students to use AI as a tool for inquiry and creativity rather than merely as a source of answers. Such competence also requires teachers to segment tasks appropriately and regulate the level of AI intervention to maintain students' active engagement, while ensuring accuracy, transparency, and ethical use of AI technologies.

Overall, AI-TPACK should be viewed not merely as an extension of the traditional TPACK framework, but as a reconceptualized theoretical model that comprehensively captures teachers' professional competencies in AI-driven teaching environments. The framework integrates pedagogical responsibility, technological expertise, and deep content understanding within a flexible and adaptive approach suited to the rapidly evolving educational landscape.

In summary, the development of teacher competence in the age of artificial intelligence should be approached as a holistic process in which technology does not replace the role of teachers but rather expands their professional capacity. Through the cultivation of digital pedagogical thinking, the design of AI-supported instructional activities, and the assessment of learning in AI-enhanced environments, the AI-TPACK framework provides both practical guidance for current teaching practice and strategic direction for future teacher education and professional development.

CONCLUSION

Based on a theoretical analysis and synthesis of prior research, this study proposes an AI-integrated theoretical framework for teaching grounded in the TPACK model (AI-TPACK), in which technological, pedagogical, and content knowledge are reconceptualized and systematically interconnected to address the demands of AI-supported teaching design and instructional practice. The proposed framework clarifies the role of artificial intelligence within the teaching process and provides a scientifically grounded basis for the development of teachers' professional competence.

The framework highlights digital pedagogical thinking, AI-supported learning task design, and the assessment of learning processes in AI-enhanced environments as core components of AI-integrated teaching competence. The implications derived from this framework extend beyond classroom practice to inform innovation in teacher education and professional development, thereby contributing to the sustainable digital transformation of education.

As a theoretically oriented study, this research inevitably has certain limitations, particularly the absence of large-scale empirical validation. Future research may focus on the development of AI-TPACK-based instruments for assessing teachers' professional competencies or on the design and evaluation of AI-supported teacher training and professional development models. These research directions are expected to further strengthen the theoretical foundation of AI-TPACK and support its more effective implementation in educational practice.

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Human Resource Management Practices and Employee Commitment in Dynamic Business Environment in Burundi

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ABSTRACT: This study examined the effect of Human Resource Management (HRM) practices on employee commitment. Using a quantitative approach, data were collected from 126 employees through a structured questionnaire and analyzed using descriptive statistics, correlation, and multiple regression analysis in SPSS (version 25.0). The findings revealed that HRM practices specifically training and development, performance appraisal, compensation and benefits, and recruitment and selection are positively associated with employee commitment. Regression results showed that training and development, performance appraisal, and compensation and benefits have significant positive effects on employee commitment, with performance appraisal emerging as the strongest predictor, while recruitment and selection was not statistically significant. The model explained approximately 69.6% of the variance in employee commitment. The study concludes that effective implementation of HRM practices plays a critical role in enhancing employee commitment and recommends that organizations prioritize employee development, fair performance appraisal systems, and competitive compensation strategies to strengthen commitment.

Cette étude a examiné l'effet des pratiques de gestion des ressources humaines (GRH) sur l'engagement des employés. Une approche quantitative a été utilisée pour recueillir des données auprès de 126 employés au moyen d'un questionnaire structuré. Ces données ont ensuite été analysées à l'aide de statistiques descriptives, de corrélations et d'une analyse de régression multiple à l'aide du logiciel SPSS (version 25.0). Les résultats ont révélé que les pratiques de GRH, et plus particulièrement la formation et le développement, l'évaluation des performances, la rémunération et les avantages sociaux, ainsi que le recrutement et la sélection, sont positivement associées à l'engagement des employés. Les résultats de la régression ont montré que la formation et le développement, l'évaluation des performances et la rémunération et les avantages sociaux ont des effets positifs significatifs sur l'engagement des employés, l'évaluation des performances se révélant être le facteur prédictif le plus important, tandis que le recrutement et la sélection n'étaient pas statistiquement significatifs. Le modèle explique environ 69,6 % de la variance de l'engagement des employés. L'étude conclut que la mise en œuvre efficace des pratiques de GRH joue un rôle crucial dans le renforcement de l'engagement des employés et recommande aux organisations de privilégier le développement des employés, des systèmes d'évaluation des performances équitables et des stratégies de rémunération compétitives afin de renforcer cet engagement.

KEYWORDS: HRM Practices, Recruitment and selection, Training and development, Performance appraisal, Compensation and benefits, and Employee commitment.

INTRODUCTION

The management of human resources in an organization is the management function that deals with recruitment, replacement, training and development, motivating and promotion or demotion of staff (Birungi, 2006). Human Resource Management consists of a series of steps that are performed on a continuous basis to keep the organization supplied with the right people in the right positions and at the right time. The steps of staffing include Human Resource Planning, Training and Development, career development, recruitment, motivation/compensation and benefit, selection, performance appraisals, induction and orientation, transfers, promotions, demotions, separations (Parajuli and Shrestha, 2021). Human Resource Management is the design of formal systems in an organization to ensure effective and efficient use of human talent to accomplish organizational goals (Jackson and Mathis, 2003).

Concepts of Human Resources Management Practices

The definition of human resources management (HRM) requires defining both HR, HRM and HRM practices. Human resources are the key function of any organization that is responsible for the people dimension of the organization (Dessler, 2015). HRM practices refer to organizational activities directed at managing the pool of human resources and ensuring that the resources are employed towards the fulfillment of organizational goals (Wright & Snell, 1991). HRM practices are a process of attracting, motivating, and retaining employees to guarantee the survival of the organization (Hassan, 2016). According to Armstrong (2010), Human Resource Practices are informal approaches used in managing people. Wall and Wood (2005) outline HRM practices as sophisticated selection methods, appraisal, training, teamwork, communications, empowerment, performance related pay and employment security. Huselid (1995) used eleven HRM practices in his study and these include personnel selection,

performance appraisal, incentive compensation, job design, grievance procedures, information sharing, attitude assessment, labor management participation, recruitment efforts, employee training and promotion criteria.

HRM practices are defined as a system that fascinates, improves, inspires, and keep employees in the organization for a long time to make sure the effective carrying out the operations of the organization (Wood & Wall, 2002; Ahmed, et al. 2020; Da Silva, et al. 2020, and Amin & Rubal, 2020). HRM practices can be defined as the linking of human resources with strategic goals and objectives to improve the organizational performance (Sims, 2007). It is concerned with the human dimension in management (Rondeau & Wagar, 2002) and refers to a set of programs, functions, and practices prepared and conducted to maximize both employee and organization performance (Aswathappa, 2007).

Sanders, et al. (2008) delivered a definition of HRM practices as: "High commitment human resource management (HRM), (e.g. selective hiring, career opportunities, performance appraisal, and participation in decision making), is defined as a bundle of HRM practices.

Measurement of Employee Commitment

As defined by Porter et al. (1974), commitment is the relative strength of the individual's identification with, and involvement in, a particular organization. It consists of three factors such as a strong desire to remain a member of the organization, a strong belief in, and acceptance of, the values and goals of the organization, and a readiness to exert considerable effort on behalf of the organization. With Meyer & Allen (1997), commitment refers to a person's dedication to a person, job, or organization. It is reflected in the person's intention to persevere in a course of action. Soliven (2009) defines it more strongly as a sacred covenant, without which life is unimaginable. Commitment is considered to be psychological immersion of an individual with his institute through sense of belonging, ownership of organizational goals and being ready to accept challenges (Dolan, Tzafrir, & Baruch, 2005). Building a committed and motivated workforce is considered as the main objective, and a key to success in the competitive environment (Mohsen, et al., 2004). Commitment has a rational component; many individuals knowingly decide to make commitments, and then they attentively plan and perform the activities needed to accomplish them (Armstrong, 2010). Committed employees will be able to perform their jobs more than management expectations (Bragg, 2002).

According to Anwar & Louis (2017), employee commitment is in respect to the laborers' connection to or support in the organizations in which they employed. According to Prabhu, et al. (2020), commitment includes elements of desires, needs, and obligations. Quevedo (2006) measured it along three domains, namely, sense of identification with the organization's goals, feeling of involvement in organizational duties and feeling of loyalty for the organization. Lai (2001), Cabautan (2002) and Daylo (2008) measured it in terms of affective, continuance and normative commitment. Meyer and Herscovitch (2001) identify more than 25 employee commitment concepts and measures. Arguing that conceptual redundancy exists across these, they group them into three foci, as commitment to work/job, commitment to career/profession and commitment to organization. Meyer and Allen (1997) present these three approaches and constructed a Three-Component Model (TCM) of commitment, which measures three forms of organizational commitment: affective commitment, normative commitment, and continuance commitment. These three are characterized by three different mindsets: desire, obligation, and cost. Affective commitment refers to the employee's emotional attachment to, identification with, and involvement in, the organization based on positive feelings, or emotions, toward the organization. Continuance commitment refers to commitment based on the costs that the employee associates with leaving the organization due to the high cost of leaving (Meyer & Allen, 1997). Normative commitment refers to an employee's feeling of obligation to remain with the organization based on the employee having internalized the values and goals of the organization. Some people are committed to their jobs because they love what they do (Anwar & Balcioglu, 2016) or because their goals align with those of the company. Others might stay because they fear what they could lose if they leave (Abdullah & Abdul Rahman, 2015). Still others might stay because they feel obligated to the company, or to their manager (Faraj, et al. 2021). Continuance Commitment-costs connected with leaving the organization; and Normative Commitment-saw commitment to stay with the association have suggestions for the proceeding with investment of the person in the organization (Abdullah, 2018). The higher an employee's level of instruction is, the lower that individual's level of organizational commitment (Saleh, et al. 2021).

Relationship between HRM Practices and Employee commitment

Various studies were undertaken on the relationship between HRM Practices and Employee commitment. Razzaq, et al. (2017), Fihla and Chinyamurindi (2018), and Parajuli and Shrestha (2021) found that HRM practices tremendously affect employee commitment. The study of Shah Nawaz and Juyal (2006) compared various HRM practices in a research-based organization and a fashion firm. HRM practices were found significantly different in two organizations and mean scores on various HRM practices were found more in the fashion organization. Regression results showed that various HRM practices were significantly predicting commitment in both organizations and when they were combined. Performance appraisal and 'attitudes towards HRM department' were the significant predictors of commitment in both the organizations. Yamao and Sekiguchi (2014) explored the factors influencing employee commitment for Japanese workers; the outcomes demonstrate that HRM practices that encourage the learning of English, for example, language training and setting language abilities as a basis for promotion and recruitment, have an effect on the affective and normative commitment of workers to their organizations' globalization. Moreover, Fesharaki and Sehat (2017) explored the idea of Islamic management of human resources and measured its effects on employee's commitment. The outcomes demonstrate that remuneration and compensation, training and development, recruitment, and selection positively affect employee's commitment.

Thus, Dheera and Krishnan (2020) demonstrated that HRM practices decidedly influenced employee commitment towards their employment and organization. Besides, Shipton et al. (2016) found that HRM can enhance employee commitment and, from that point, improve execution. Considering the impact of a financial squeeze on employee commitment, the profile of employee commitment might depend on the mindboggling blend of environmental factors, such as financial conditions, and HRM practices (Meyer, Morin, & Wasti, 2017). However, the literature suggests that HRM Practices play an important role in the management of employees in order to accomplish the objectives of the organization. The practices namely recruitment, training, performance appraisal, compensation and benefits are key predictors of attracting, motivating, and retaining talented employees. The effective implementation of HRM practices align human resources with strategic goals and enhance employee commitment.

Theoretical perspective

The study was underpinned by Harvard Model and Guest model. The Harvard Model was developed from what Boxall (1993) calls the 'Harvard framework', by Beer et al. in 1984. The Harvard model works as a strategic map to guide all managers in their relations with employees and concentrates on the human or soft aspect of HRM. It works on the premise that employees needed to be congruent, competent, and cost effective (Beer, et al., 1984). Beer proposes that many diverse personnel and labor relations activities may be subsumed under four human resource policy areas, which are Employee Influence, Human Resource Flow, Reward Systems, and Work Systems. Huczynski and Buchanan (2001) and Loosemore, et al. (2003) added that, the Harvard Model provided the needed link between "SHRM decisions, the business environment and an organization's performance. It provided a more open system model of how Strategic HRM policy influences other organizational functions and is constrained by stakeholders and situational factors. The Situational Factors includes the internal and external factors that impact an organization's HR policies and practices, such as the company's size, industry, and competitive environment.

Secondly, the Harvard Model recognizes that there are many different stakeholders in an organization not just shareholders. It emphasizes the importance of considering the needs and interests of all stakeholders, including employees, customers, and communities. Another key component of the Harvard model is the HRM Policy Choices. These are the specific HR policies and practices that an organization decides to adopt, such as recruitment and selection, training and development, compensation and benefits, and performance management. Finally, the Harvard Model suggests that effective HR management can lead to improved outcomes for both the organization and its employees, such as increased productivity, higher employee satisfaction, and greater competitiveness.

The Guest Model was developed by David Guest at King's College London in 1997, the Guest comparative model works on the premise that a set of integrated HRM practices will result to superior individual and organizational performance. It emphasizes the importance of integrating HR policies and practices with an organization's overall strategy and goals and holds that HRM strategies like differentiation, innovation, the focus on Quality and cost reduction will lead to practices like better training appraisal, selection, rewards, job designs, involvement, and security leading to more quality outcomes, commitment, and flexibility. However, The Harvard and Guest models of Human Resource Management (HRM) both emphasize the strategic role of HR practices in enhancing organizational performance, though they differ in focus. The Harvard Model (Beer, et al., 1984) highlights the human aspect of HRM, advocating for employee commitment, stakeholder consideration, and alignment of HR policies such as recruitment, training, compensation, and performance management with organizational goals, while accounting for situational factors like industry and company size. It suggests that effective HRM can improve outcomes for both employees and the organization. Similarly, the Guest Model (1997) links integrated HR practices to superior individual and organizational performance, emphasizing alignment with strategy and the use of HR policies to enhance productivity, innovation, and employee commitment. However, Guest primarily measures organizational performance through financial indicators.

METHODOLOGY

The study adopted a quantitative approach and applied both descriptive and correlational research designs. From a total population of 472 employees, a sample of 126 was drawn using probability sampling, specifically simple random sampling. Data were collected through a structured questionnaire. The reliability of the research instrument was confirmed through a pilot study, where all Cronbach's Alpha values exceeded 0.70. Content validity was ensured through expert evaluation. The collected data were systematically coded and analyzed using SPSS version 25.0, employing both descriptive and inferential statistical methods.

RESULTS

Descriptive and Inferential statistics were computed based on the study variables and relationship statistics as given by correlation analysis, coefficient of determination, analysis of variance and regression coefficients. Correlation was computed to examine the relationship between each of the aspects of Human Resource Management Practices and Employee Commitment. Pearson Correlation Coefficients were derived at 99% confidence level, 2-tail test.

Table 1. Descriptive results of the study variables

	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Recruitment and Selection	4.35	.545	-.744	.216	-.068	.428
Training and development	4.20	.623	-.734	.216	.514	.428
Performance Appraisal	4.38	.578	-1.092	.216	.358	.428
Compensation and Benefits	3.87	.730	-.550	.216	.226	.428
Employee Commitment	4.27	.594	-1.043	.216	.544	.428

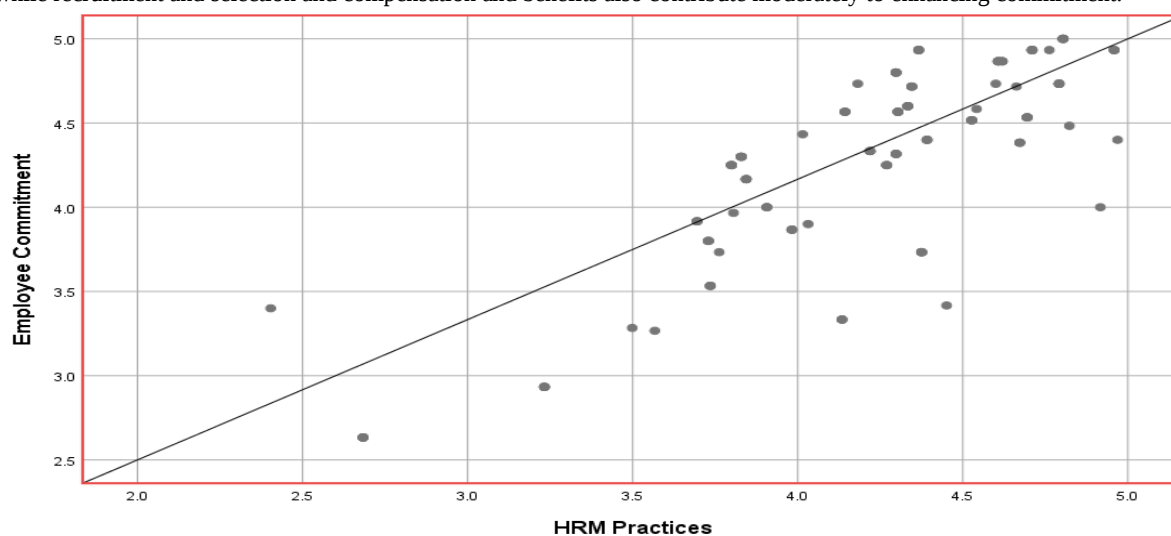
The results indicated that employees generally rated HRM practices aspects and employee commitment positively. Performance Appraisal (Mean = 4.38) and Recruitment and Selection (Mean= 4.35) received the highest mean scores, while Compensation and Benefits had the lowest mean (Mean = 3.87), suggesting comparatively lower satisfaction in this area. Standard deviations ranged from 0.545 to 0.730, reflecting moderate variability in responses. All variables exhibited negative skewness, particularly Performance Appraisal (Skewness = -1.092) and Employee Commitment (Skewness = -1.043), indicating a tendency for respondents to report above average values. Kurtosis values were within acceptable limits, suggesting the distributions are relatively normal. Overall, the results reflect generally favorable perceptions of HRM practices and a high level of employee commitment among the participants.

Table 2. Correlation Analysis

		Recruitment and Selection	Training and development	Performance Appraisal	Compensation and Benefits	Employee Commitment
Employee Commitment	Pearson Correlation	.609**	.734**	.720**	.664**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	126	126	126	126	126

** . Correlation is significant at the 0.01 level (2-tailed).

All variables used were found to be positively correlated to dependent variable (Employee commitment). The results indicated a moderate positive relationship between recruitment and selection and employee commitment ($r=.609^{**}$); a strong positive relationship between training and development and employee commitment ($r=.734^{**}$); a strong positive relationship between performance appraisal and employee commitment ($r=.720^{**}$); a moderate relationship between compensation and benefits and employee commitment ($r=.664^{**}$). The results show that all examined HRM practices are positively linked to employee commitment, with training and development and performance appraisal having the strongest influence, while recruitment and selection and compensation and benefits also contribute moderately to enhancing commitment.

**Figure 1. Scatter plot of HRM Practices and Employee Commitment**

The scatter plot shows a positive relationship between HRM Practices and Employee Commitment, with most data points clustering near the trend line, indicating that stronger HRM Practices are generally associated with higher employee commitment.

Table 3. Test of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
HRM Practices	.140	126	.000	.913	126	.000
Employee Commitment	.154	126	.000	.901	126	.000

a. Lilliefors Significance Correction

The normality of the study variables was assessed using the Kolmogorov–Smirnov test with Lilliefors correction and the Shapiro–Wilk test. The results indicated that HRM Practices significantly deviated from a normal distribution (Kolmogorov–Smirnov = .140, $p < .001$; Shapiro–Wilk = .913, $p < .001$). Similarly, Employee Commitment was not normally distributed (Kolmogorov–Smirnov = .154, $p < .001$; Shapiro–Wilk = .901, $p < .001$). As the significance values for both tests were below the conventional threshold of .05, the null hypothesis of normality was rejected. Thus, the assumption of normality was violated, and non-parametric statistical techniques were considered appropriate for subsequent analyses. The results indicate that both HRM Practices and Employee Commitment deviate from a normal distribution, suggesting that the assumption of normality is not met. As a result, parametric tests may not be appropriate, and non-parametric statistical methods should be used for subsequent analyses to ensure valid and reliable results.

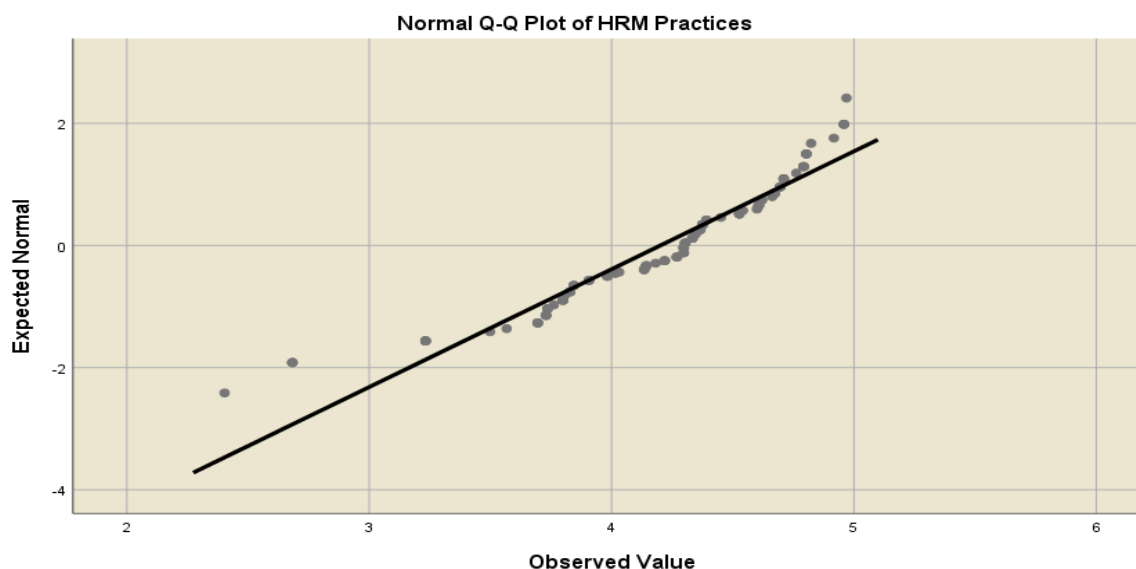


Figure 2. Q-Q Plot of HRM Practices

The Normal Q–Q plot shows that HRM practices data generally follow a normal distribution, as most points align closely with the reference line, particularly in the central region. Minor deviations at the lower and upper tails suggest slight skewness or the presence of outliers; however, these departures are modest and do not indicate a serious violation of the normality assumption. Overall, the data can be considered approximately normal and suitable for parametric statistical analysis.



Figure 3. Q-Q Plot of Employee commitment

The Normal Q–Q plot for employee commitment indicates that the observed values closely follow the theoretical normal distribution, as evidenced by the alignment of most data points with the reference line. Minor deviations at the lower and upper tails suggest slight departures from normality, potentially due to mild skewness or a small number of outliers. Nevertheless, these deviations are not substantial, and the distribution can be considered approximately normal and suitable for parametric statistical analyses.

Regression analysis

Regression analysis was used to examine the effect of HRM Practices Aspects on Employee commitment. The results were presented in tables below as follow:

Table 4. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.834 ^a	.696	.686	.333

a. Predictors: (Constant), Compensation and Benefits, Performance Appraisal, Recruitment and Selection, Training and development

The results in the table above show an R-Square of 0.696 with the standard error of the estimate being 0.333. This implied that Human Resource Practices Aspects (Recruitment and selection, training and development, performance appraisal, and compensation and benefits) explain changes in Employee commitment up to 69.6 %. The remaining 30.4% is explained by other factors that are not considered in this study.

Table 5. Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.695	4	7.674	69.239	.000 ^b
	Residual	13.410	121	.111		
	Total	44.105	125			
a. Dependent Variable: Employee Commitment						
b. Predictors: (Constant), Compensation and Benefits, Performance Appraisal, Recruitment and Selection, Training and development						

As indicated in the table above, F-ratios in the ANOVA tests whether the overall regression models were a good fit for the data. Statistically, the result showed that Human Resource Management Practices aspects predicted significantly the Employee commitment ($F_{(4,121)} = 69.239$; $p\text{-Value} = 0.000 < 0.05$). Therefore, the regression was a good fit of the data.

Table 6. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.263	.271		.968	.335	-.275	.800
	Recruitment and Selection	.070	.079	.064	.884	.378	-.087	.227
	Training and development	.270	.078	.283	3.474	.001	.116	.424
	Performance Appraisal	.416	.066	.404	6.340	.000	.286	.546
	Compensation and Benefits	.193	.060	.237	3.237	.002	.075	.311
a. Dependent Variable: Employee Commitment								

The results in the table above indicate that when all the predictors are held constant, employee commitment would remain at 0.263. Recruitment and Selection does not have a statistically significant effect on employee commitment ($\beta = 0.070$, $p = .378$). This means that improvements in recruitment and selection practices do not meaningfully change employees' level of commitment in this model. When recruitment and selection increase by 1 unit, employee commitment increases by 0.070 units. Training and Development has a significant positive effect on employee commitment ($\beta = 0.270$, $p = .001$). This indicates that when training and development increases by 1 unit, employee commitment increases by 0.270 units, holding other factors constant. Performance Appraisal has a strong and significant positive effect on employee commitment ($\beta = 0.416$, $p < .001$). It is the most influential predictor, meaning effective and fair performance appraisal systems greatly enhance employee commitment. This implied that when performance appraisal increases by 1 unit, employee commitment increases by 0.416. Compensation and Benefits also show a significant positive effect on employee commitment ($\beta = 0.193$, $p = .002$). This meant that when compensation and benefits increase by 1, employee commitment increases by 0.193 units.

The model can be summarized as follows: $Y = 0.263 + 0.070X_1 + 0.270X_2 + 0.416X_3 + 0.193X_4$. Where Y is the employee commitment, X_1 =Recruitment and selection, X_2 = Training and development, X_3 = Performance appraisal, X_4 =Compensation and benefits.

CONCLUSIONS

The findings of this study indicate that several Human Resource Management (HRM) practices including training and development, performance appraisal, compensation and benefits, and recruitment and selection are positively related to employee commitment. Among these practices, training and development as well as performance appraisal emerged as the strongest predictors of employee commitment. Despite the violation of the normality assumption, the data were considered appropriate for analysis, and the regression model accounted for approximately 70% of the variance in employee commitment. These results underscore the significant role of HRM practices in promoting employee dedication and emphasize the importance of implementing effective HRM strategies to enhance organizational commitment.

RECOMMENDATIONS

Based on the findings of this study, the researcher recommends that: Management should strategically invest in training and development initiatives and implement structured, transparent performance appraisal mechanisms. These practices have been shown to exert the most substantial influence on employee commitment and are essential for fostering a motivated and dedicated workforce. The top management should maintain the competitive and well-structured compensation and benefits packages.

AUTHORS' DECLARATION

I declare that this study is original research and I agree to publish it in the journal.

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Trends in the Utilization of Articulate Storyline Interactive Media in Indonesian Language Learning: A Systematic Literature Review

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ABSTRACT: This systematic literature review examines the trends and effectiveness of Articulate Storyline as an interactive learning medium in Indonesian language education. Through a comprehensive analysis of 15 empirical studies published between 2023-2025, this review investigates the implementation patterns, pedagogical approaches, and learning outcomes associated with Articulate Storyline-based interventions. The review employed PRISMA guidelines for systematic screening, with inclusion criteria focusing on language learning contexts, empirical methodologies, and measurable outcomes. The findings reveal that Articulate Storyline demonstrates consistent effectiveness in enhancing student engagement, learning independence, and academic performance across various language competencies including reading comprehension, speaking skills, listening abilities, and writing proficiency. Quantitative analyses across studies showed significant improvements in learning outcomes, with N-Gain scores ranging from 0.59 to 0.81, indicating medium to high effectiveness levels. Validation studies consistently reported high validity scores (79.65%-97.7%) and practicality ratings (87%-98%), confirming the pedagogical soundness of Articulate Storyline-based interventions. However, the review identifies critical limitations including small sample sizes, single-location implementations, and limited longitudinal assessment. The integration of Articulate Storyline with contemporary pedagogical approaches such as Problem-Based Learning and local wisdom demonstrates promising potential for creating culturally responsive and engaging language learning environments. This review contributes to the growing body of evidence supporting technology-enhanced language instruction and provides recommendations for future research directions, including cross-institutional studies, longitudinal effectiveness assessments, and adaptive learning feature integration.

KEYWORDS: Articulate Storyline, Interactive Learning Media, Language Education, Systematic Literature Review, Educational Technology.

INTRODUCTION

The rapid advancement of educational technology has fundamentally transformed pedagogical approaches in language education, creating unprecedented opportunities for interactive and engaging learning experiences. Digital learning media have become increasingly essential in addressing the diverse learning needs of 21st-century students, who are characterized by their digital nativity and preference for multimedia-rich educational content (Sembiring et al., 2025). Among various educational technology tools, Articulate Storyline has emerged as a prominent platform for developing interactive learning materials that combine multimedia elements, interactive features, and learner-centered design principles. The platform's versatility in creating customized, engaging, and pedagogically sound learning experiences has attracted considerable attention from educators and researchers worldwide. Despite the growing adoption of Articulate Storyline in educational contexts, a comprehensive synthesis of empirical evidence regarding its effectiveness in language learning remains limited (Yuliyanti & Fauji, 2023). This gap in the literature necessitates a systematic examination of existing research to understand the current state of knowledge, identify implementation patterns, and establish evidence-based recommendations for future practice and research (Rokhim et al., 2023).

The Indonesian language education context presents unique challenges and opportunities for technology integration, particularly in developing engaging materials that address diverse linguistic competencies while maintaining cultural relevance. Traditional language instruction methods often struggle to provide sufficient interactive practice opportunities, individualized feedback, and multimodal learning experiences that contemporary learners require (Uzmi et al., 2023). Interactive learning media, particularly those developed using authoring tools like Articulate Storyline, offer promising solutions to these pedagogical challenges by enabling educators to create scenario-based activities, immediate feedback mechanisms, and multimedia-rich content. Research has increasingly demonstrated that well-designed interactive media can significantly enhance

student motivation, engagement, and learning outcomes in language education contexts (Wahyuni et al., 2022). The ability to integrate various media formats including audio, video, animations, and interactive quizzes within a single platform makes Articulate Storyline particularly suitable for language learning, where exposure to authentic language use and multiple practice modalities are crucial (Saralee et al., 2024). Furthermore, the platform's capacity to support both web-based and offline delivery modes addresses accessibility concerns in diverse educational settings.

Recent empirical studies have begun to document the effectiveness of Articulate Storyline in various language learning contexts, revealing promising results in terms of learning achievement, student engagement, and skill development. Quantitative studies employing pre-test and post-test designs have consistently reported significant improvements in student performance following Articulate Storyline-based interventions (Nita et al., 2023). For instance, implementations in elementary Indonesian language learning have demonstrated substantial gains in reading comprehension and text analysis skills. Similar positive outcomes have been documented in foreign language education, including Arabic and English, where the platform has been utilized to develop listening comprehension, speaking proficiency, and grammatical competence (Ramadani et al., 2024). The convergence of these findings across different language contexts and educational levels suggests that Articulate Storyline possesses inherent design features that facilitate effective language learning. However, the heterogeneity in research methodologies, target populations, and measured outcomes necessitates systematic synthesis to establish generalizable conclusions and identify factors that moderate effectiveness.

The theoretical foundations supporting the use of interactive media like Articulate Storyline in language education draw from multiple learning theories, including constructivism, multimedia learning theory, and engagement theory. Constructivist approaches emphasize active learning, knowledge construction through interaction, and scaffolded support—all features that Articulate Storyline can effectively implement through its interactive design capabilities (Sembiring et al., 2025). Cognitive theory of multimedia learning suggests that presenting information through multiple modalities enhances learning by engaging both visual and verbal processing channels, thereby reducing cognitive load and facilitating deeper understanding (Ajmadewi et al., 2024). Engagement theory posits that meaningful learning occurs when students are actively engaged in collaborative, authentic, and project-based activities, which interactive media can support through scenario-based learning and immediate feedback mechanisms (Yuniarsih & Nuryanto, 2025). These theoretical perspectives collectively provide a robust framework for understanding why Articulate Storyline-based interventions might be particularly effective for language learning (Yuliyanti & Fauji, 2023). The alignment between platform affordances and evidence-based learning principles suggests that properly designed Articulate Storyline materials should theoretically enhance language acquisition processes. Integration of these theoretical frameworks into practical instructional design has become increasingly important for maximizing the effectiveness of technology-enhanced language instruction.

Despite the growing body of research on Articulate Storyline in educational contexts, several critical gaps remain in the literature that limit our comprehensive understanding of its effectiveness and optimal implementation strategies. First, most existing studies employ small sample sizes and single-institution designs, which limit the generalizability of findings across diverse educational contexts and student populations (Sudiantara et al., 2024). Second, the majority of research focuses on short-term learning outcomes measured immediately after interventions, with limited investigation of long-term retention and transfer effects (Hadza et al., 2020). Third, while validation studies confirm technical quality and usability, fewer studies examine the specific design features and pedagogical approaches that mediate learning effectiveness (Saralee et al., 2024). Fourth, comparative studies examining Articulate Storyline against alternative interactive media platforms or traditional instruction methods remain scarce, making it difficult to establish relative effectiveness (Daryanes et al., 2023). Fifth, research on the integration of Articulate Storyline with contemporary pedagogical approaches such as flipped learning, game-based learning, and problem-based learning is still emerging (Nita et al., 2023). These gaps highlight the need for comprehensive synthesis of existing evidence to establish what is known, identify remaining uncertainties, and guide future research directions.

This systematic literature review aims to address these gaps by comprehensively analyzing empirical research on Articulate Storyline utilization in language learning contexts, with particular focus on Indonesian language education. Specifically, this review seeks to: (1) identify and synthesize empirical evidence regarding the effectiveness of Articulate Storyline in enhancing language learning outcomes; (2) examine the methodological approaches employed in existing research to assess quality and rigor; (3) analyze implementation patterns including target populations, language competencies addressed, and pedagogical integration strategies; (4) evaluate the validity, practicality, and effectiveness of Articulate Storyline-based learning media based on reported validation studies; (5) identify factors that moderate effectiveness including design features, pedagogical approaches, and contextual variables; and (6) establish evidence-based recommendations for practice and future research. By systematically synthesizing existing evidence, this review contributes to the knowledge base in educational technology and language education, providing researchers and practitioners with comprehensive insights into the current state of knowledge, best practices for implementation, and priorities for future investigation.

LITERATURE REVIEW

The utilization of interactive learning media in Indonesian language learning is closely connected to the theoretical foundations of multimedia learning. Mayer's *Cognitive Theory of Multimedia Learning* emphasizes that learning is more effective when information is presented through an integrated combination of verbal and visual elements that align with human cognitive architecture (Mayer, 2002). Articulate Storyline, as an interactive multimedia authoring tool, facilitates the integration of text, images, audio, animation, and interactive assessments within a single learning environment. In Indonesian language learning, these multimedia features support text comprehension, idea development in writing, and the strengthening of language skills through more engaging and contextualized learning experiences (Mustika et al., 2025).

In addition, the use of Articulate Storyline aligns with constructivist learning theory, which views learning as an active process of knowledge construction rather than passive reception (Piaget, 1970; Vygotsky, 1978). Interactive media enable students to explore content, make decisions, and receive immediate feedback, thereby fostering deeper cognitive engagement. In the context of Indonesian language learning, such constructivist-oriented environments support students in constructing textual meaning, organizing written discourse, and reflecting on language

use independently (Rahmawati et al., 2021). However, many existing studies still conceptualize Articulate Storyline primarily as a technological delivery tool, rather than explicitly designing learning activities based on key constructivist principles such as scaffolding, social interaction, and metacognitive reflection.

A review of previous studies reveals an increasing trend in the use of Articulate Storyline in Indonesian language learning, particularly at the elementary and secondary school levels. Most empirical studies report positive effects on students' motivation, engagement, and learning outcomes, especially in writing skills and language comprehension (Putri et al., 2020; Wulandari & Nugroho, 2022). The dominant research approach is research and development (R&D), focusing on media validity, practicality, and effectiveness as evaluated by experts, teachers, and students. These findings indicate that Articulate Storyline is perceived as a promising digital medium for supporting language instruction.

Despite these positive outcomes, several limitations remain in the existing literature. Many studies focus on limited outcome variables such as learning achievement and motivation, while higher-order thinking skills, creative language use, and multimodal literacy are less frequently examined. Furthermore, most studies are conducted in isolated classroom or school contexts, limiting the generalizability of their findings. The absence of a comprehensive synthesis also makes it difficult to identify broader research patterns, dominant themes, and methodological tendencies across studies.

Given these conditions, a systematic literature review is necessary to comprehensively map research trends, advancements, and gaps in the utilization of Articulate Storyline for Indonesian language learning. Therefore, this article contributes by synthesizing existing empirical evidence, identifying dominant research focuses, and highlighting underexplored areas that can inform future research and instructional design in interactive, technology-enhanced Indonesian language learning.

MATERIALS AND METHODS

This systematic literature review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor and transparency in the identification, screening, and synthesis of relevant studies. The review process consisted of four main phases: identification, screening, eligibility assessment, and inclusion. The search strategy was designed to capture all relevant empirical studies examining Articulate Storyline utilization in language learning contexts. Multiple electronic databases were systematically searched, including Google Scholar, ERIC, ProQuest, and Indonesian scientific databases. The search terms combined keywords related to the technology platform ("Articulate Storyline" OR "interactive learning media" OR "multimedia learning") with language education descriptors ("language learning" OR "Indonesian language" OR "Bahasa Indonesia" OR "foreign language education" OR "language instruction"). The initial search was conducted in October 2024 and yielded a comprehensive pool of potentially relevant publications. To ensure currency and relevance, the search was limited to studies published between 2023 and 2025, reflecting the most recent developments and implementations in the field. Additionally, reference lists of included studies were manually screened to identify any additional relevant publications not captured through database searches, employing a snowball sampling approach to maximize coverage (Sembiring et al., 2025).

The inclusion and exclusion criteria were established a priori to maintain consistency and objectivity in study selection. Studies were included if they met the following criteria: (1) focused on language learning or language education as the primary educational context; (2) employed Articulate Storyline as the main or significant component of the intervention; (3) reported empirical data including quantitative outcomes, validation scores, or effectiveness measures; (4) utilized systematic research methodologies such as experimental designs, quasi-experimental designs, or development research with validation; (5) were published in peer-reviewed journals or conference proceedings; and (6) were written in English or Indonesian. Studies were excluded if they: (1) focused solely on theoretical discussions without empirical data; (2) examined non-language subjects as primary learning domains; (3) did not specifically identify Articulate Storyline as the platform used; (4) lacked clear methodological descriptions or outcome measures; or (5) were review articles, editorials, or opinion pieces. Two independent reviewers conducted the initial screening of titles and abstracts, with discrepancies resolved through discussion and, when necessary, consultation with a third reviewer. Full-text articles were then retrieved for studies meeting initial screening criteria and subjected to detailed eligibility assessment against the inclusion criteria. This rigorous screening process resulted in the final inclusion of 15 empirical studies that met all specified criteria and provided sufficient data for synthesis and analysis (Yuniarsih & Nuryanto, 2025).

Data extraction was conducted systematically using a standardized extraction form developed specifically for this review to capture relevant information across multiple dimensions of each study. For each included study, the following information was extracted: (1) bibliographic details including authors, publication year, and source; (2) study objectives and research questions; (3) methodological approach including research design, sample size, and participant characteristics; (4) intervention details including language competencies addressed, duration, and pedagogical approaches; (5) outcome measures including validity scores, practicality ratings, effectiveness indicators, and learning achievement data; (6) key findings including statistical results and effect sizes when available; (7) reported limitations and researcher recommendations; and (8) quality indicators including validation procedures and measurement instruments used. The extracted data were organized into summary tables to facilitate systematic comparison across studies and identification of patterns, trends, and gaps in the literature. Quality assessment was conducted using adapted criteria for educational technology research, evaluating methodological rigor, sample adequacy, measurement validity, and reporting completeness. The synthesized data were then analyzed narratively to identify themes, patterns, and trends across studies, with particular attention to consistency of findings, methodological variations, and contextual factors that might influence outcomes. This comprehensive approach to data extraction and synthesis enabled both quantitative summarization of effectiveness indicators and qualitative interpretation of implementation patterns and pedagogical implications.

Table 1. Study Selection and Screening Process

Phase	Description	Number of Studies
Identification	Initial database search results	127
After duplicate removal	Studies remaining after removing duplicates	89
Title and abstract screening	Studies screened based on title and abstract	89
Studies excluded	Not meeting initial inclusion criteria	51
Full-text assessment	Full-text articles assessed for eligibility	38
Studies excluded	Not meeting full inclusion criteria	23
Final inclusion	Studies included in systematic review	15
Quality assessment	Studies meeting quality criteria	15

RESULTS

The systematic review identified 15 empirical studies published between 2023 and 2025 that examined the utilization of Articulate Storyline in language learning contexts. The included studies demonstrated substantial heterogeneity in terms of target populations, language competencies addressed, research methodologies, and outcome measures. Regarding educational levels, the distribution showed that 7 studies focused on elementary education, 5 studies targeted secondary education contexts, and 3 studies examined applications across multiple educational levels. In terms of language focus, 9 studies investigated Indonesian language learning, 3 studies examined Arabic language instruction, 2 studies explored English language education, and 1 study addressed French language learning. This distribution reflects the predominant focus on Indonesian language contexts while also indicating growing interest in applying Articulate Storyline to foreign language instruction. The geographic distribution of studies was primarily concentrated in Indonesia, with implementations spanning diverse regions including Sumatra, Java, Bali, and Kalimantan, suggesting widespread adoption across the Indonesian archipelago. The language competencies addressed by the interventions included reading comprehension in 6 studies, speaking skills in 3 studies, listening abilities in 2 studies, writing proficiency in 2 studies, and integrated language skills in 2 studies, demonstrating the versatility of Articulate Storyline across different linguistic domains.

Methodological analysis revealed that the majority of studies employed development research designs following the ADDIE or similar instructional design models, accounting for 11 of the 15 studies. These development studies typically progressed through systematic phases including needs analysis, design, development, implementation, and evaluation. Four studies utilized quasi-experimental designs with pre-test and post-test measurements, enabling direct assessment of learning effectiveness through comparative analysis. Sample sizes varied considerably across studies, ranging from small-scale implementations involving 20-30 students to larger studies with samples exceeding 100 participants. The median sample size was 45 students, reflecting typical classroom-based implementations. Most studies employed convenience sampling from single institutions, which represents a methodological limitation affecting generalizability. Data collection instruments included validation questionnaires for assessing media quality, learning achievement tests for measuring outcomes, student response questionnaires for evaluating user experience, and observation protocols for documenting implementation processes. The validation procedures typically involved multiple expert reviewers including content specialists, media experts, and language education practitioners, providing triangulated assessment of material quality and pedagogical appropriateness.

The effectiveness of Articulate Storyline-based interventions was assessed through multiple indicators including validation scores, learning achievement gains, and student response ratings. Validity assessment across all development studies demonstrated consistently high scores, with material validity ratings ranging from 79.65% to 97.7%, media validity scores spanning 75% to 97%, and overall validity indices between 0.88 and 0.98. These high validity scores indicate that Articulate Storyline-based materials generally met established criteria for content accuracy, pedagogical alignment, technical quality, and design appropriateness. Practicality assessments, which evaluated usability and implementation feasibility, yielded similarly positive results with scores ranging from 87% to 98%, suggesting that both educators and students found the materials practical and user-friendly. Effectiveness measures, primarily assessed through learning achievement comparisons, revealed substantial improvements in student performance. Studies employing N-Gain calculations reported values ranging from 0.59 to 0.81, with 4 studies achieving high effectiveness levels, 8 studies demonstrating medium effectiveness, and 3 studies showing significant statistical improvements without N-Gain reporting. Pre-test to post-test comparisons showed percentage improvements ranging from 20% to 35%, with several studies documenting increases from below-average scores to above-average or mastery levels.

Student engagement and learning independence emerged as important secondary outcomes across multiple studies. Five studies specifically measured student engagement or motivation, reporting positive effects with rating scores averaging above 85% positive response. The interactive features of Articulate Storyline, including immediate feedback, multimedia integration, and self-paced learning options, were consistently cited as factors contributing to enhanced engagement (Ariadiny & Bektiningsih, 2023). Three studies examined learning independence or self-directed learning as outcome variables, demonstrating that Articulate Storyline-based materials effectively supported autonomous learning behaviors. Students reported appreciating the flexibility to access materials across multiple devices, review content at their own pace, and receive immediate feedback on practice activities. The multimodal presentation of content through text, images, audio, and video was particularly valued by students, as it accommodated diverse learning preferences and enhanced comprehension. Student response questionnaires across studies consistently yielded high satisfaction ratings, typically exceeding 90% positive responses, indicating strong user acceptance and perceived value of Articulate Storyline-based interventions.

Pedagogical integration patterns revealed diverse approaches to incorporating Articulate Storyline into language instruction. Six studies explicitly integrated Articulate Storyline with Problem-Based Learning approaches, using the platform to present authentic problems, provide scaffolded support, and facilitate inquiry-based activities. Two studies combined Articulate Storyline with local wisdom and cultural content, demonstrating the platform's capability to support culturally responsive pedagogy (Mustika et al., 2025). Three studies employed Articulate

Storyline for flipped classroom implementations, with students accessing interactive materials for initial content exposure before engaging in collaborative classroom activities. The remaining studies utilized more traditional supplementary approaches, with Articulate Storyline materials serving as additional practice resources or enrichment activities. Implementation duration varied considerably, with some interventions consisting of single lesson sequences while others extended across full academic terms. Most implementations involved 4-8 instructional sessions, balancing sufficient exposure for measurable outcomes with practical constraints of curriculum coverage and time availability. The majority of studies implemented Articulate Storyline materials in blended learning formats, combining technology-mediated instruction with face-to-face teacher guidance and peer interaction.

Despite predominantly positive findings, the studies collectively identified several limitations and challenges that warrant consideration. Sample size emerged as a consistent limitation, with 11 studies acknowledging that small samples restricted generalizability of findings. Geographic concentration in single institutions or regions limited the assessment of effectiveness across diverse contextual settings. Eight studies noted that implementations focused on specific content topics or language competencies, making it unclear whether effectiveness would extend to different curricular areas. Temporal limitations were also apparent, with most studies assessing immediate post-intervention outcomes without examining retention or long-term effects. Technical challenges mentioned across studies included occasional connectivity issues for web-based delivery, device availability constraints, and varying levels of student digital literacy that influenced implementation smoothness. Teacher preparation and professional development emerged as important implementation factors, with several studies noting that educator familiarity with Articulate Storyline influenced material quality and implementation fidelity. Resource requirements including development time, technical expertise, and access to multimedia production tools represented practical barriers to widespread adoption and scaling.

Table 2. Summary of Validation Scores Across Studies

Validation Aspect	Mean Score	Range	Number of Studies Reporting
Material Validity	92.4%	79.65% - 97.7%	15
Media Validity	88.7%	75% - 97%	15
Language Quality	91.2%	86% - 95.4%	12
Practicality Score	93.8%	87% - 98%	13
Student Response	91.6%	85% - 97.16%	14
Overall Validity Index	0.91	0.88 - 0.98	8

Table 3. Learning Effectiveness Indicators Across Studies

Effectiveness Measure	Studies (n)	Results Summary
N-Gain Score (High: >0.70)	4	Range: 0.78 - 0.81
N-Gain Score (Medium: 0.30-0.70)	8	Range: 0.59 - 0.70
Significant pre-post improvement (p<0.05)	12	All showing positive gains
Mean score improvement	15	Range: 20% - 36% increase
Students reaching mastery level	9	Range: 65% - 88% of students
Control vs. experimental group	4	All favoring experimental group

Table 4. Language Competencies Addressed by Articulate Storyline Interventions

Language Competency	Number of Studies	Example Implementations
Reading Comprehension	6	Main idea identification, text analysis, short story comprehension
Speaking Skills	3	Oral presentation, conversational practice, pronunciation
Listening Comprehension	2	Audio comprehension exercises, listening response activities
Writing Skills	2	Composition development, paragraph construction
Grammar/Language Structure	3	Syntax analysis, grammatical rules application
Integrated Language Skills	2	Multiple competencies combined in authentic tasks

Table 5. Pedagogical Approaches Integrated with Articulate Storyline

Pedagogical Approach	Studies (n)	Implementation Characteristics
Problem-Based Learning	6	Authentic problems, inquiry-based activities, scaffolded support
Culturally Responsive Teaching	2	Local wisdom integration, cultural context embedding
Flipped Classroom	3	Pre-class content access, in-class collaborative activities
Independent Learning	5	Self-paced progression, autonomous practice, flexible access
Traditional Supplementary	4	Additional practice resources, enrichment materials

DISCUSSION

The synthesis of empirical evidence from 15 studies demonstrates that Articulate Storyline represents an effective and pedagogically sound platform for developing interactive language learning materials, with consistent positive outcomes across diverse educational contexts, language competencies, and student populations (Yuliyanti & Fauji, 2023). The high validation scores reported across studies, averaging above 90% for material validity, media quality, and practicality, provide robust evidence that Articulate Storyline-based interventions meet established criteria for instructional quality and usability. These findings align with contemporary educational technology research emphasizing the importance of

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theoretically grounded, user-centered design in digital learning materials (Uzmi et al., 2023). The platform's technical capabilities enable the integration of multiple multimedia elements, interactive features, and immediate feedback mechanisms that align with cognitive theory of multimedia learning and engagement theory (Sudiantara et al., 2024). The consistency of positive findings across different researchers, institutions, and implementation contexts suggests that the observed effectiveness is not merely the result of novelty effects or researcher bias, but rather reflects genuine pedagogical value inherent in well-designed Articulate Storyline materials. Furthermore, the platform's flexibility in supporting diverse instructional approaches demonstrates its adaptability to various educational contexts and learning objectives.

The learning effectiveness data, particularly the N-Gain scores ranging from medium to high levels and the substantial pre-test to post-test improvements observed across studies, provide compelling quantitative evidence of Articulate Storyline's positive impact on language learning outcomes. The consistency of effectiveness across different language competencies including reading comprehension, speaking skills, listening abilities, and grammatical knowledge suggests that the platform's affordances support diverse linguistic learning processes rather than being limited to specific skill areas (Nita et al., 2023). This versatility is particularly valuable in language education where integrated competency development is essential for communicative proficiency (Septiana S et al., 2023). The significant improvements documented in experimental studies, with intervention groups consistently outperforming control groups receiving traditional instruction, strengthen causal claims regarding Articulate Storyline's effectiveness (Ajmadewi et al., 2024). However, it is important to note that the observed effectiveness likely results from the interaction between platform affordances and pedagogical design decisions rather than the technology itself. Studies that explicitly integrated evidence-based pedagogical approaches such as problem-based learning, scaffolded instruction, and immediate formative feedback tended to report stronger effects, suggesting that instructional design quality mediates technology effectiveness.

The positive student engagement and motivation outcomes reported across multiple studies represent important findings given the well-established relationship between engagement and learning in educational psychology literature (Sembiring et al., 2025). Articulate Storyline's interactive features including clickable elements, drag-and-drop activities, scenario-based simulations, and immediate feedback appear to create more engaging learning experiences compared to static digital materials or traditional print resources (Ajmadewi et al., 2024). The multimodal presentation of content accommodates diverse learning preferences and may reduce cognitive load by distributing information processing across visual and verbal channels as suggested by dual coding theory (Yuniarsih & Nuryanto, 2025). The self-paced, flexible access nature of Articulate Storyline materials supports learner autonomy and self-regulated learning, which are critical competencies for 21st-century learners. Students' positive responses regarding usability, accessibility, and perceived learning value indicate high user acceptance, which is essential for sustained technology adoption and implementation fidelity (Rokhim et al., 2023). The platform's capability to function across multiple devices including computers, tablets, and smartphones addresses practical accessibility concerns and aligns with contemporary mobile learning trends.

The integration of Articulate Storyline with contemporary pedagogical approaches, particularly problem-based learning and culturally responsive teaching, demonstrates the platform's flexibility and potential for supporting innovative instructional models. Problem-based learning implementations using Articulate Storyline effectively presented authentic language use situations, provided scaffolded support through branching scenarios and hints, and facilitated inquiry-based exploration through interactive elements (Hadza et al., 2020). This integration addresses a significant challenge in language education: providing authentic, contextualized language practice opportunities that mirror real-world communication demands. The incorporation of local wisdom and cultural content in several studies exemplifies culturally responsive pedagogy, demonstrating that Articulate Storyline can support the development of culturally relevant materials that enhance learner engagement and cultural connection (Daryanes et al., 2023). Flipped classroom implementations illustrate how Articulate Storyline can facilitate pedagogical innovation by enabling students to access foundational content independently, freeing classroom time for interactive practice, collaborative activities, and teacher-facilitated skill development. These diverse integration patterns suggest that Articulate Storyline functions effectively as a flexible instructional tool that can be adapted to various pedagogical frameworks rather than dictating specific teaching approaches.

Despite the predominantly positive findings, the identified limitations across studies highlight important considerations for interpreting results and planning future research (Ramadani et al., 2024). The prevalence of small sample sizes and single-institution implementations significantly limits the generalizability of findings and prevents robust statistical modeling of moderating factors (Safitri & Witanto, 2025). The concentration of research in Indonesian educational contexts, while providing valuable evidence for that specific setting, limits understanding of effectiveness across diverse linguistic, cultural, and educational system contexts (Nurlaila et al., 2025). The focus on short-term outcome assessment without longitudinal follow-up leaves important questions unanswered regarding retention, transfer, and sustained effects of Articulate Storyline-based interventions (Sembiring et al., 2025). The predominance of development research designs, while valuable for establishing validity and initial effectiveness, provides weaker causal evidence compared to randomized controlled trials or robust quasi-experimental designs with appropriate controls for confounding variables (Ajmadewi et al., 2024). The limited examination of specific design features and pedagogical components that drive effectiveness prevents the development of evidence-based design principles that could guide future material development.

The implementation challenges identified across studies, including technical issues, resource requirements, and teacher preparation needs, highlight important practical considerations for scaling Articulate Storyline adoption in language education (Yuliyanti & Fauji, 2023). Technical barriers such as connectivity limitations, device availability constraints, and platform compatibility issues can significantly impede implementation, particularly in resource-constrained settings. These challenges underscore the importance of developing both online and offline delivery options, optimizing materials for low-bandwidth environments, and ensuring cross-device compatibility. The substantial time investment required for developing high-quality Articulate Storyline materials represents a significant barrier to widespread adoption, particularly for individual teachers managing heavy instructional loads. This suggests the need for institutional support including dedicated development time, professional development opportunities, and collaborative development models that distribute workload and leverage collective expertise (Hadza et al., 2020). Teacher digital literacy and familiarity with Articulate Storyline emerged as important implementation factors, indicating that professional development and ongoing technical support are essential for successful adoption.

The theoretical implications of this review extend beyond establishing Articulate Storyline's effectiveness to illuminating how interactive media design features support language learning processes. The effectiveness of immediate feedback features aligns with formative assessment theory and suggests that technology-enabled formative feedback can enhance learning by providing timely, specific guidance that helps learners identify and correct errors (Nita et al., 2023). The positive effects of multimodal content presentation support multimedia learning theory and suggest that coordinated visual-verbal presentation reduces cognitive load and enhances comprehension, particularly for complex language concepts. The engagement and motivation effects observed across studies align with self-determination theory, suggesting that Articulate Storyline's support for learner autonomy, competence development through scaffolded challenges, and relatedness through authentic scenarios fulfill basic psychological needs that drive intrinsic motivation (Ramadani et al., 2024). The effectiveness of scenario-based and problem-based implementations aligns with situated learning theory, suggesting that contextualized, authentic language practice facilitated by interactive media enhances transfer and application abilities (Safitri & Witanto, 2025). These theoretical connections position Articulate Storyline not merely as a delivery mechanism but as a pedagogical tool that can instantiate evidence-based learning principles in practice.

The practical implications of this review for educators, instructional designers, and educational technology researchers are substantial and multifaceted (Sembiring et al., 2025). For educators, the evidence supports investing time and resources in developing or adopting Articulate Storyline-based materials for language instruction, particularly when materials incorporate interactive elements, immediate feedback, authentic scenarios, and alignment with curriculum objectives. The positive effectiveness across diverse language competencies suggests that Articulate Storyline can support comprehensive language instruction rather than being limited to specific skills (Yuniarsih & Nuryanto, 2025). For instructional designers, the high validation scores and effectiveness indicators provide evidence-based justification for prioritizing Articulate Storyline in technology tool selections for language learning material development. The successful integration with various pedagogical approaches suggests that designers should focus on instructional strategies first, then leverage Articulate Storyline's capabilities to implement those strategies effectively rather than allowing technology features to drive pedagogical decisions. For researchers, the identified methodological limitations and gaps provide clear directions for future investigation including larger-scale, multi-institutional studies, longitudinal effectiveness assessments, comparative effectiveness research examining Articulate Storyline against alternative platforms, and experimental studies examining specific design features and implementation variables that moderate effectiveness.

CONCLUSION

This systematic literature review provides comprehensive evidence that Articulate Storyline represents an effective, pedagogically sound, and highly valued platform for developing interactive language learning materials. The synthesis of 15 empirical studies reveals consistent positive outcomes across multiple effectiveness indicators including high validation scores, significant learning achievement improvements, and strong student engagement. The platform's versatility across different language competencies, educational levels, and pedagogical approaches demonstrates its flexibility and broad applicability in diverse language education contexts. The integration of Articulate Storyline with contemporary pedagogical innovations including problem-based learning, culturally responsive teaching, and flipped classroom models illustrates its potential to support transformative pedagogical practices rather than simply digitizing traditional instruction.

However, the identified methodological limitations including small sample sizes, single-location implementations, short-term outcome assessment, and predominance of development research designs necessitate cautious interpretation and highlight critical directions for future research. Future investigations should prioritize larger-scale, multi-institutional studies to enhance generalizability, implement longitudinal designs to assess retention and sustained effects, conduct comparative effectiveness research to establish relative advantages over alternative platforms, and examine specific design features and implementation variables that moderate outcomes. Additionally, research extending beyond Indonesian contexts to diverse linguistic and cultural settings, investigating cost-effectiveness and scalability, and exploring integration with emerging technologies such as artificial intelligence and adaptive learning systems would significantly advance the knowledge base. Educational institutions and policymakers should consider supporting Articulate Storyline adoption through professional development, resource allocation, and infrastructure development while maintaining focus on pedagogical quality and evidence-based design principles.

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Using Project-Based Learning in Elementary Mathematics Instruction

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ABSTRACT: In the context of competency-based educational reform, the adoption of active instructional approaches in elementary mathematics has become increasingly essential. This study explores the application of project-based learning (PBL) in the design of mathematics instruction for elementary students through a four-step process: goal identification, planning, implementation, and evaluation. First, learning objectives are defined in alignment with curriculum requirements and students' cognitive characteristics. Second, project plans are developed by designing meaningful tasks, organizing collaborative learning activities, and specifying expected learning products. Third, students engage in project implementation by collaboratively addressing real-world problems and applying mathematical knowledge under teacher guidance. Finally, learning outcomes are evaluated through both process- and product-oriented assessment, integrating teacher assessment, self-assessment, and peer assessment. The findings suggest that implementing PBL through a structured four-step process enhances student engagement and supports the development of mathematical competence, problem-solving skills, collaboration, and the ability to apply mathematics in authentic contexts.

KEYWORDS: Project-based learning; elementary mathematics; mathematical competence; instructional design

1. INTRODUCTION

In the context of 21st-century education, increasing emphasis has been placed on developing problem-solving skills, critical thinking, and the ability to apply knowledge to real-life situations, particularly at the elementary level. Elementary mathematics education has undergone fundamental changes, shifting from a primary focus on knowledge transmission and routine computational skills toward the development of mathematical thinking and reasoning, mathematical modeling, mathematical problem-solving, mathematical communication, and the effective use of mathematical tools and learning resources. In addition, the mathematics curriculum promotes integrated problem-solving across disciplines, linking mathematics with subjects such as physics, chemistry, biology, geography, computer science, technology, history, and the arts. This approach creates meaningful opportunities for students to experience mathematics and apply mathematical knowledge in real-world contexts (Ministry of Education and Training, 2018).

Approaching project-based learning reveals that it is a learner-centered instructional method in which students actively engage in inquiry, address real-world problems, and produce meaningful products. This approach is grounded in the progressive educational philosophy of William Heard Kilpatrick. According to Kilpatrick (1926), when learners participate in a given situation, they may exhibit different forms of behavior depending on how their needs are satisfied. He argued that individual behavior is influenced by the extent to which personal needs are fulfilled; stimuli that generate satisfaction or frustration lead to corresponding learner responses manifested through their actions. From this perspective, intellectual capacity plays a guiding role in directing individuals' activities toward specific goals that are expected to satisfy their needs. Kilpatrick further emphasized that human behavior is goal-oriented, with learning emerging as individuals strive to achieve goals that bring personal satisfaction. Learning motivation, therefore, represents the connection between an individual's readiness to act consciously and the pursuit of self-determined goals. Accordingly, the learning process begins with the identification of a goal, followed by exploration and reasoning about possible ways to achieve that goal, engagement in purposeful practical activities, and ultimately the experience of satisfaction upon goal attainment. This sequence facilitates meaningful learning and underpins the theoretical foundation of project-based learning (Kilpatrick, 1918; Beineke, 1998).

Project-based learning (PBL) has attracted considerable attention from educational researchers due to its effectiveness in enhancing learning skills and fostering critical thinking. Harasym et al. (2013) argue that the use of project-based learning can promote students' critical thinking and contribute to the development of ethical reasoning. Similarly, Schmidt, Rotgans, and Yew (2011) emphasize the important role of PBL in activating prior knowledge and facilitating the construction of new understanding. They suggest that working in small groups not only encourages collaboration but also enhances students' long-term retention of knowledge.

Krajcik and Shin (2014) contend that PBL helps overcome superficial learning by enabling learners to develop deep conceptual understanding through the application of knowledge to complex problems similar to those encountered in professional practice. The authors highlight that PBL is particularly well suited to the context of 21st-century education, where learners are expected to develop problem-solving, critical thinking, and collaboration skills. From a theoretical perspective, Sutinen (2013) compared Kilpatrick's project method with Dewey's

problem-solving method, noting that although both approaches emphasize learning through action, they differ in their goals and pedagogical orientations.

Thomas (2000) proposed five essential criteria for defining authentic project-based learning: (1) projects constitute the core of the curriculum; (2) projects are organized around driving questions or problems; (3) learners engage in constructive inquiry; (4) projects allow a high degree of learner autonomy; and (5) projects are closely connected to real-world contexts. These criteria have since served as a foundational theoretical framework for subsequent PBL research.

Beyond learning outcomes, several studies have demonstrated that students engaged in project-based learning achieve higher academic performance and develop more positive attitudes toward learning, particularly in science education. Research findings indicate that PBL not only improves academic achievement but also strengthens students' self-efficacy beliefs and learning attitudes (Bilgin et al., 2015; Kurt & Akoglu, 2023). In addition, the effectiveness of PBL has been documented in mathematics and science education (Jacques, 2017; Wilhelm et al., 2008). Although PBL has been successfully applied across various educational domains, Kurt and Akoglu (2023) emphasize that its implementation faces several challenges, including teachers' project design capacity, time constraints, and difficulties in assessing student learning outcomes.

However, many scholars emphasize that the effectiveness of project-based learning largely depends on the quality of project design, the level of instructional support provided by teachers, and the use of appropriate assessment systems (Harasym et al., 2013; Pedersen & Hoby, 2020). This highlights the need for further research focusing on the design, implementation, and evaluation of project-based learning in specific subject areas and educational levels. Accordingly, this paper presents key theoretical issues related to project-based learning, including its characteristics and instructional process, and examines its application in elementary mathematics instruction through a concrete project example. The proposed project serves as a practical reference for elementary teachers, supporting them in improving instructional effectiveness and enabling students to achieve the intended learning objectives of the mathematics curriculum.

Project-Based Learning in Teaching

According to Michael Knoll, Kilpatrick's project method primarily focuses on students' learning processes. As a result, the instructional role of the teacher is not clearly articulated within this approach. The central idea of the project method lies in fostering students' intellectual and cognitive development; however, how teachers should organize instructional activities to ensure that learning occurs in accordance with the principles of the project method has not been sufficiently clarified (Campbell, 1995).

Nevertheless, Kilpatrick (1918) argued that the teacher's role is to support the learning process and facilitate students' cognitive development. In this sense, teachers act as facilitators who guide students either directly or indirectly in developing their understanding. The teacher's responsibility is to create learning situations and experiences that motivate students to engage in the learning process and achieve the intended goals (Kilpatrick, 1918; Beineke, 1998; Tenenbaum, 1951).

Based on these perspectives on learning and the role of teachers in project-based learning, the concept of project-based learning in instruction can be defined as follows: Project-based learning is an instructional method in which students undertake complex learning tasks that integrate theory and practice in order to produce a tangible product (Nguyen Huu Hop, 2018).

Characteristics of the Project Method in Teaching and Learning Organization

When implementing the project method, teachers need the capacity to assess learners' situations and to propose motivating tasks that encourage students' active engagement and cognitive development—tasks that essentially constitute a project (Kilpatrick, 1918; Beineke, 1998; Tenenbaum, 1951). In addition to assessing individual learners, teachers must also be able to conduct social assessment in order to design situations and projects that align with educational objectives. Accordingly, teachers' responsibilities include evaluating the applicability of projects to social life, moral development, and democratic values, while ensuring that instructional activities correspond to the demands of the project—namely, that they genuinely reflect learners' interests and concerns regarding the proposed tasks (Kilpatrick, 1918; Tenenbaum, 1951). A particular challenge faced by teachers is how to sustain learners' interest in projects for as long as possible and in a purposeful manner (Kilpatrick, 1918). From this perspective, the key characteristics of the project method in organizing educational activities can be summarized as follows:

- **Practice-oriented focus:** Project topics are derived from real-life situations in social contexts, professional practice, and everyday life. Project tasks should involve problems that are appropriate to learners' developmental levels and cognitive capacities. Learning projects with social relevance help connect school-based learning with real-life and societal contexts. Under ideal conditions, project implementation may generate positive social impacts.
- **Learner-interest orientation:** Students are involved in selecting project topics and learning content that match their abilities and personal interests. Moreover, learners' interests should be continuously fostered throughout the project implementation process.
- **Complex and interdisciplinary nature:** Project content integrates knowledge from multiple disciplines or subject areas in order to address complex tasks or problems.
- **Action orientation:** Project implementation involves a combination of theoretical inquiry and the application of theory to practical and hands-on activities. Through this process, theoretical understanding is examined, reinforced, and expanded, while learners' action skills and practical experience are developed.
- **Learner autonomy:** In project-based learning, students are expected to actively and independently participate in all stages of the instructional process. This requirement both demands and promotes learners' responsibility and creativity. Teachers primarily assume the roles of advisors, facilitators, and supporters. However, the level of learner autonomy should be appropriate to students' experience, capabilities, and the complexity of the tasks.
- **Collaborative work:** Learning projects are typically carried out in groups, involving collaboration and task distribution among group members. Project-based learning requires and cultivates readiness and skills for teamwork among participants, including collaboration among

students, between students and teachers, and with other social stakeholders involved in the project. This characteristic is also referred to as the social dimension of learning.

- **Product orientation:** During project implementation, the outcomes are not limited to theoretical gains; in most cases, learning projects result in tangible products derived from practical and hands-on activities. These products may be used, disseminated, or presented publicly.

2. RESULTS AND DISCUSSION

Process of Implementing the Project Method in Teaching

From the perspective of learners' psychological development during the learning process, Kilpatrick proposed a theoretical framework for the project method consisting of four distinct phases.

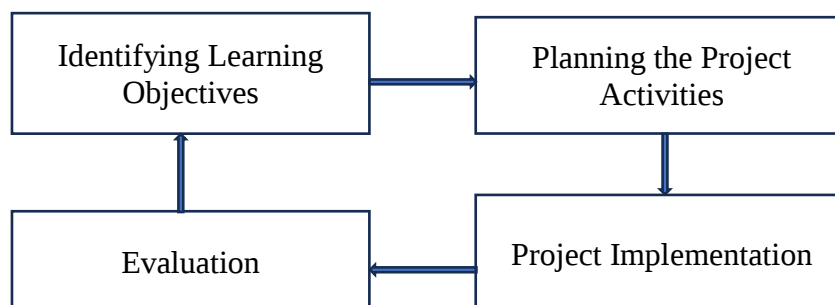


Figure 1. Kilpatrick's Theory of the Project Method (Kilpatrick, 1918, p. 333)

Figure 1 illustrates that William Heard Kilpatrick's learning theory is grounded in four stages. These include: (1) identifying objectives in order to generate learners' motivation to engage in a project and their readiness to achieve a specific goal through their own actions; (2) consciously planning individual actions; (3) undertaking practical actions to achieve goals that are feasible and attainable; and (4) evaluating the degree of satisfaction with the outcomes achieved. Kilpatrick argued that a learning activity cannot be effectively motivated if learners do not clearly understand the object of their motivation. Likewise, planning and realizing an activity are not possible without a consciously defined goal toward which learners are directed. If learners wish to evaluate something, they must have a point of reference for what is being evaluated—namely, the goal established for the activity. When learners act in order to achieve a defined goal, Kilpatrick conceptualized this process as learning (Kilpatrick, 1918).

An example of motivation-driven learning connected to a process is illustrated through students constructing a kite, as presented in Kilpatrick's theory of the project method. Stage 1: Identifying the goal, which is to construct a kite and make it fly. Stage 2: Planning how to construct the kite properly, determining what knowledge and skills are required and how the kite can be made to fly. Stage 3: Implementing reflective thinking about the characteristics of the kite and identifying ways to achieve the intended outcome. Students then take action based on their explorations to make the kite fly, thereby generating a sense of satisfaction. Stage 4: Evaluating the outcomes of the kite-making process described above, which represents the learning process as it unfolds.

Mathematics Content at the Primary School Level Applicable to the Project-Based Learning Method

Table 1: Elementary Mathematics Contents Suitable for Project-Based Learning

No.	Grade	Mathematics Content	Example Project
1	Grade 1	Counting and comparing numbers within 10–20; basic geometric shapes	Exploring Objects Around Me
2	Grade 1	Comparing lengths (longer–shorter)	Measuring School Supplies
3	Grade 2	Addition and subtraction within 100	My Mini Shop
4	Grade 2	Length measurement (cm, m)	Measuring Our Classroom
5	Grade 2	Time concepts (hour, day)	My Daily Schedule
6	Grade 3	Multiplication and division	Childhood Market
7	Grade 3	Perimeter of rectangles	Designing a Mini Vegetable Garden
8	Grade 3	Measurement of mass and capacity	Planning a Healthy Meal
9	Grade 4	Fractions	Sharing Household Tasks
10	Grade 4	Area of plane figures	Designing a Green Classroom
11	Grade 4	Data collection and representation (charts, graphs)	Surveying Reading Habits
12	Grade 5	Ratio and percentage	Planning a Class Event Budget
13	Grade 5	Area and volume of solid figures	Designing a Children's Playground
14	Grade 5	Integrated real-life word problems	Saving Electricity and Water at School

Designing Mathematics Lessons in Primary Education

In applying the project-based learning method to the teaching of Mathematics at the primary level, we implemented a model lesson on the topic of **area and volume of geometric figures** (Grade 5 Mathematics) as follows:

- **Content:** Area and Volume of Geometric Figures
- **Project Title:** *Designing a Children's Playground*
- **Duration:** Two class sessions

Procedure	Teacher's Activities	Students' Activities	Purpose of Transformation
Objectives	• Apply knowledge of the area and volume of geometric figures (rectangles, squares, rectangular prisms, cubes, etc.) to a real-world context. • Develop problem-solving competence, mathematical thinking, and mathematical modeling skills. • Foster skills in planning, teamwork, presentation, and reporting of results. • Create a problem situation by posing the question: <i>"If your school had an empty plot of land, how would you design a playground for younger students?"</i> • Organize students into groups to discuss and identify the objectives of the project. • Conclude by clarifying the project objectives, product requirements, and the timeline for implementation.	• Listen to the problem situation and share initial ideas. • Participate in group discussions to identify the objectives to be achieved (designing a playground, calculating area and volume). • Record the agreed-upon objectives and reach consensus on group tasks.	Identify the expected learning outcomes and performance requirements for learners in implementing the project.
Project Implementation	Task Assignment • Organize students into groups to collaboratively carry out the assigned task: designing a playground within a given area. • Provide suggested components, such as a play area, sandbox, activity zone, and walkways. • Emphasize the requirement to apply mathematical knowledge, particularly concepts related to area and volume.	• Receive the assigned task and ask clarifying questions about the requirements. • Discuss and select appropriate project components. • Identify the mathematical content and concepts to be applied.	• Apply knowledge of the area and volume of geometric figures (rectangles, squares, rectangular prisms, cubes, etc.) to a real-world context.
	• Guide students in developing a project plan. • Help identify the necessary knowledge and skills required for implementation. • Observe and monitor the working process of the groups.	• Engage in group discussions to determine the sequence of tasks. • Assign responsibilities to group members in accordance with individual abilities. • Develop a plan for carrying out the tasks. • Calculate the area and volume of the selected components. • Complete the project products (drawings, models, and reports).	• Develop problem-solving competence, mathematical thinking, and mathematical modeling skills. • Strengthen skills in planning and collaborative teamwork.
	• Provide support when students encounter difficulties. • Remind students to ensure adherence to the project timeline.	Each member carries out their assigned tasks in accordance with the specified timeline.	Develop skills in teamwork, presentation, and reporting of results.

Assessment	• Evaluate the accuracy and feasibility of the financial plan. • Assess the creativity and effectiveness of the proposed financial solutions.	• Group representatives present the design and the calculation methods. • Conduct self-assessment and peer assessment among groups.	Transformation Outcomes Achieved in Relation to the Objectives
	Assessmen Criteria	Description of Requirements	Maximum Score
	1. Application of mathematical knowledge	Accurately calculate the area and volume of the components and clearly present the calculation procedures.	3.0
	2. Design of the project product	Ensure a logical and clear layout; provide a design that is feasible and appropriate to real-world conditions.	2.0
	3. Solving real-world problems	Propose reasonable design solutions with practical applicability.	2.0
	4. Collaboration and participation in group activities	Participate actively, demonstrate a cooperative attitude, and complete assigned tasks.	1.5
	5. Presentation and reporting of the project product	Present ideas clearly and coherently, using appropriate mathematical language.	1.5
Total			10.0

3. CONCLUSION

The findings indicate that applying the project-based learning method in primary mathematics teaching enables teachers to appropriately identify core mathematical content and the competencies to be developed in students, to align learning objectives with specific learning activities, and to create conditions for students to engage in meaningful and appropriately challenging tasks. Through this approach, students' problem-solving competence, mathematical thinking, and teamwork skills are effectively fostered. The assessment phase does not focus solely on the final product but also emphasizes the evaluation of the learning process, thereby supporting students' self-regulation and the refinement of acquired knowledge and skills. Project-based instructional activities can be implemented beyond the traditional classroom setting, transforming the learning environment and increasing students' learning motivation. In addition, students are provided with opportunities to present their products, which contributes to the development of presentation skills and the ability to analyze the value of their work. The study confirms that the application of the project-based learning method following a four-stage process constitutes an appropriate and feasible approach for teaching mathematics at the primary level, contributing to improved instructional effectiveness and enhanced student learning outcomes. The results may serve as a useful reference for teachers and educational administrators in designing and organizing mathematics teaching activities in line with current educational reform orientations. Nevertheless, like any instructional method, project-based learning has both strengths and limitations. This study primarily highlights its strengths in promoting students' active engagement in learning, providing opportunities for problem solving, and integrating knowledge from multiple subject areas during the completion of project products. However, the application of this method is time-consuming and may pose challenges in accurately assessing individual competencies once a group product has been completed. Therefore, teachers need to design lessons in a highly structured manner and closely monitor the implementation process in order to mitigate these limitations.

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The Impact of Media Strategy on Local Radio Stations: A Case Study on Drug Addiction Through Reports From DJA-FM Radio, During the Period 2016-2020

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ABSTRACT: This study examines the topic of media strategy in local radio stations, taking the issue of drug abuse as addressed in the reports of DJA-FM, Radio as a case study. The subject is presented and structured into chapters and sections according to the planned outline, as follows:

The first chapter of this study discusses the role of local radio stations and their broadcasting of programs on the dangers and harmful effects of drugs in society. It includes three sections that cover the stages of radio broadcasting, the types of radio stations, their capacities, characteristics, importance, and the tools of communication.

The first section focuses on radio programs, the skills required to prepare such programs, radio influence, and the target audience.

The second section addresses drugs, their types, and the harms resulting from drug abuse.

The third and final section sheds light on DJA-FM, Radio, revealing its nature, its development, and the types of programs it offers to the community.

Through this study, the researcher reached several findings, including:

Local radio stations serve as an effective tool for awareness campaigns and for reinforcing educational messages within society.

DJA-FM, Radio has improved its performance in order to enhance its awareness programs aimed at large segments of the population.

Upon completing the final form of this study, the researcher recommends the following:

Despite the efforts made by local radio stations to raise awareness among the Chadian population about the dangers of drugs, there remains a need to intensify these efforts to reach a wider societal segment.

Local radio stations should improve certain aspects of their work environment, particularly internal facilities, and provide written documents and archives that researchers and intellectuals can consult.

KEYWORDS: Strategy, Media, Local Radio Stations, Drugs.

INTRODUCTION

Audio media, such as radio, are a medium that impacts the public through its awareness programs. Local radio stations constantly work to educate and raise awareness within society. As a tool that addresses all segments of society, they influence people in one way or another. Most of the programs offered by local radio stations are beneficial to society and aim to reduce some of the problems encountered, particularly the phenomenon of drug use. This scourge affects most societies worldwide, burdening governments with legal proceedings and efforts to combat it. However, despite all these governmental efforts, it continues to spread within communities, and young people are the most affected group, trapped by drugs. The efforts of governments, as well as local media, whether audio or visual, continue to aim to combat this dangerous phenomenon and reduce it through the implementation of strategic plans. These plans support joint programs led by governments in coordination with other local media (radio, television and newspapers), with the aim of combating this phenomenon.

We also note that the majority of local radio stations have offered targeted programs addressing this phenomenon, despite the current challenges that necessitate a mastery of the scientific foundations for designing and preparing awareness programs aimed at resolving such diverse social phenomena. Audible radio has become a leading means of communication used to raise awareness in society in terms of its impact. Despite radio's growing role in the communication process and its unlimited potential for education, training, culture, guidance, and orientation, its effective use suffers greatly from the lack of appropriate scientific planning ¹. Recent years have brought progress and well-being to humankind through

¹ Mostafa Mohamed Issa Fallatah : Auditory broadcasting as a means of communication and education, King Faisal University, 1st edition, 1998.

scientific and technological advancements and the industrial revolution, making travel from one country to another easier. This has contributed to the mixing of customs, traditions, and values, some beneficial and others detrimental. Among these harmful habits, their effects are not limited to destroying the life of the dependent individual, but their impacts also extend to the family, to society as a whole, and to humanity ².

The importance of research:

The importance of this research is as follows:

1. This study addresses an important social issue, namely the phenomenon of drug use. 2. It aims to find a solution to combat this phenomenon among young people. 3. It seeks to intensify awareness campaigns and programs broadcast by local radio stations. 4. It aims to end drug use in society. 5. It seeks to identify the parties involved in the introduction of drugs into society.

Research objectives

The research objectives include the following:

1- To understand the local radio stations in N'Djamena, the capital city, and their perceived role in society. 2- To highlight the useful awareness programs offered by these radio stations. 3- To closely examine whether the awareness messages broadcast by local radio stations are well received by the target audience. 4- To identify the challenges hindering the effectiveness of local radio stations in broadcasting their educational and awareness messages. 5- To verify whether local radio stations have actually offered programs that contribute to reducing the problem of drug use in society.

Research problem

This research addresses a real problem in society: drug use among young people. The researcher seeks to understand the effectiveness of local radio stations in combating this phenomenon, given that a large number of young people use drugs without oversight from the relevant authorities. This problem led the researcher to ask the following question: what role do local radio stations play in the fight against drugs, and what influence do they have on users?

Local radio stations are thus considered a media tool that helps society address drug use by intensifying awareness programs, which should be specifically targeted at young people and adolescents, as they are the most vulnerable group to this serious scourge.

Research questions

The research questions include the following points:

1- What is the role of DJA-FM radio in raising awareness and educating the public about the dangers of drugs?
2- What is the influence of DJA-FM radio's programs on its listeners?
3- What type of awareness programs does DJA-FM radio offer?
4- Are there specific programs to combat drug use? 5- Have these programs contributed to solving the problem of drug use? 6- Does DJA-FM radio offer specific programs to combat drug use?

Research Hypotheses

1. Local radio stations contributed to providing awareness and cultural programs regarding drug use. 2. The programs offered by local radio stations influenced the reduction of drug use among young people. 3. Everything offered by local radio stations was well received by the target audience. 4. Some local radio stations fulfilled their role regarding drug use. 5. Some young people were exposed to the awareness programs offered by local radio stations to educate society about drugs.

Research methodology

The researcher uses the descriptive and analytical method, considered the most appropriate for this study, to describe the most important details of local radio stations and their modes of operation.

Research population

The research population is that of the city of N'Djamena and the researcher will take a sample from this population.

Limitations of the research

The research is limited as follows:

1. Spatial limits: This concerns the city of N'Djamena, the capital, which is home to several local radio stations, including DJA-FM radio.
2. Temporal limits: Between the five years 2016-2020.

Search terms

Impact: This refers to information relayed by the press or its successors, and impact is the mark left by something or resulting from an action. Another definition: impact in the universal dictionary. Arabic-Arabic dictionary.

impact: the remainder of something, and in the plural إثار وأثر, and we say خرجت في أثره and خرجت في أثره ³, meaning after it ³.

Strategy: This is a comprehensive, long-term plan aimed at achieving specific objectives, based on a set of decisions and methods to direct efforts and resources.

It is used in various fields such as business, politics, and warfare, and includes analyzing the current situation, determining strengths and weaknesses, opportunities and threats, and analyzing how to effectively achieve the objective.

Media : This involves transmitting information, news, and knowledge to the public through various means, such as print media, radio, television, and the internet, in diverse forms ranging from traditional to digital across different fields.

² Al- Zarad and Faysal: Alcohol and Drug Addiction, Dar Al- Ilm , printing, publishing and distribution, Lebanon, 2009.

³ Al- Athar : Definition and meaning of Al- Athar in the Al- Ma'ani Al- Jami ' dictionary, an Arabic-Arabic dictionary. Al- Ma'ani <https://www.almaany.com>, 05/12/2025.

Radio : This is the most widespread and popular means of communication, reaching a general audience of all levels. It can reach this audience by bypassing barriers of illiteracy and geographical obstacles, as well as political restrictions that prevent some other media from reaching their communities, and it does not require total commitment.

Local : Radio stations present within the local territory of a given country, whose programs are established locally, that is, within a limited scope, unlike regional and international stations, and which are also dedicated to their region and local affairs.

Fighting against : Confronting an abnormal phenomenon, event, or situation within the society in which we live today.

Drugs : These are substances that numb the body and senses and plunge the individual into a kind of torpor. Drugs are among the most destructive scourges of modern times, due to their inherent danger, except in emergency situations ⁴.

Search results

Through the study, the researcher arrived at several results as follows:

1. This study clearly demonstrates that local radio stations are an appropriate tool for raising awareness and that their messages resonate deeply within society. 2. The study showed that the work of local radio stations has led to a significant increase in awareness among the Chadian people regarding the dangers of drugs, particularly among young people. 3. Despite some challenges faced by local radio stations, they successfully disseminated their awareness messages and alerts, proving to be an easy and accessible tool for all members of society. 4. The majority of Chadian society is aware of what drugs are, which has enabled local radio stations to highlight the negative aspects of this phenomenon and provide health advice to those who are involved in drug use. 5. DJA-FM radio has developed in order to create awareness programs for large segments of society and to broaden its perspectives, which has allowed it to gain a large number of listeners across the country.

Search recommendations

After summarizing the findings of this scientific study, the researcher recommends the following:

1- Although local radio stations have raised awareness among the Chadian people about the dangers of drugs, they need to adjust their approach and redouble their efforts to reach a larger segment of society. 2- The researcher recommends that the government support local radio stations in their activities, which primarily aim to dispel certain misconceptions within society, and provide them with logistical and technical support so that they can operate professionally and in accordance with local needs.

3- Local radio stations need to improve certain aspects of their work in terms of various facilities within the radio station, and provide written documents and archives that some intellectuals can consult.

4- Modify certain schedules of awareness programs that have educational importance for the targeted citizen so that a wide audience can follow them.

Chapter One: Origin and Evolution of Radio Programs:

Section One: The Role of Radio Types, Their Importance and Characteristics: The Stages of Radio Transmission:

Radio broadcasting begins in the studio with the microphone and ends when the listener tunes into the radio receiver. The stages of radio transmission can be summarized as follows:

First : In the radio studio : Broadcasting begins inside the studio, where the microphone converts sound energy into electrical energy, which is then transmitted to the studio control room.

Second : In the studio control room : In this room, the electrical energy representing the sound coming from the studio is amplified using an amplifier. The sound, now electrical current, is then routed to the main control room in the radio station building. It is worth noting that the studio control room broadcasts the recorded tapes and discs containing all the programs listed on the radio station's daily schedule. The tape and disc recordings pass through the amplifier in the studio control room before being sent to the main control room. It is clear that radio plays an important, indispensable role in all programs, and particularly in entertainment programs, even if this is at the expense of programs with an informative purpose, and which have a considerable impact on the orientation of public opinion, like other mass media ⁵.

Third : In the main control room : In this room, the electrical audio signals from all radio services are collected, as they converge here. These are the sounds that represent the content of each radio service; that is, the electrical current that originally produced the sound arrives in the main control room. The function of this room is to send the electrical audio signals from the various radio services to the transmitting station, and this is done via wireless links connecting the radio building to the various transmitting stations, which are distributed around the world.

Fourth : At the transmitting station : The generator or oscillator located at the transmitter station produces electrical pulses or beats of regular frequency known as carrier waves.

The carrier wave is a wave with a regular frequency capable of carrying sound and propagating over long distances. Propagation depends on the type of wave used for radio broadcasting. For example, medium waves can propagate longer distances than long waves, and short waves can propagate farther than medium waves. The wavelength and frequency vary from station to station, which can cause interference between some stations. Radio waves and frequencies are allocated to different countries by the International Telecommunication Union. With the availability of satellite communication technology, many channels can now be used for radio broadcasting via what is called satellite radio. **Fifth : the reception phase via the radio receiver** : the radio antenna picks up radio waves emitted and broadcast into space. These waves come from national and international stations. Generally, the radio antenna only allows one wave to pass through at a time during reception. This is done using an indicator that controls the choice of wavelengths and allows the selection of the most suitable radio waves and frequencies. This means that the radio's dial controls the modulation of the wavelength via the capacitor also present in the radio. Once the desired wave is selected for listening, the radio then

⁴ Mohamed Miner Hajjaj : The Media Dictionary, Dar Al- Fajr for publishing and distribution, 1st edition, 2004.

⁵ Maguy Helwani : Introduction to radio and television art, publication and distribution, Alame Al- Kutub Printing House , Cairo, 2000.

covers a limited geographical area (local, national, and regional radio stations), but it can also broadcast beyond national borders to distribute its programs (international radio). This means that the radio broadcasts a range of media, educational, and entertainment programs, sending them simultaneously to the listening device ⁶.

Sixth step : the detection process : this operation takes place inside the radio and is the reverse of the modulation performed at the transmitting station.

In this process, the sound of the program broadcast by the radio station is separated from the modulated wave; that is, the audio signal is isolated from the carrier wave. The electrical currents representing sound are sent to the amplifier where they are amplified, and then transmitted to the radio's speaker.

Types of Radio, Their Importance, and Characteristics:

Radio encompasses several types, as follows: 1 - **Local Radio** : This type of radio offers a local service and serves a local community. Its programming is aimed at a specific and limited community living within a small and economically, socially, and culturally homogeneous area, creating a cohesive environment. The

Concept of Local Radio : Local radio is a branch of local media that emerges from a specific and limited environment and targets well-defined groups, thus becoming closely linked to them. It is connected to local culture and the actual conditions of the environment, reflecting the cultural and regional heritage of that environment. It fully embraces the prevailing ideas within that environment, taking into account the dominant ideas of the target audience. Therefore, local radio possesses characteristics that distinguish it from other types of radio.

2- **International Radio** : There are several definitions of international radio, sometimes called directed radio, which can be summarized as follows:

A. International radio is radio that transcends the borders of a single state to reach the people of other countries. B. International radio refers to the transmission of music and sounds over vast areas to be received by one or more groups of people outside the borders of the broadcasting state. C. International radio is radio that directs its diverse programs worldwide, with broadcasts in the languages of the people in the countries targeted by these stations. D. Directed radio refers to the broadcasting of a media message from one country to another in a language that the target audience can understand.

The Origin of Targeted International Radio

International radio only became known and saw its modern concept develop after the discovery of shortwave by radio amateurs whose governments had forbidden them from using long and medium waves for leisure due to saturation with broadcast services. International radio spread following the success of amateurs using shortwave. Russia was among the first countries to recognize the importance of this type of communication and its uses in the political sphere; it used radio to spread the word about the Bolshevik Revolution and communist ideas to the world. Radio Moscow, broadcasting in English, alarmed the British government, which promptly severed diplomatic relations with Russia in 1927. This was the first time in the history of international media that diplomatic relations between two countries had been broken off because of targeted radio.

Characteristics of the international radio audience

1- An educated audience, having completed secondary and university studies. 2- The majority reside in cities and urban areas. 3- They have broad political interests. 4- They live in a specific geographic area, such as the Arab region, Northern Europe, or Southeast Asia. 5- Their interests extend beyond their local community, and often even beyond the national and nationalist framework. 6- They rarely correspond with the radio station they listen to, unlike with national radio stations in their own country. 7- Opinion leaders constitute one of the main categories of the audience targeted by international radio, and they listen to these stations to use their content in discussions with their peers, colleagues, and friends. 8- Many international radio listeners are hesitant to correspond with these stations, especially in countries that impose strict censorship on their citizens' correspondence. 9- The characteristics of the international radio audience are largely linked to the level of democracy and the atmosphere of freedom reigning in a country. 10- International radio stations encounter many difficulties and obstacles in understanding the trends of their listeners and the characteristics of their audience.

Skills for preparing radio programs:

The program as a concept : this is the budget, the list of courses, or the plan of what you are going to produce.

The program in practical terms : this is all the content, whether audio or video, broadcast via radio or television for a given period and with a specific objective, which is to reach listeners or viewers. Programs are distinguished from one another by the melody of their introduction and conclusion, their broadcast length, and the time they are broadcast to the public.

Types of discussion programs : there is a set of discussion programs, whether radio or television, that share certain characteristics.

Here are the types of these programs:

1. Discussion programs. 2. Live programs. 3. News programs. 4. Competition programs. 5. Cultural programs. 6. Children's programs. 7. Social programs. 8. Sports programs. 9. Economic programs.

Chapter Two: Harm Caused by Drug Use:

Physical and Mental Damage: The researcher describes how doctors and healthcare professionals state that the use of certain types of drugs can cause insanity, impair memory, transmit neurological, infectious, and gastrointestinal diseases, paralyze mental agility and thinking, affect the intestines in the digestive system, cause loss of appetite, lead to malnutrition and lethargy, weaken sexual function, cause stiffening of tissues and arteries, and also cause skin damage and risks to the body, which manifest as follows:

1. Palpitations caused by repeated intravenous and subcutaneous injections. 2. Discoloration of veins in the elbow, forearm, thigh, leg, etc. 3. Fusion and hardening of veins (sometimes over a length of about 20 cm). 4. Yellowing of the mucous membranes (pallor due to anemia, iron deficiency, hemolysis, blood donations in exchange for local food, which also leads to damage to the lymph nodes), which includes:

⁶ Abdulaziz Sharaf : Introduction to the Media, Dar Al- Kitab Al- Masri , Cairo, Egypt.

- a. Swollen lymph nodes in the shoulder.
- b. Disorders of white blood cells and lymphocytes, which can also lead to damage in other parts of the body.
- c. Injuries caused by inflammation at the injection site. d. Inflammation of the arteries resulting in loss of pulse following injection, causing head injuries and violence. e. The drug covers almost anything ingested, inhaled, injected, or sucked through the mouth, including drugs and prohibited substances, beverages, cigarettes, tobacco, and other items .

It also causes damage to the heart, which manifests as follows:

1. Hypertension. 2. Heart valve damage. 3. Right and left atrial insufficiency. It also causes damage to the lungs, which manifests as follows: 1. Pulmonary hypertension. 2. Pneumonia. It also causes damage to the urinary and reproductive systems, which manifests as follows: 1. Kidney: renal failure. 2. Hepatitis. 3. Severe pain from kidney stone attacks. Reproductive system: in men, it causes erectile dysfunction, infertility, and premature ejaculation; in women, it causes a decrease in libido , etc.⁷

Psychological, moral, and social damage

A person addicted to drug use exhibits deplorable traits and adopts shameful habits, including cowardice, lying, and contempt for moral values. Drug use also leads to the commission of crimes such as theft, rape, adultery, highway robbery, and murder. The drug user also loses their moral principles and neglects their duties. It is well known that colonial countries use the promotion of drugs as a formidable weapon to break the strength of their people, corrupt the nation's morals, and extinguish the spirit of struggle and resistance. There is no doubt that the spread of drugs in a country constitutes a factor of weakness that the enemies of Islam strive to maintain and prolong. Among some drugs is qat , which is described as: "a persistent plant that grows in mountainous regions and in several countries such as Yemen, Sudan, Somalia, Ethiopia, and others."

Qat is considered beneficial, curing fever and digestive system ailments. Scientists have noted that qat has a sedative effect on the human nervous system and that excessive consumption can lead to psychological disturbances ⁸. Stimulants

comprise a group of substances that act on the central nervous system. Among the best known is caffeine, found in coffee and tea, the use of which is not considered dangerous and does not lead to addiction, unlike other stimulants such as qat , among others ⁹.

Economic Damage

Drug addiction causes economic disruption, starting with the individual, then affecting the family, and finally society as a whole. Since the individual is an integral part of society, a decrease in their productivity leads to a decrease in society as a whole. If an individual succumbs to drugs and becomes deeply immersed in them, the following consequences result: 1. Drug use in any form exhausts the body, leading to laziness and inertia, thus rendering the individual incapable of fulfilling many obligations and making them passive in most situations. 2. Drug use leads the user to spend exorbitant sums on drugs, representing a significant loss for themselves, their family, and society. They are willing to sacrifice themselves even physically and are unable to manage their household budget; they always prefer to buy drugs at any cost, which is a loss for their family, without realizing that drugs are also harmful to society.

3. Almighty God has forbidden extravagance, making it a forbidden act, and has described extravagant individuals as brothers of the devils. Extravagance consists of spending on falsehood. It is clear from the above that drugs lead to the loss of the five pillars that Islam strives to preserve, and which all divine laws have enunciated: religion, life, intellect, chastity, and material possessions. The drug user quickly loses their faith by voluntarily ceasing to pray, then the other pillars follow, and the structure collapses from its foundations. Thus, it is possible to protect young people by strengthening protective factors and reducing the risk factors surrounding the individual. Raising awareness among all those responsible for education, instruction, and training about the risk factors threatening young people in their society from the dangers associated with the consumption of psychoactive substances directly contributes to reducing the low level of awareness of the dangers of drugs. This also indicates that drugs cause serious physical and mental health damage, and their use can lead to loss of life due to terrible accidents committed by those who use them ¹⁰.

He also informs us that drugs cause serious damage and consequences for mental health, and that their use can lead to loss of life due to horrific accidents committed by users.

They also cause brain damage, preventing the mind from functioning normally, and drug use can drive a person to offer their wife, son, or sister to dealers and traffickers for a dose or injection, even losing their sense of modesty from the very first moments of use ¹¹.

DJA-FM Radio , and the Nature of its Programs. Presentation of DJA-FM Radio

DJA - FM Radio is considered one of the private radio stations operating in the local Chadian media landscape. It is the first independent private radio station founded in N'Djamena by ordinary citizens. The idea to create this prestigious radio station came from a group of patriotic individuals hoping to change certain habits within Chadian society, which had previously suffered from divisions, wars, and conflicts. At their head was Mrs. Zahra Mahamat. Yacoub in May 1998. This woman also worked in the media field both within and outside the country. Radio DJA-FM is located

⁷ Mansour Abdulmajid Sayed Ahmed: Addiction, its causes and preventive and therapeutic manifestations, Ministry of the Interior, Drug Control Research Center, Riyadh, 1406 AH.

⁸ Jafar and Hassan: Drugs and tobacco and their harmful effects, Dar Al- Harf Al- Arabi for printing, publishing and distribution, Lebanon, 2002.

⁹ Atiyat and Abdulrahman Shaaban : Drugs and Dangerous Substances and Responsibility for Combating Them, Naif Arab Academy of Security Sciences, Riyadh.

¹⁰ National Commission for the Fight Against Drugs: Prevention of the Consumption of Drugs and Psychoactive Substances, Between Theory and Practice, Review of the Ministry of the Interior, 2016.

¹¹ Mohamed ben Yahya Al- Najimi : Drugs and their rules in Islamic Sharia, Research and Study Center, Naif Arab University for Security Sciences, 1st edition, 2004.

in the Ambassatna neighborhood, in the third arrondissement, on General Charles de Gaulle Street, near the capital's central market and the grain market. It broadcasts its programs on FM 96.9. The building is rented, and the rent amounts to two million (2,000,000) per year.

The idea and methods of creating the radio station:

The idea for DJA-FM radio arose after its founders noticed a lack of awareness among the Chadian people regarding certain immoral behaviors, as well as a lack of cultural and health awareness within society at the time and even today.

Since then, the radio station has broadcast programs that had been planned in advance, striving to translate and implement the established objectives within the realities of daily life.

Reasons for the creation of DJA-FM radio : Among the reasons that led to the creation of this radio station was the fact that the national radio was a government radio station operating according to a plan established by the state. This meant that it did not have sufficient or complete freedom to broadcast information concerning state policy. Thus, freedoms were limited, and at that time, there was no other radio station capable of making its voice heard by the population besides the Chadian national radio.

It was also noted that there was no space for freedom of expression, nor for those who wished to have their voices heard. DJA-FM radio was created to broadcast the events and news that Chadian society demanded, in order to overcome such obstacles. Therefore, it was a free and independent radio station, capable of fully fulfilling its mission.

Among the other reasons that led to the creation of DJA-FM radio, there is the need for Chadian society to have a radio that expresses its opinion and broadcasts educational, health, entertainment and other programs.

Funding Sources : The radio station receives no external support from any organizations or civil society associations. Its revenue comes primarily from announcements and advertisements, as well as notices such as missing children or death notices. However, some of these types of announcements have disappeared over time, leaving only the most significant ones.

Currently, the radio station relies on the income provided by its director, Ms. Zahra Mahamat . Yacoub, who covers the radio station's expenses as well as those of its staff. Occasionally, the radio station also receives specific grants from the Chadian government and local media outlets—whether audio, visual, or print—as part of initiatives to encourage and stimulate these media institutions.

Stages of Radio DJA-FM's development : The radio station has gone through several stages since its creation. Initially, it used traditional equipment consisting of recording devices that operated with small magnetic tapes, gradually evolving towards the modern digital system used by most local and international radio stations worldwide.

The radio station's beginnings were traditionally somewhat modest, like many international, regional, and local stations, until it experienced development and growth in both performance and evaluation, as well as in the technical equipment acquired.

DJA -FM Radio's objectives : The radio station clearly defined its objectives from its inception in order to follow understandable methods and approaches, and to make its vision clear to its listeners, the citizens of Chad. These objectives include:

1. Working to change certain negative behaviors in the daily lives of some.
2. Fully raising awareness among Chadian citizens regarding education, culture, and other matters.
3. Eliminating and rejecting hatred and sectarianism among the country's inhabitants.
4. Contributing, through its various programs, to the development and advancement of the country and its citizens.
5. Fighting corruption within Chadian society.
6. Changing certain negative practices and traditions in place.
7. To disseminate necessary information and news to the population, both locally and internationally.

Types of programs offered by DJA-FM radio : Regarding program production and recording, this radio station has played a significant and extensive role by offering a variety of programs that have contributed to raising awareness among Chadian citizens and fostering closer ties between Chadian cultures from north to south. The types of programs offered by this radio station include:

1. Educational programs.
2. Social programs.
3. Political programs.
4. Cultural programs.
5. Health programs.
6. General programs.

CONCLUSION

In conclusion, the researcher can only mention a series of difficulties encountered in his journey and efforts to complete this work and scientific duty. This study has undoubtedly contributed to enriching his knowledge through his engagement with books, manuscripts, and libraries. The choice of this topic—namely, the impact of media strategies on local radio stations to combat drug use, using Radio DJA-FM as a model—was motivated solely by scientific research objectives and the desire to uncover certain truths about this fascinating subject. This study allowed the researcher to acquire diverse scientific and health-related insights. After considerable effort, the researcher was able to identify the appropriate elements for this topic, hoping that they would meet the scientific objectives and benefit those curious and passionate about knowledge.

Research Results

Through this study, the researcher achieved the following results:

6. This study clearly demonstrates that local radio stations are an appropriate tool for raising awareness and that their messages resonate deeply within society.
7. The study showed that the work of local radio stations has led to a significant increase in awareness among the Chadian population regarding the dangers of drugs, particularly among young people.
8. Despite some challenges faced by local radio stations, they successfully conveyed their messages and awareness campaigns, proving to be an easy and accessible tool for all members of society.
9. The majority of Chadian society is aware of what drugs are, thus paving the way for local radio stations to present the negative aspects of this phenomenon and provide health advice to those who are involved.
10. DJA-FM radio has developed its programs with the aim of expanding its awareness programs to broad segments of society and broadening its perspectives, which allows it to gain a large number of listeners across the country.

Research Recommendations

After completing the final image of this scientific study, the researcher recommends the following:

5- Despite the efforts of local radio stations to raise awareness among the Chadian people about the dangers of drugs, they need to revise their approach and increase their efforts to reach a larger segment of society. 6- The researcher recommends that the government support local radio stations in their activities, which primarily aim to dispel certain misconceptions, and provide logistical and technical support so that these stations have a conducive environment to carry out their missions professionally and in accordance with local aspirations.

7- Local radio stations should improve certain aspects of their work, particularly their internal facilities, and provide written documents and archives that scholars could consult.

8- It is necessary to adjust the scheduling of some awareness programs, which are important for educating the target audience, so that a wider public can access them.

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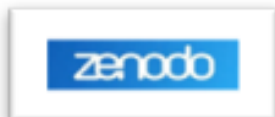
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