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**ZAGADNIENIA
INFORMACJI
NAUKOWEJ**
Studia Informacyjne

**ISSUES IN
INFORMATION
SCIENCE**
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ISSUES IN INFORMATION SCIENCE – INFORMATION STUDIES

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The subtitle of the journal – *Information Studies* – emphasizes the interdisciplinary nature of its subject profile covering a broad spectrum of issues studied by various academic disciplines and professional activity domains related to access to resources of recorded information and knowledge and the use of these resources by contemporary man and society. Other subjects to be covered by ZIN – *Information Studies* involve: (1) theoretical ponderings on the practice of information-related activities performed by various communities, (2) the results of research on the conditions influencing those activities and ways of improving methods and tools employed for the activities in question, (3) the methodology of information science research, information science history and education concerning the information science. The subject profile of ZIN – *Information Studies* covers, among else, the issues of:

- information services in institutions of science, culture, business, education and administration,
- information and knowledge management,
- traditional and online scholarly communication,
- information and knowledge organization,
- metadata theory and practice,
- Web 2.0,
- Semantic Web,
- information architecture,
- information websites usability,
- digital humanities,
- human-computer interaction,
- natural language processing,
- information retrieval,
- use of information and behavior of the information users,
- social response to modern information technologies,
- culture of information,
- information, digital and media skills,
- information policy,
- information ethics.

ZIN – *Information Studies* is addressed to: (1) information science teachers and lecturers, researchers and students, (2) practitioners of information-related activities who analyze methods and tools used to implement those activities in various domains and organizational environments, (3) politicians and donors related to information activities in various domains. The journal content may also be of some interest to teachers, students and researchers in other disciplines of science which deal with various aspects of information existence and use in the contemporary world.

ZIN – *Information Studies* is included in the list of journals scored by Polish Ministry of Science and Higher Education and indexed by: Central European Journal of Social Sciences and Humanities (CEJSH), Central and Eastern European Online Library (CEEOL), Library and Information Science and Technology Abstracts (LISTA), Polish Bibliography of Book Studies (PBB), WorldCat and Polish Scholarly Bibliography (PBN). The journal is registered in the European Reference Index for the Humanities (ERIH Plus).

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- przetwarzania języka naturalnego,
- wyszukiwania informacji,
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- społecznej recepcji nowoczesnych technologii informacyjnych,
- kultury informacji,
- kompetencji informacyjnych i cyfrowych,
- polityki informacyjnej,
- etyki informacyjnej.

Zagadnienia Informacji Naukowej – Studia Informacyjne adresowane są do wykładowców, badaczy i studentów nauki o informacji, a także praktyków działalności informacyjnej, krytycznie analizujących metody i narzędzia jej realizacji w różnych środowiskach dziedzinowych i organizacyjnych oraz polityków i donatorów działalności informacyjnej w różnych dziedzinach. Lektura czasopisma może też zainteresować wykładowców, studentów i badaczy innych dyscyplin, które zajmują się różnymi aspektami funkcjonowania informacji we współczesnym świecie.

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The role of academic libraries in supporting open science: Infrastructure, policy, and practice in federal universities in South-East Nigeria

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Abstract

Purpose/Thesis: This study examines how academic libraries support open science through infrastructure, policy frameworks, and practices in federal universities in South-East Nigeria.

Approach/Methods: A survey of library staff across five federal universities (N = 208) employed a structured questionnaire; descriptive statistics summarised indicators of infrastructure, policy, and practice.

Results and Conclusions: Libraries demonstrate moderate infrastructural readiness and policy presence and engage in repository management, but lack stable power, effective outreach, and faculty collaboration; funding and ICT deficits are major barriers.

Originality/Value: Provides localised empirical evidence linking infrastructure, policy, and library practice to open science adoption in the region, thereby guiding institutional and national strategies.

Keywords

Academic library. Infrastructure. Institutional repository. Open access. Open science. Policy framework. Research support.

Text was received on the 15th of September 2025.

1. Introduction

1.1. Background to the Study

Open science is reshaping scholarly communication by fostering transparency, collaboration, and unrestricted access to research outputs. Globally, institutions are embracing open access publishing, open data sharing, and digital repositories to enhance research visibility and drive innovation (UNESCO, 2021; Chiware and Skelly, 2022; Boulton *et al.*, 2020). In Africa, regional initiatives such as LIBSENSE and the African Open Science Platform are gaining momentum, yet implementation remains uneven due to infrastructural limitations and policy gaps (Mwelwa *et al.*, 2020; LIBSENSE, 2024).

Academic libraries are the intellectual backbone of higher education institutions, serving as gateways to knowledge, research, and innovation. Traditionally, they functioned as repositories of print materials, but the 21st century has seen a dramatic shift in their roles. Modern academic libraries now operate as digital knowledge centres that enhance research visibility and support open access initiatives. In Nigeria, academic libraries are increasingly expected to align with global standards, offering services that go beyond collection management to include digital literacy training, research data support, and repository development (Dangida and Magaji, 2021).

Infrastructure is a critical enabler of open science. Academic libraries require robust ICT systems, reliable internet bandwidth, digital storage, and a stable power supply to support open-access platforms and research data services (Ayodele *et al.*, 2022; Iyoha, 2023; Ogunbodede and Oribhabor, 2022; Schroeder, 2007). In Nigeria, infrastructural deficits remain a major barrier to digital transformation. Many university libraries operate with outdated systems, limited connectivity, and inadequate technical support, which hinder their ability to host repositories or facilitate open data practices (Basri *et al.*, 2018; Olaniyi *et al.*, 2022).

Policy frameworks are essential for guiding the adoption of open science. Institutional policies on open access, copyright, and data sharing provide the legal and strategic foundation for libraries to operate effectively. Nigeria's National Policy on Open Educational Resources (NUC, 2024; *Model Open Science Policy*, 2024) emphasised the need for institutional compliance, infrastructure development, and capacity building (UNESCO, 2021; Chiware and Skelly, 2022; LIBSENSE, 2024). However, many universities lack formal policies or implementation strategies, leading to fragmented practices and limited researcher engagement.

Library practices form the operational backbone of open science, encompassing institutional repository management, information literacy training, digitisation of collections, and research support services. Librarians play a pivotal role in facilitating access to digital resources, guiding researchers on publication strategies, and

promoting ethical data management. Their technical expertise, advocacy efforts, and collaboration with faculty are essential for sustaining open science initiatives. Ming and Ren (2020) emphasised the growing demand for data literacy and research data management skills among librarians in the digital era. In the Nigerian context, Olubiyo (2022) highlighted the need for digital competencies among librarians, including metadata creation, repository development, and handling of digital media, as critical enablers of open science.

Several implicit variables shape the effectiveness of open science adoption in Nigerian universities. Digital literacy plays a foundational role in determining how well librarians and researchers can navigate digital platforms and apply open science tools. Gutiérrez-Ángel *et al.* (2022) emphasised that digital literacy in university settings directly influences the ability to engage with scholarly technologies and resources. In the Nigerian context, Olubiyo (2022) highlighted that the gap in digital competencies among librarians hinders effective repository management, metadata creation, and research support. The availability and accessibility of digital resources such as journals, databases, and institutional repositories also affect the scope and quality of research output. However, utilisation patterns remain uneven due to infrastructural limitations, low awareness, and inconsistent ICT training. Oaiya (2023) underscored the need for national policy frameworks and institutional capacity-building to overcome these challenges and foster sustainable open science practices across Nigerian campuses.

The study covers all six federal universities located in South-East Nigeria: University of Nigeria Nsukka (UNN), Nnamdi Azikiwe University Awka (NAU), Michael Okpara University of Agriculture Umudike (MOUUAU), Federal University of Technology Owerri (FUTO), Alex Ekwueme Federal University Ndufu-Alike (AE-FUNAI), and Federal University of Health Sciences Otolu-Nnewi (FUHSO). The primary respondents will include academic librarians, library administrators, and research support staff. The scope of content includes infrastructure, policy frameworks, librarian practices, digital skills, and challenges in open science adoption. Private institutions and non-library-based initiatives are excluded from this study.

1.2. Problem statement

Despite growing awareness and emerging policy frameworks, the adoption of open science in federal university libraries across South-East Nigeria remains constrained. Infrastructure is fragmented, technical expertise is limited, and institutional commitment is inconsistent. Many libraries struggle with unstable power supply, inadequate ICT tools, and poor internet connectivity, which hinder their ability to sustain repositories or facilitate open data sharing. In addition, the absence of coherent policies, low researcher engagement, and insufficient funding

create systemic barriers. These persistent challenges highlight the urgent need for empirical evidence on how academic libraries in South-East Nigeria can support open science through infrastructure, policy frameworks, and professional practices.

1.3. Purpose of the study

The main purpose of this study is to examine how academic libraries support the adoption of open science through infrastructure, policy frameworks, and professional practices in federal universities in South-East Nigeria.

The study seeks to:

- (1) Identify the infrastructural resources provided by academic libraries that enable open science in federal universities in South-East Nigeria.
- (2) Examine the institutional policy frameworks that guide academic libraries in promoting open science.
- (3) Analyse the professional practices employed by academic libraries in support of open science.
- (4) Determine the key challenges that hinder academic libraries from effectively supporting open science.

To achieve the objectives of the study and to verify the adopted hypotheses, the following research questions were formulated:

- (1) What infrastructural resources do academic libraries provide to support open science in federal universities in South-East Nigeria?
- (2) What institutional policy frameworks guide academic libraries in promoting open science?
- (3) What professional practices are employed by academic libraries to facilitate open science?
- (4) What are the major challenges affecting academic libraries in their efforts to support open science in federal universities in South-East Nigeria?

2. Literature review

2.1. Conceptual framework

The conceptual framework for this study is anchored on the evolving role of academic libraries in supporting open science within Nigerian federal universities. It integrates six interrelated constructs: academic libraries, open science, infrastructure, policy frameworks, library practices, and implementation challenges. These constructs provide the theoretical basis for understanding how institutional structures, digital resources, and professional competencies converge to enable or constrain the adoption of open science. The framework is informed by current

literature and contextualised within the realities of Nigerian higher education, where infrastructural limitations, policy gaps, and digital literacy disparities continue to shape the trajectory of open science (Olubiyo, 2022; Oaiya, 2023). Open science has emerged as a transformative paradigm in scholarly communication, emphasising transparency, accessibility, and collaboration across disciplines and borders. In Europe, initiatives such as Plan S and the European Open Science Cloud (EOSC) have accelerated institutional adoption of open access publishing and data sharing (European Commission, 2020). In North America, universities have begun integrating open science principles into tenure policies and research evaluation frameworks, recognising their role in enhancing reproducibility and public engagement (McKiernan *et al.*, 2016; Tennant *et al.*, 2016). In Asia, countries such as South Korea have invested in national repositories and open data platforms to support innovation and enhance global visibility (Shmagun *et al.*, 2022).

In Nigeria, open science is increasingly regarded as a strategic tool for addressing development challenges and enhancing research visibility. Mwelwa *et al.* (2020) and Chiware and Skelly (2022) highlighted the role of regional frameworks such as LIBSENSE in promoting infrastructure development and policy alignment across African research institutions. Abduldayan (2024) emphasised the importance of capacity building and advocacy, noting that librarians are key agents in operationalising open science principles through repository management, metadata creation, and researcher support.

In Nigeria, studies have examined digital literacy gaps (Olubiyo, 2022), infrastructure readiness (Oaiya, 2023), and librarians' engagement in open science practices (Ango and Akporhonor, 2024; Sulyman *et al.*, 2023). However, most existing research is either national or regional in scope and lacks a specific focus on federal universities in South-East Nigeria. Moreover, few studies explicitly connect infrastructure, policy, and practice to measurable open science outcomes. This study addresses these gaps by offering a localised, empirical analysis of how academic libraries in South-East Nigeria support open science through strategic alignment of resources, policies, and professional practices.

Academic libraries have undergone a significant transformation over the past two decades. Once defined primarily by their print collections and cataloguing systems, they now serve as dynamic hubs for digital scholarship, research support, and knowledge dissemination. Their functions have expanded to include the management of institutional repositories, the facilitation of open-access publishing, and the provision of information-literacy training. Olubiyo (2022) highlighted the growing digital competencies required of Nigerian librarians to support these evolving roles. Agboke and Oladokun (2024) discussed the integration of emerging technologies, such as artificial intelligence and robotics, into Nigerian academic libraries despite infrastructure challenges. Globally, academic libraries are increasingly recognised as strategic partners in research development, contributing to the

visibility and impact of scholarly outputs. UNESCO (2021) emphasised the role of research libraries in advancing open science through infrastructure, policy advocacy, and support for researchers. Similarly, Salisu and Okpala (2024) found that academic libraries in Northern Nigeria actively promote open access publishing to enhance scholarly visibility.

In Nigeria, however, many academic libraries still operate under constrained conditions, with limited funding, outdated infrastructure, and inconsistent policy support. Sani and Tokawa (2025) reported that university libraries in North-West Nigeria face infrastructural deficits that hinder service delivery. Okuonghae and Ugwulebo (2021) also noted that digital literacy gaps and limited access to electronic resources hinder librarians' ability to support research effectively. These limitations continue to affect their full participation in the open science movement.

Infrastructure is a critical enabler of open science (see Diagram 1). Academic libraries require robust ICT systems, reliable internet connectivity, digital storage, and a stable power supply to support open-access platforms and research data services. Ogala and Okeh (2021) emphasised that ICT infrastructure in Nigerian university libraries significantly enhances teaching, research, and scholarly communication. The National Information Technology Development Agency (NITDA) has issued regulatory guidelines to strengthen ICT adoption across public institutions, including tertiary education, with frameworks supporting cloud computing, data protection, and public internet access. NITDA (2019) stated that, without adequate infrastructure, libraries cannot host repositories, facilitate data sharing, or effectively support digital scholarship.

Policy frameworks provide the legal and strategic foundation for implementing open science. Nigeria's draft *National Policy on Open Educational Resources* (NUC, 2024) outlined institutional responsibilities for infrastructure development and capacity building in higher education. The Model Open Science Policy developed by WACREN (2024) further articulates strategic priorities, including open science infrastructure, human resource development, and institutional compliance mechanisms. However, policy implementation in Nigerian universities remains fragmented. Chiware and Skelly (2022) argued that African science systems often operate in silos, lacking interoperable policies and coordinated frameworks. Augonus (2023) found that only a minority of Nigerian universities have formal institutional repository policies, limiting their ability to regulate and disseminate research outputs effectively.

Library practices are the operational expression of open science principles. These include managing institutional repositories, conducting information literacy training, digitising collections, and offering research support services. Ugwulebo and Okuonghae (2021) emphasised the importance of information literacy and digital resource utilisation among postgraduate students, highlighting librarians' role in guiding access to and use of digital resources. Digitisation efforts are also

central to modern library services, with Abduldayan (2024) noting that digitisation enhances preservation and access to educational resources in Nigerian academic libraries. Librarians play a central role in facilitating access to digital resources, guiding researchers on publication strategies, and promoting ethical data management. Their digital skills and ability to engage users are critical for sustaining open science initiatives. Adetunla and Chowdhury (2025) found that Nigerian university librarians face challenges in developing operational digital skills, which are essential for managing repositories, metadata, and research support services. Abduldayan (2024), through the LIBSENSE initiative, advocated for librarian-led capacity building and policy engagement to advance open science in Nigerian institutions.

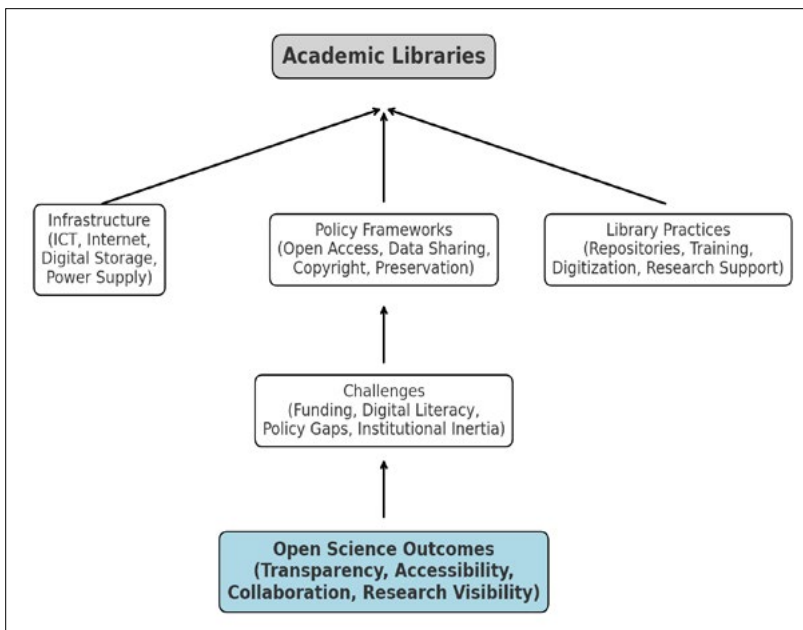


Diagram 1. Conceptual framework model

Source: Prepared by the Authors.

Despite growing awareness and emerging policy frameworks, the adoption of open science in federal university libraries across South-East Nigeria is hindered by infrastructural deficits, low digital literacy, policy gaps, and institutional inertia. Echedom and Anyira (2020) found that integrating open access into library workflows is challenged by poor ICT infrastructure, inadequate training, and a lack of formal policy support. (Worie, Unegbu, and Opara, 2022) emphasised that librarians in Nigerian academic libraries face declining morale and limited professional support, which affects their ability to engage with digital tools and open science

practices. Abduldayan (2024) highlighted that fragmented implementation and lack of institutional commitment continued to slow progress, despite national efforts to promote open science through policy and advocacy. Addressing these challenges requires coordinated efforts across policy, infrastructure, and capacity-building domains. It also demands a cultural shift within academic institutions, where openness, collaboration, and transparency are valued and rewarded.

2.2. Theoretical framework

This study is underpinned by Rogers' Diffusion of Innovations Theory, which provides a foundational lens for understanding how new ideas and technologies are adopted within institutional systems. Developed by Everett Rogers in 1962, the theory explains the process through which innovations are communicated over time among members of a social system. It emphasises five key elements: the innovation itself, communication channels, time, the social system, and adopter categories.

In this study, open science is understood as an innovation, encompassing practices such as open access publishing, open data sharing, and institutional repository development. Academic libraries serve as the primary agents of diffusion, responsible for introducing and facilitating these practices within the university system. The communication channels include training programs, digital platforms, and policy advocacy efforts led by librarians and institutional stakeholders. The social system refers to federal universities in South-East Nigeria, where the adoption of open science is influenced by institutional culture, leadership commitment, and resource availability. The time dimension reflects the varying pace at which different institutions engage with open science, shaped by infrastructural readiness and policy support. The adopter categories, ranging from innovators to laggards, are represented among librarians, faculty, and researchers, whose engagement levels vary with digital literacy, awareness, and institutional incentives. Furthermore, the adopter categories identified in Rogers' model, innovators, early adopters, early majority, late majority, and laggards, can be observed among stakeholders in this study. Some academic libraries and librarians function as innovators and early adopters, pioneering initiatives such as repository development and open access advocacy. Others, however, fall within the late majority or laggard categories due to infrastructural constraints, low digital literacy, or weak institutional commitment. These variations reflect the uneven diffusion of open science practices across federal universities in South-East Nigeria, demonstrating how institutional readiness and leadership support determine the pace of innovation adoption.

Rogers' theory is particularly relevant to this study because it captures both the structural and behavioural dynamics of innovation adoption. It helps explain why some libraries are early adopters of open science practices, while others lag due to infrastructural deficits, policy gaps, or resistance to change. By applying this

theoretical lens, the study examines how academic libraries navigate the diffusion process and how variables such as infrastructure, policy frameworks, library practices, digital literacy, and implementation challenges interact to shape the trajectory of open science adoption. This framework supports the study's analytical approach by linking theoretical constructs to empirical realities, offering a nuanced understanding of how innovation spreads within Nigerian higher education institutions. The theory thus provides a useful framework for interpreting how open science diffuses across university libraries, highlighting that adoption depends not only on the availability of technology but also on institutional culture and librarian initiative.

2.3. Empirical studies

Academic libraries are increasingly transforming into digital knowledge hubs. Abdu, Farouk and Maisango (2025) examined Nigerian open-access repositories and found that only 17 of 5,317 were registered in ROAR, revealing a significant shortfall in digital infrastructure. Similarly, Agboke and Oladokun (2025) reported that inadequate infrastructure and limited technical skills hinder digital library services, but their work did not focus on South-East federal universities. This study, therefore, investigates how the available infrastructure within those universities supports open-science initiatives, such as repositories and data sharing.

Adedoyin *et al.* (2024) evaluated institutional compliance with Nigeria's National Policy on Open Educational Resources, finding that fewer than 8 per cent of universities had formal OER policies due to weak administrative commitment. WACREN (2024) also introduced the Model Open Science Policy, emphasising infrastructure, human capacity, and governance, but implementation across institutions remains uneven. The current study builds on these efforts by exploring how library-specific policies function within federal universities in South-East Nigeria.

Ango (2024) investigated the adoption of open-source library management software in North-Central Nigeria, finding high usability but moderate levels of digital literacy among librarians. Onwubiko (2023) similarly observed that librarians in Ebonyi State were active in information dissemination but lacked adequate digital tools and training. This study extends those insights by linking librarians' professional practices directly to open-science outcomes, including open data, transparency, and collaboration.

Agboke and Oladokun (2025) further highlighted barriers such as poor infrastructure and resistance to new technologies, while Tella *et al.* (2023) found that inadequate facilities and low digital literacy limited access for distance learners. These studies confirm persistent challenges in Nigerian academic libraries but seldom address the open-science context of South-East federal universities. The present research, therefore, identifies the specific financial, technical, and institutional barriers affecting open-science adoption in the region.

3. Research methodology

This study adopted a survey research design, which was considered appropriate for collecting data from a large population at a specific point in time. Survey design enables researchers to describe existing conditions, analyse relationships, and make generalisations about a population based on sampled responses (Kabir, 2016). It is particularly effective in capturing the opinions, perceptions, and attitudes of library staff regarding infrastructural readiness, policy frameworks, and professional practices that support open science in federal universities.

The population comprised professional and para-professional library staff in the five federal universities located in South-East Nigeria. These universities include: University of Nigeria, Nsukka; Nnamdi Azikiwe University, Awka; Federal University of Technology, Owerri; Alex Ekwueme Federal University, Ndufu-Alike; and Michael Okpara University of Agriculture, Umudike. The total population of library staff across these institutions was 219.

Because the study population was relatively small and manageable, the entire staff population of 219 was used as the sample. This approach eliminated the need for sampling and ensured complete coverage of the study population.

The primary data collection instrument was a structured questionnaire titled the Academic Libraries and Open Science Adoption Questionnaire (ALOSAQ). The questionnaire was divided into four sections, covering infrastructural resources, policy frameworks, library practices, and challenges hindering open science adoption. Items were measured using a four-point Likert scale ranging from Strongly Agree to Strongly Disagree.

Copies of the questionnaire were administered to respondents via direct delivery by research assistants. This method was chosen to maximise response rate and ensure that the instrument reached the target respondents at each selected university.

The collected data were analysed using descriptive statistics, including the mean, standard deviation, median, and mode, to address the research questions. The decision rule was set such that mean scores of 2.50 and above were interpreted as agreement, while scores below 2.50 indicated disagreement. In addition to the mean and standard deviation, the median and mode were also computed to provide additional measures of central tendency, ensuring consistency and reliability in interpreting respondents' opinions.

The study upheld ethical standards by ensuring voluntary participation, informed consent, and confidentiality of responses. Permission was obtained from the university librarians at the participating institutions prior to data collection. Respondents were assured that their responses would be used solely for academic purposes.

4. Data presentation and results

Of 219 copies of the questionnaire distributed to library staff across the five federal universities under study, 208 were completed and returned, yielding a response rate of 95%. This high response rate enhanced the reliability of the data collected and minimised non-response bias.

4.1. Demographic information of respondents

The respondents' demographic data included variables such as gender, academic qualification, designation, and years of experience. The results are presented in Table 1.

Table 1. Demographic characteristics of respondents (N = 208)

| Variable | Category | Frequency | Percentage (%) |
|------------------------|------------------------|-----------|----------------|
| Gender | Male | 98 | 47.1 |
| | Female | 110 | 52.9 |
| Academic Qualification | Diploma | 36 | 17.3 |
| | Bachelor's degree | 82 | 39.4 |
| | Master's degree | 70 | 33.7 |
| | PhD | 20 | 9.6 |
| Designation | Librarian II/III | 58 | 27.9 |
| | Senior Librarian | 46 | 22.1 |
| | Principal Librarian | 42 | 20.2 |
| | Deputy/Chief Librarian | 62 | 29.8 |
| Years of Experience | 1–5 years | 52 | 25.0 |
| | 6–10 years | 60 | 28.8 |
| | 11–15 years | 44 | 21.2 |
| | 16 years and above | 52 | 25.0 |

Source: Prepared by the Authors.

The demographic results in Table 1 show that female respondents (52.9%) slightly outnumbered male respondents (47.1%), indicating balanced gender representation in the libraries surveyed. In terms of academic qualification, the majority of respondents held bachelor's (39.4%) or master's degrees (33.7%), suggesting that the workforce is well qualified to engage with professional and digital practices. A smaller proportion had diplomas (17.3%) or doctoral degrees (9.6%). Regarding designation, almost one-third of respondents (29.8%) held senior positions as Deputy or Chief Librarians, while the remainder were distributed across lower

cadres, reflecting a diverse mix of experience levels. Years of experience were distributed fairly: 25% had 1–5 years, 28.8% had 6–10 years, 21.2% had 11–15 years, and 25% had more than 16 years. This distribution demonstrates a healthy combination of early-career, mid-career, and senior professionals within the libraries.

4.2. Infrastructural resources provided by academic libraries

The first research question sought to identify the infrastructural resources provided by academic libraries to support open science in federal universities in South-East Nigeria. The results are presented in Table 2.

Table 2. Descriptive statistics on infrastructural resources provided by academic libraries for open science (N = 208)

| S/N | Item | Mean | SD | Median | Mode | Decision |
|-----|--|------|------|--------|------|-----------|
| 1 | Availability of ICT facilities (computers, servers, etc.) for open science | 2.83 | 0.91 | 3.0 | 3 | Agreed |
| 2 | Availability of reliable internet connectivity | 2.79 | 0.93 | 3.0 | 3 | Agreed |
| 3 | Provision of institutional repositories for open access publishing | 2.72 | 0.95 | 3.0 | 3 | Agreed |
| 4 | Availability of adequate digital storage and data management systems | 2.61 | 0.97 | 3.0 | 3 | Agreed |
| 5 | Provision of stable electricity and backup power | 2.48 | 0.98 | 2.0 | 2 | Disagreed |
| 6 | Access to electronic databases and e-journals | 2.76 | 0.92 | 3.0 | | Agreed |
| 7 | Availability of functional library websites for research support | 2.64 | 0.96 | 3.0 | 3 | Agreed |
| 8 | Accessibility of open-source research tools provided by the library | 2.48 | 0.98 | 2.0 | 2 | Disagreed |
| 9 | Availability of dedicated ICT support staff to manage the digital infrastructure | 2.71 | 0.94 | 3.0 | 3 | Agreed |
| 10 | Adequacy of physical facilities (e.g., computer labs, research commons) for open science | 2.43 | 0.99 | 2.0 | 2 | Disagreed |
| | Grand Mean/SD | 2.65 | 0.94 | | | |

Note: Mean, median, and mode were used as complementary measures of central tendency. An agreement was defined as a score of 2.50 or higher. Source: Prepared by the Authors.

The results in Table 2 indicate that most libraries provide moderate infrastructural support for open science, particularly in ICT facilities (Mean = 2.83), internet connectivity (Mean = 2.79), and access to electronic databases (Mean = 2.76). Institutional repositories (Mean = 2.72) and ICT support staff (Mean = 2.71) are

also available, but not consistently across all universities. However, key challenges remain: stable electricity (Mean = 2.48), open-source research tools (Mean = 2.48), and physical facilities (Mean = 2.43) were rated below the acceptance threshold of 2.50. These findings suggest that, while digital infrastructure is gradually improving, systemic issues, such as power supply and dedicated research spaces, continue to hinder full support for open science.

4.3. Institutional policy frameworks guiding academic libraries

The second research question examined the institutional policy frameworks that guide academic libraries in promoting open science. The results are shown in Table 3.

Table 3. Descriptive statistics on institutional policy frameworks for open science (N = 208)

| S/N | Item | Mean | SD | Median | Mode | Decision |
|-----|--|------|------|--------|------|-----------|
| 1 | Existence of formal institutional policy on open science | 2.68 | 0.93 | 3.0 | 3 | Agreed |
| 2 | Presence of an open access policy for scholarly communication | 2.63 | 0.92 | 3.0 | 3 | Agreed |
| 3 | Availability of copyright and intellectual property policies | 2.59 | 0.97 | 3.0 | 3 | Agreed |
| 4 | Existence of research data management and sharing policy | 2.54 | 0.95 | 3.0 | 3 | Agreed |
| 5 | Existence of library guidelines for repository management | 2.72 | 0.94 | 3.0 | 3 | Agreed |
| 6 | Institutional alignment with national or international open science frameworks | 2.57 | 0.96 | 3.0 | 3 | Agreed |
| 7 | Incentives for faculty participation in open access publishing | 2.46 | 0.98 | 2.0 | 2 | Disagreed |
| 8 | Inclusion of open science in university research strategy | 2.62 | 0.95 | 3.0 | 3 | Agreed |
| | Grand Mean/SD | 2.60 | 0.95 | | | |

Note: Mean, median, and mode were used as complementary measures of central tendency. An agreement was defined as a score of 2.50 or higher. Source: Prepared by the Authors.

As shown in Table 3, most respondents agreed that institutional policy frameworks exist to guide open science in varying degrees. Policies on repository management (Mean = 2.72), open science (Mean = 2.68), and open access (Mean = 2.63) were particularly acknowledged. Copyright policies (Mean = 2.59) and alignment with national or international frameworks (Mean = 2.57) were also moderately affirmed. However, incentives for faculty participation in open access publishing

(Mean = 2.46) fell below the acceptance threshold, indicating that while policies are in place, mechanisms to encourage active researcher engagement remain weak. The overall grand mean (2.60) suggests that institutional policies provide a moderate foundation for open science, but practical enforcement and incentive structures are still underdeveloped

4.4. *Library practices supporting open science*

The third research question focused on the professional practices employed by academic libraries to facilitate open science in federal universities in South-East Nigeria. The findings are presented in Table 4.

Table 4. Descriptive statistics on library practices supporting open science (N = 208)

| S/N | Item | Mean | SD | Median | Mode | Decision |
|-----|---|------|------|--------|------|-----------|
| 1 | Management of institutional repositories for open access publishing | 2.77 | 0.94 | 3.0 | 3 | Agreed |
| 2 | Digitisation of theses, dissertations, and other scholarly works | 2.72 | 0.95 | 3.0 | 3 | Agreed |
| 3 | Provision of information literacy and digital skills training | 2.81 | 0.92 | 3.0 | 3 | Agreed |
| 4 | Collaboration with faculty on research dissemination | 2.69 | 0.97 | 3.0 | 3 | Agreed |
| 5 | Promotion of open access publishing among researchers | 2.65 | 0.93 | 3.0 | 3 | Agreed |
| 6 | Offering research data management support services | 2.56 | 0.96 | 3.0 | 3 | Agreed |
| 7 | Conducting outreach and advocacy for open science awareness | 2.48 | 0.98 | 3.0 | 3 | Disagreed |
| 8 | Engagement in open educational resources (OER) initiatives | 2.51 | 0.95 | 3.0 | 3 | Agreed |
| 9 | Providing guidance on the ethical use of open data and research outputs | 2.66 | 0.94 | 3.0 | 3 | Agreed |
| 10 | Supporting collaborative research through digital platforms | 2.59 | 0.96 | 3.0 | 3 | Agreed |
| | Grand Mean/ SD | 2.64 | 0.95 | | | |

Note: Mean, median, and mode were used as complementary measures of central tendency. An agreement was defined as a score of 2.50 or higher. Source: Prepared by the Authors.

The results in Table 4 reveal that academic libraries are actively engaged in practices that support open science. Strong practices include information literacy training (Mean = 2.81), repository management (Mean = 2.77), and the digitisation of scholarly works (Mean = 2.72). Libraries also moderately engage in faculty

collaboration (Mean = 2.69) and ethical guidance on the use of open data (Mean = 2.66). However, outreach and advocacy for open science (Mean = 2.48) fell below the acceptance threshold, indicating limited effort to promote awareness among researchers. Overall, the grand mean of 2.64 indicates that, although professional practices are moderately aligned with open science principles, there remains a need to strengthen advocacy, faculty partnerships, and data management services.

4.5. Challenges hindering academic libraries in supporting open science

The fourth research question sought to determine the challenges hindering academic libraries in federal universities in South-East Nigeria from effectively supporting open science. The results are presented in Table 5.

Table 5. Descriptive statistics on challenges hindering open science adoption in academic libraries (N = 208)

| S/N | Item | Mean | SD | Median | Mode | Decision |
|-----|--|------|------|--------|------|----------|
| 1 | Inadequate funding for infrastructure and services | 2.86 | 0.90 | 3.0 | 3 | Agreed |
| 2 | Unstable power supply and poor energy backup systems | 2.81 | 0.92 | 3.0 | 3 | Agreed |
| 3 | Insufficient ICT facilities and digital tools | 2.74 | 0.94 | 3.0 | 3 | Agreed |
| 4 | Poor internet connectivity and low bandwidth | 2.77 | 0.93 | 3.0 | 3 | Agreed |
| 5 | Lack of institutional open science policies | 2.63 | 0.95 | 3.0 | 3 | Agreed |
| 6 | Low digital literacy among library staff and researchers | 2.71 | 0.94 | 3.0 | 3 | Agreed |
| 7 | Limited training opportunities for librarians | 2.68 | 0.96 | 3.0 | 3 | Agreed |
| 8 | Low awareness and adoption of open science by faculty | 2.59 | 0.97 | 3.0 | 3 | Agreed |
| 9 | Inadequate collaboration between libraries and researchers | 2.62 | 0.95 | 3.0 | 3 | Agreed |
| 10 | Resistance to change from traditional publishing models | 2.55 | 0.98 | 3.0 | 3 | Agreed |
| | Grand Mean | 2.70 | 0.94 | | | |

Note: Mean, median, and mode were used as complementary measures of central tendency. An agreement was defined as a score of 2.50 or higher. Source: Prepared by the Authors.

As shown in Table 5, respondents agreed that several challenges significantly hinder academic libraries' ability to support open science. The most critical barriers include inadequate funding (Mean = 2.86), unstable power supply (Mean = 2.81), and poor internet connectivity (Mean = 2.77). Other notable challenges

are insufficient ICT tools (Mean = 2.74) and low digital literacy among staff and researchers (Mean = 2.71). Institutional-level issues, such as the lack of policies (Mean = 2.63), low faculty awareness (Mean = 2.59), and resistance to traditional publishing practices (Mean = 2.55), also constrain adoption. The overall grand mean of 2.70 indicates that systemic, infrastructural, and cultural challenges collectively weaken libraries' capacity to embrace open science fully.

5. Discussion, conclusion and recommendations

5.1. Discussion of findings

The findings of this study reveal a multifaceted landscape of infrastructural readiness, policy engagement, and professional practices within federal university libraries in South-East Nigeria as they transition toward open science. Consistent with earlier studies by Abdu, Farouk, and Maisango (2025) and Agboke and Oladokun (2025), this research confirms that infrastructural deficits remain a significant barrier. Respondents cited unreliable internet connectivity, limited access to digital repositories, and inadequate ICT facilities as persistent challenges. However, unlike previous studies that focused on broader national or regional trends, this study provides localised evidence indicating that some federal institutions in the South-East have begun leveraging existing infrastructure to support open access publishing and data sharing, albeit inconsistently.

Policy engagement across institutions was uneven. While national frameworks such as the National Policy on Open Educational Resources (Adedoyin *et al.*, 2024) and the Model Open Science Policy (WACREN, 2024) offered strategic direction, only a minority of libraries reported having formalised internal policies aligned with these instruments. This finding echoes Adedoyin *et al.*'s (2024) observation of low institutional compliance and highlights a persistent gap between national aspirations and institutional realities. Furthermore, the study uncovered that policy awareness among library staff was generally low, suggesting a need for targeted advocacy and stronger administrative commitment.

Professional practices among librarians showed encouraging trends. A majority of respondents reported active involvement in managing institutional repositories, conducting information literacy training, and supporting research activities. These findings align with Ango (2024) and Onwubiko (2023), who documented increasing digital engagement among librarians in North-Central and South-Eastern Nigeria. However, the current study extends these insights by directly linking such practices to open science outcomes, including data transparency and collaborative research. Despite moderate digital skills, librarians demonstrated a willingness to adopt open science tools, provided that adequate training and institutional support are available.

Finally, the study identified several implementation challenges, including limited funding, resistance to change, and lack of technical expertise. These findings corroborate those of Agboke and Oladokun (2025) and Tella *et al.* (2023), who emphasised the role of emerging technologies and digital literacy in shaping library service delivery. Within the South-East context, institutional inertia and fragmented policy execution were particularly pronounced, underscoring the need for coordinated efforts across infrastructure, policy, and capacity-building domains.

Overall, this study contributes new empirical insights by situating open science adoption within the specific realities of federal university libraries in South-East Nigeria. It highlights both the progress made and the systemic barriers that must be addressed to operationalise open science principles in the region fully.

5.2. Conclusions

This study explored the role of academic libraries in supporting open science through infrastructure, policy frameworks, and professional practices within federal universities in South-East Nigeria. The findings revealed that, although libraries provide moderate infrastructure support, such as ICT facilities, internet connectivity, and digital repositories, significant challenges persist. These include unstable power supply, limited access to open-source tools, and inadequate physical spaces, all of which constrain effective service delivery. At the policy level, institutional frameworks exist but are often weakly enforced, with minimal incentives to encourage faculty participation in open science initiatives. Although librarians actively engage in information literacy training and repository management, outreach and advocacy efforts remain underdeveloped, limiting broader institutional uptake. Systemic barriers, including funding shortages, infrastructure deficits, low digital literacy, and institutional inertia, continue to impede the full adoption of open science practices. Guided by Rogers' Diffusion of Innovations Theory, the study concludes that academic libraries in the region are gradually integrating open science principles. However, infrastructural, policy, and cultural constraints impede the widespread diffusion of this approach across universities. Strengthening these dimensions through targeted investment, policy reform, and capacity building is essential to advancing transparency, collaboration, and visibility in scholarly research across Nigerian federal universities.

5.3. Recommendations

Based on the findings, the following recommendations are made:

- (1) Federal universities should prioritise investment in ICT facilities, stable internet connectivity, reliable power supply, and adequate research spaces to support open science.

- (2) University administrations should formalise and enforce comprehensive open science policies, with clear guidelines for repository management, data sharing, and copyright compliance. Incentive structures should be established to encourage faculty participation in open access publishing.
- (3) Academic libraries should intensify efforts in outreach and advocacy, actively engaging faculty and students in open science awareness programs. Libraries should also expand training on research data management and the ethical use of digital resources.
- (4) Continuous professional development programs should be provided to enhance librarians' digital skills, enabling them to act as effective facilitators of open science.
- (5) Adequate funding should be allocated to libraries for open science initiatives. Collaboration with national and regional bodies such as LIBSENSE, NITDA, and WACREN should be strengthened to align with global open science frameworks.

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Rola bibliotek akademickich we wspieraniu otwartej nauki: infrastruktura, polityki i praktyki na federalnych uniwersytetach w południowo-wschodniej Nigerii

Abstrakt

Cel/Teza: Celem badania jest analiza sposobów, w jakie biblioteki akademickie wspierają otwartą naukę poprzez infrastrukturę, ramy polityk oraz praktyki funkcjonujące na federalnych uniwersytetach w południowo-wschodniej Nigerii.

Podejście/Metody: Badanie ankietowe przeprowadzono wśród pracowników bibliotek pięciu federalnych uniwersytetów (N = 208), z wykorzystaniem ustrukturyzowanego kwestionariusza. Statystyki opisowe posłużyły do opracowania wskaźników dotyczących infrastruktury, ram politycznych oraz praktyk działania.

Wyniki i wnioski: Biblioteki wykazują umiarkowany poziom przygotowania infrastrukturalnego oraz obecność ram politycznych i angażują się w zarządzanie repozytoriami. Jednocześnie borykają się z brakiem stabilnych dostaw energii, nieskutecznymi działaniami informacyjnymi oraz ograniczoną współpracą z kadrą akademicką. Istotnymi barierami w realizacji działań z zakresu otwartej nauki pozostają niedostateczne finansowanie oraz deficyty w zakresie technologii informacyjno-komunikacyjnych.

Oryginalność/Wartość: Artykuł dostarcza zlokalizowanych empirycznych dowodów łączących infrastrukturę, polityki i praktyki biblioteczne z adopcją otwartej nauki w regionie, wspierając tym samym kształtowanie strategii instytucjonalnych i krajowych.

Słowa kluczowe

Biblioteka akademicka. Infrastruktura. Otwarty dostęp. Otwarta nauka. Polityki. Repozytorium instytucjonalne. Wsparcie badań.

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Perpetual archiving in Polish open access journals in light of data from the Directory of Open Access Journals

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Abstract

Purpose: Long-term, or perpetual, archiving of content is essential for preserving access to scientific knowledge and cultural heritage. In light of studies on so-called vanished journals, this issue has become particularly important, especially in the context of Open Access journals.

Method: A multiple-case study was used. The study tracked declarations made by Polish Open Access journals indexed in the *Directory of Open Access Journals* (DOAJ) regarding perpetual archiving. Using database filters, Polish journals were identified, and data were then personally collected on their declared perpetual archiving policies, including the services and repositories used. The analysis covered data from the last five years and included more than 250 titles out of over 858 Polish journals indexed in DOAJ.

Results: A large proportion of Polish journals indexed in DOAJ did not declare any long-term content archiving policy in the services recommended by DOAJ in 2020–2024, in accordance with the services listed by *The Keepers Registry*. Among the journals whose editorial offices or publishers declared such a policy, the most frequently indicated services were PKP PN, CLOCKSS, LOCKSS, Portico, and the Internet Archive. No significant relationship was found between a journal's business model, including the use of Article Processing Charges (APCs), and its content archiving policy. It is concerning that some editorial offices of journals registered in DOAJ have not declared any policy on the long-term archiving of content.

Originality/Cognitive value: To date, the state of perpetual archiving in Polish Open Access journals has not been the subject of broader research. This study contributes to expanding research on disappearing journals in Polish science.

Keywords:

Open Access; perpetual archiving; scientific journals.

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1. Introduction

As noted by Eugenia Beh and Jane Smith (2012), the proper preservation of library collections is considered one of the core functions of libraries. It entails not only ensuring continuous access to resources—whether purchased or subscribed—but also archiving them and maintaining perpetual access. This also applies to titles that, for various reasons, have ceased publication.

While archiving refers to the storage of information, perpetual access is associated with the library's right to access licensed electronic journals—previously subscribed to—after the end of the subscription period (or when the journals are no longer available). Both authors point out that access to electronic journals in today's digital environment poses a significant challenge for librarians and the wider academic community. While in previous decades the content of subscribed journals could be archived in physical form—such as bound volumes or microfilm copies—today's electronic journals require a much higher level of engagement in terms of perpetual archiving, particularly in relation to titles that, for various reasons, are no longer subscribed to by libraries or have disappeared from the publishing market (Beh & Smith, 2012).

According to the definition proposed by the Electronic Resource Management Initiative of the Digital Library Federation, perpetual archiving is “the right to ongoing access to licensed materials paid for during the term of the license agreement” (Carr, 2010). Grzegorz Gmiterek defines it as “a set of processes designed to ensure continuous access to materials that form part of the digital heritage, for as long as such continuity is required” (Gmiterek, 2013). This raises the question of how access to content can be ensured and how the preservation of journal content can be addressed in a way that is convenient not only for libraries but, above all, for researchers and scholars, who are not only creators but also users of the content published in digital journals.

Gmiterek (2013) draws attention to the issue of the accessibility of long-term archived copies of documents, in particular to the preservation of mechanisms to ensure future users can access the “authentic content of a digital document” and use it in accordance with its original purpose, regardless of changes in formats, technologies, and modes of access.

According to Aneta Januszko-Szakiel (2009), key parameters from the perspective of access to archival materials are integrity and authenticity. As the author explains, this is related to their completeness and resistance to unauthorized or inappropriate modifications. These may include intentional actions by unauthorized users, errors or negligence on the part of authorized users, interference caused by computer viruses or other malicious software, as well as damage resulting from failures of hardware, communication channels, power supply, or software errors.

Another factor relating to the usability of archived digital resources is also worth noting. Januszko-Szakiel (2009) emphasizes that, alongside accessibility, usability also entails the possibility for authorized users to make use of collections within the scope of their access rights. As Gmiterek (2013) notes, in the face of rapid technological change—which also affects the field of digital archiving—such accessibility can be maintained through migration to new, currently used formats, simulation of the original access environment (emulation), or by separating data from their original storage media and preserving them in a digital archival repository.

According to Ellen Finnie Duranceau (1998), libraries must become aware of the scale of the responsibility they share with journal publishers. It is necessary to develop an appropriate strategy, particularly for low-budget projects whose content has not been secured in any way, for example, by inclusion in an e-journal aggregator. Publishers are generally willing to declare support for archiving. The problem, however, is that libraries have no guarantee whether such cooperation will continue or how long it will last.

The author questions the reliability of publishers' commitments, as they may eventually withdraw from participation in the process of perpetual archiving and effectively leave libraries to manage on their own. Developing an ideal model for preserving journal content is not easy, but it is achievable through the combined expertise of librarians and the technical capabilities of entities responsible for publishing periodicals.

A separate issue is persuading publishers to archive content independently, especially for titles that cease publication or disappear from the market for reasons beyond their control.

2. Literature review

Discussions on the long-term archiving of electronic publications began in the library sector in 1993–1995. The first institution to take action in this area was the National Library of Australia, whose staff developed procedures for preserving materials stored in electronic form. At that time, the Preserving Access to Digital Information group (hereafter: PADI) was formed, with the primary goal of developing a national strategy that would include guidelines for the long-term preservation of the accessibility and usability of digital resources in Australia.

A website was also created, which served not only as a platform providing information about the activities of the newly established body, but also as a forum for the exchange of information and cooperation among representatives of institutions involved in the creation, preservation, and dissemination of collections.

Parallel work was carried out in the United States, initially through the National Archives and Records Administration (hereafter: NARA). The development of

the Electronic Records Archives program (hereafter: ERA) was initiated, with the Library of Congress becoming involved, particularly in the archiving of its American Memory collections. Between 1996 and 2000, the National Digital Library Program was implemented, and in 2000, the United States Congress approved the national digital preservation initiative—the National Digital Information Infrastructure and Preservation Program (hereafter: NDIIPP).

In Europe, the first discussions on the perpetual archiving of journal content emerged in the Netherlands and Germany in the mid-1990s. More advanced work in this area began between 1998 and 2000. It is also worth noting efforts in the United Kingdom, where in 2001 the Digital Preservation Coalition (hereafter: DPC) was established as a body responsible for safeguarding the national digital heritage.

In Poland, the issue of long-term archiving also requires greater attention and commitment from both libraries and journal publishers. While projects aimed at digitization of collections have long been implemented with considerable success, initiatives focused on archiving digital materials are introduced reluctantly or only on an occasional basis. This is primarily due to a lack of sufficient expertise in this area and the absence of established standards that could be applied across institutions (Januszko-Szakiel, 2010).

Among researchers dealing with long-term or perpetual archiving, many focus on the regulation of rights related to licenses for accessing electronic resources. For example, Michelle Polchow (2021) notes that changes in subscription service models have drawn library users' attention to the issue of content archiving. Moreover, few institutions are aware of users' expectations and of the role they must play in ensuring sustained access to information. Libraries may encourage copyright holders to participate in archiving initiatives; however, in practice, this happens very rarely. This also applies to publishing in Open Access.

On the other hand, it is worth noting that many libraries still approach journal subscriptions and perpetual archiving with considerable caution (Meddings, 2011). Eileen Gifford Fenton (2006) emphasizes that most institutions are unwilling to allocate substantial financial resources to these purposes and continue to prioritize the acquisition of print journals. As she observes, demand for print resources remains high, limiting scholarly publishers' ability to reduce investment in the production and distribution of printed materials.

To enable both libraries and publishers to change this situation, it is necessary to develop reliable solutions for electronic archiving. According to Patrick J. Carr (2010), formats, tools, and workflows may change, but the goal remains the same—ensuring continuous access to information for present and future generations. He also points out that libraries should respond to the expectations of future users. As access to electronic resources continues to expand, it becomes essential to establish principles of cooperation, particularly with consortia responsible for managing archiving platforms.

Martin Paul Eve (2024) notes that despite advanced technological solutions implemented across many areas, the digital preservation of serial publications remains a low priority. A significant proportion (approximately 28%) of scholarly journal articles with DOIs appears to be entirely unpreserved in archives. The problem is not limited to academic journals. Among the many factors contributing to this situation, the author highlights concerns regarding the formats in which materials are preserved. It should be noted that digital preservation is a multi-stage process carried out over time. Moreover, it requires continuous reinvestment and an appropriate level of effort to ensure sustained protection and access to information.

It is also worth noting that in recent years several initiatives have emerged to support the perpetual archiving of journal content. One example is the LOCKSS Program (“Lots of Copies Keep Stuff Safe”). It offers decentralized and distributed preservation, seamless perpetual access, and archiving of authentic, original versions of content and works within an open-source model (LOCKSS Program, n.d.).

LOCKSS was launched by the Stanford University Libraries in 1999, and its development was closely aligned with the needs of the library community, following the traditional paper-based preservation model, in which multiple copies of individual content elements are distributed worldwide to ensure availability in the event of loss or destruction of one copy (LOCKSS Program, n.d.). Similarly, LOCKSS provides continuous, real-time access to digital materials through a distributed peer-to-peer network.

In practice, following permission from the publisher, individual libraries or their partners create local archives of their Open Access and subscription-based collections. At the same time, each library operates within the system as one of many nodes and remains connected to other participating institutions in the network. In the event of damage or loss of a copy, it can be immediately repaired or replaced with a copy from another library. When preserved content becomes unavailable from the publisher, LOCKSS lifts access restrictions and provides access to all users.

Since its launch over two decades ago, LOCKSS has become one of the most widely used preservation programs among academic institutions.

Another tool—CLOCKSS—was established in 2006 on the initiative of the Private LOCKSS Networks. Like its predecessor, it provides continuous preservation of content, ensuring that materials remain accessible even when they are no longer available directly from the publisher.

LOCKSS technology is also used by the PKP Preservation Network (hereafter: PKP PN). This is a long-term digital preservation program implemented by the Public Knowledge Project (PKP), which manages the open-source journal publishing system known as Open Journal System (OJS). Preservation activities had been planned by PKP since 2014 and were offered to publishers using OJS at the turn of 2015–2016.

PKP PN distinguishes two types of trigger events, which result in the ingestion of archived content into one or more OJS instances maintained by PKP member institutions. The first such event may be a notification from an OJS journal manager that the publisher has ceased publishing and maintaining the journal. The second is the discontinuation of payments to PKP PN following a period of inactivity in publishing (PKP Preservation Network, n.d.).

PKP PN uses automated techniques to detect potential trigger events and then follows up with journals to confirm their publication status. The network offers archiving for journals that use an appropriate version of OJS (v. 3.1.2 or later), have a registered ISSN, and have published at least one article. Archiving is carried out automatically via an OJS plugin and is free of charge for institutions using the system.

Another solution increasingly adopted by libraries worldwide is Portico, managed by an advisory board composed of librarians and publishers. The platform was launched by the organization Ithaka in 2005. Like the tools described above, Portico provides access to triggered content. The difference is that materials behind a paywall are made available exclusively to libraries participating in Portico, regardless of whether they previously subscribed to the triggered title.

Portico includes nearly 34,000 journals. Unlike LOCKSS-based systems, it operates as a centralized archive and does not require libraries to maintain their own servers. However, this comes with higher financial costs, which not all libraries can afford (Laakso et al., 2021).

In addition to the services discussed above, providing long-term preservation of content, the Keepers Registry should also be noted, as an initiative that serves as a global registry tracking archiving status of digital content assigned ISSNs—including e-journals and other continuing resources—and operates within the ISSN Portal.

It enables librarians and decision-makers to identify which organizations are responsible for preserving specific e-resources, how preservation is carried out, and under what access conditions. It also supports cooperation among archiving agencies that act as long-term custodians of digital content and seeks to promote awareness of the importance of digital preservation in safeguarding cultural and scientific heritage (About Keepers Registry, n.d.).

In addition to the preservation services mentioned earlier, the Keepers Registry aggregates data from initiatives and institutions such as the British Library, the Internet Archive, the Library of Congress, the Chinese National Digital Preservation Program, as well as the national libraries of France, Switzerland, the Netherlands, and Spain (Information about archiving agencies..., n.d.).

3. Long-term digital archiving and Open Access journals: introductory remarks

This paper presents the results of a study on perpetual archiving as declared by Polish scholarly journals indexed in the Directory of Open Access Journals. Before discussing the results, however, it is necessary to consider how Open Access is understood and how it relates to the issues of long-term digital archiving addressed in this article.

In the scholarly literature, numerous definitions of Open Access address different aspects of making content openly available. These definitions consider both primary and secondary openness (the so-called gold and green routes), as well as legal conditions for openness, particularly transparency regarding copyright ownership and licensing.

From a legal perspective, a distinction is made between *gratis* Open Access, in which content made available online may be used under the personal use provisions of copyright law, and *libre* Open Access, which allows users broader use of content beyond such limitations. In practice, *libre* Open Access typically involves applying an open license (e.g. Creative Commons or a publisher's own open license) and clearly specifying the terms governing copyright ownership (Suber, 2014; Pamuła-Cieślak, 2017b).

Peter Suber (2014) notes that Open Access was defined in three key declarations at an early stage of the debate on this form of making scholarly content available: the Budapest Open Access Initiative (February 2002), the Bethesda Statement on Open Access Publishing (June 2003), and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (October 2003). The definitions contained in these declarations emphasize that Open Access should be broad, easy, free of charge, and publicly available online, allowing users to read, download, copy, distribute, print, search, link to full texts, index, transmit as data to software, and use the content for any lawful purpose—without financial, legal, or technical barriers.

The only limitation permitted within this framework is the requirement to ensure authors' control over the integrity of their works and the right to proper attribution and citation (Suber, 2014).

Drawing on the declarations mentioned above, a widely cited definition of Open Access was proposed by Rachel Hardy, Charles Oppenheim, Tim Brody, and Steve Hitchcock (2005). They define Open Access as permanent online access to full texts of articles, free of charge for all users.

The adjectives “full” and “permanent” used in the definitions cited above clearly point to the importance of ensuring continuous, uninterrupted, and unimpeded access to content published in Open Access. Such access can only be ensured by long-term archiving.

This issue has been addressed in relatively few scholarly publications. A study commissioned by cOAlition found that many Open Access journals, regardless of their business model, report having no policy ensuring the perpetual archiving of content or, when describing their digital preservation policies, refer to services that do not provide such archiving (Bosman et al., 2021).

At the same time, research shows that Open Access content is disappearing permanently and irreversibly. Between 2000 and 2019, content published in 174 Open Access journals disappeared from the internet without trace (Laakso et al., 2021).

The findings of these studies have also served as a catalyst for expanding the availability of long-term digital archiving, particularly for Open Access journal publishers who cannot afford other forms of preservation. As a result, the JASPER project to archive Open Access journals was launched at the initiative of the team behind the Directory of Open Access Journals (Pamuła, 2024).

4. Study objectives and methodology

The aim of the study was to examine data on perpetual archiving in Polish Open Access journals to determine how many Polish Open Access journals indexed in the Directory of Open Access Journals (DOAJ) declare a policy of perpetual archiving, and to identify the business models under which they operate. It was assumed that the use of Article Processing Charges (APCs) may influence a journal's archiving policy, as such policies can be financed from these revenues.

The study also explored whether archiving policies depend on publishers. The hypothesis was that publishers influence the choice of archiving services for long-term preservation, as they are typically responsible for establishing agreements with archiving providers.

Data were selected using filters available in the DOAJ database, without a search query. In the section on indexed journals, the country-of-publication filter (Poland) was applied, and the indexing years were selected sequentially: 2020, 2021, 2022, 2023, and 2024 (up to 15 May). It should be noted that not all journals published in Poland are necessarily associated with Polish academic institutions or, more broadly, with Polish scholarship. This is due to the fact that two major publishers specializing in Open Access journals are based in Poland – De Gruyter and Sciendo (Pamuła-Cieślak, 2017a).

No attempt was made to distinguish between such affiliations; therefore, the study included all journals indexed in the database between 1 January 2020 and 15 May 2024 that declared Poland as the country of publication.

The following data were extracted from the records: year of indexing in DOAJ, journal title, DOAJ record URL and ISSN, information on declared perpetual archiving services or the absence of such a policy, business model (including

whether authors are charged fees and the amount of such charges, if any), and the journal's publisher.

The data were collected between 15 and 20 May 2024, which is important given the ongoing curation of records that no longer meet DOAJ requirements and the potential discrepancies resulting from this process. At that time, the Directory of Open Access Journals included 861 journals published in Poland. The analysed sample comprised 391 journals indexed in the database between 1 January 2020 and 15 May 2024, representing 45% of all Polish journals indexed in DOAJ.

5. Results

The results indicate that 303 titles (77.5%) out of 391 Polish Open Access journals indexed in DOAJ during the study period did not declare a policy of perpetual archiving in any service.

Among all 391 journals, 41 titles (10.5%) reported a business model based on author-paid fees. Journals charging APCs performed slightly better in terms of declared perpetual archiving than the overall sample: 16 of them (39%) have such a policy, while 25 (61%) do not.

Detailed numerical data are presented in Table 1.

Table 1. Number of fee-based and no-fee Open Access journals published in Poland, by the presence or absence of a perpetual archiving policy

| Polish journals in DOAJ | Total number of journals | Number of fee-based journals | Number of no-fee journals |
|---|--------------------------|------------------------------|---------------------------|
| | 391 | 41 | 350 |
| Journals with a perpetual archiving policy | 88 | 16 | 62 |
| Journals without a perpetual archiving policy | 303 | 25 | 278 |

Source: own elaboration.

The most frequently indicated perpetual archiving service among the journals analysed is Portico, with 40 instances. It is followed by the service offered by PKP PN, with 29 instances. The remaining archiving services selected by journals were reported much less frequently; details are presented in Table 2 and Figure 1.¹

¹ It should be noted that the total number of instances reported in Table 2 (103) exceeds the number of journals that declare a policy of perpetual archiving (88). This is because some journal records indicate that content is archived in more than one such service.

Table 2. Number of Polish Open Access journals indexed in DOAJ across long-term archiving services.

| Archiving service | Number of journals |
|--|--------------------|
| Portico | 40 |
| PKP PN | 29 |
| National Library of Poland (BN) | 8 |
| Internet Archive (IA) | 6 |
| Library / digital library (DL) | 3 |
| CLOCKSS | 3 |
| Scholars Portal | 3 |
| LOCKSS | 2 |
| Index Copernicus | 2 |
| Journal's own website | 2 |
| Polona | 2 |
| Digital Repository of Scientific Institutes (RCIN) | 1 |
| PubMed Central (PMC) | 1 |
| Other | 1 |

Source: own elaboration.

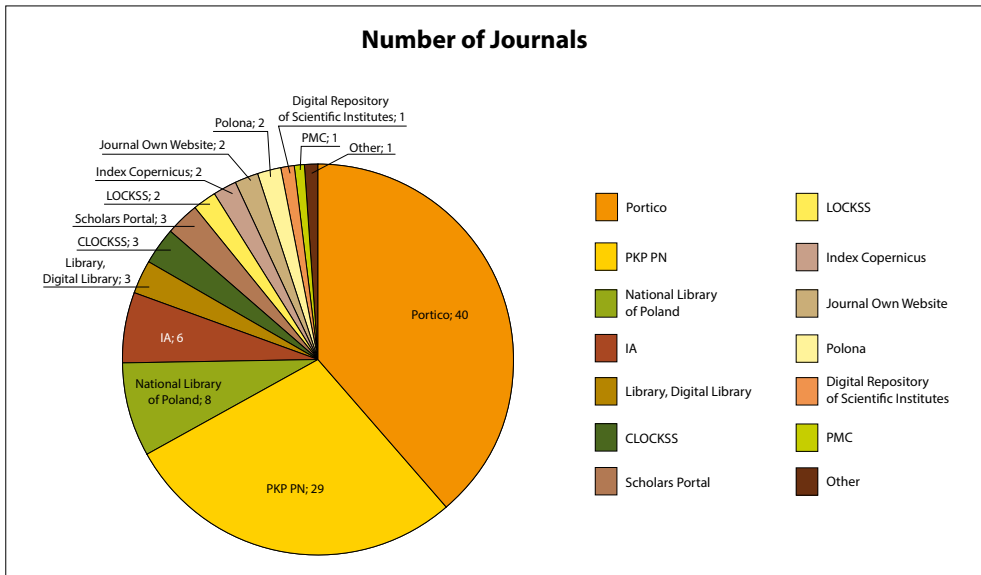
Most journals declaring long-term archiving in Portico are published by publishers specializing in Open Access, namely Sciendo (28 journals) and De Gruyter (9 journals). Among these, 16 journals charge APCs.

As noted above, 29 journals have archived their content in PKP PN. This group is dominated by journals published by universities, particularly by the University of Łódź Press (10 journals) and Adam Mickiewicz University Press (7 journals). The remaining journals indexed in this service are also university publications, including those from Cardinal Stefan Wyszyński University (3 titles), as well as individual titles from the University of Warsaw, Jagiellonian University, the University of Silesia, the Gdynia Maritime University, and the Pedagogical University of Kraków.

This may be related to the use of the Open Journal Systems (OJS) software developed by the Public Knowledge Project, which is also responsible for archiving within PKP PN. The use of OJS facilitates the preparation and transfer of content for archiving. To be archived in PKP PN, a journal must use an appropriate version of OJS (v. 3.1.2 or later), have an ISSN, and have published at least one article. Archiving is carried out automatically via an OJS plugin and is free of charge for institutions using the system, provided that the journal does not use any paid archiving services, such as CLOCKSS (PKP Preservation Network, n.d.).

Additionally, 44 of the 391 journals included in the study declared, in their DOAJ records, archiving in at least one fee-based service. The majority of these journals (32 titles) do not charge Article Processing Charges.

Figure 1. Declarations of content archiving by Polish Open Access journals indexed in DOAJ, by archiving service.



Source: own elaboration.

6. Conclusions

Polish Open Access journals indexed in DOAJ during the study period did not declare a policy of long-term content archiving. No significant relationship was found between a journal's business model or its publisher and the declaration of long-term archiving. However, a pattern can be observed: the fee-based service Portico is primarily selected by publishers specializing in Open Access journals, whereas services that offer free perpetual archiving (under certain conditions) are more commonly used by publishers affiliated with Polish higher education institutions.

Only five journals indicated the Internet Archive as their sole or one of several archiving services. Several editorial offices selected the "Other" option when applying to DOAJ, indicating services not intended for long-term digital preservation or for responding to trigger events (e.g. journal websites, CEJSH, digital library platforms), which confirms findings from studies on diamond Open Access journals (Bosman et al., 2021).

In light of the analyses conducted and the results obtained, there appears to be a clear need for education and support for publishers and editorial teams of Open Access journals regarding perpetual archiving policies, funding mechanisms, and available free preservation options. Otherwise, the permanent loss of access to Open Access journal content may become even more widespread, posing a risk to Polish scholarly journals published under this model.

7. Concluding remarks

Attention to the long-term archiving of Open Access content appears essential to ensuring access to the results of scientific research. In light of existing partial studies, it can be concluded that the problem exists, although it remains insufficiently explored, both globally and locally.

Addressing this issue requires the joint efforts of all relevant stakeholders, including government agencies responsible for science, custodians of digital content, research institutions, organizations promoting Open Access publishing, publishers, libraries (particularly academic ones), as well as authors and users interested in continuous, reliable, and open access to scholarly content.

Such efforts, however, first and foremost require awareness of the problem, an assessment of its scale, and financial resources, which are crucial to preserving this type of content.

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Wieczysta archiwizacja w polskich czasopismach otwartego dostępu w świetle danych z Directory of Open Access Journals

Abstrakt:

Teza/cel: Długoterminowa (wieczysta) archiwizacja treści jest niezwykle ważna, aby zachować dostęp do wiedzy naukowej i dziedzictwa kulturowego. W świetle badań dotyczących tzw. znikających czasopism (ang. *vanished journals*) tematyka ta stała się jeszcze ważniejsza, zwłaszcza dla czasopism otwartych.

Metoda: Zastosowano metodę wielokrotnego studium przypadku. Postanowiono prześledzić deklaracje polskich czasopism otwartego dostępu zarejestrowanych w Directory of Open Access Journals w zakresie wieczystej archiwizacji. Za pomocą filtrów dostępnych w bazie wyselekcjonowano polskie czasopisma, a następnie z autopsji zebrano dane na temat ich deklaracji w zakresie polityki wieczystej archiwizacji (informacja o serwisach, repozytoriach). Wykorzystano dane z ostatnich 5 lat (ponad 250 tytułów na ponad 858 zaindeksowanych w bazie).

Wnioski: Duża część polskich czasopism zaindeksowanych w DOAJ nie zadeklarowała polityki długotrwałej archiwizacji treści w żadnym z serwisów rekomendowanych przez DOAJ w latach 2020–2024 (zgodnie z serwisami rekomendowanymi przez „Keepers Registry”). Serwisami wskazywanymi przez te redakcje/wydawców, które taką politykę zadeklarowały, są najczęściej PKP PN, CLOCSS, LOCKSS, Portico oraz Internet Archive. Nie odnotowano znaczącego powiązania pomiędzy modelem biznesowym czasopisma (np. „Article Processing Charges”) a polityką archiwizacji treści. Niepokoi fakt, że część redakcji czasopism zarejestrowanych w DOAJ nie zadeklarowała żadnej polityki długotrwałej archiwizacji własnych treści.

Oryginalność/Wartość poznawcza: Stan archiwizacji wieczystej polskich czasopism otwartego dostępu nie był do tej pory przedmiotem szerszych badań. Jest to przyczynek do poszerzenia badań nad znikającymi czasopismami na polskim gruncie naukowym.

Słowa kluczowe

Czasopisma naukowe. Open Access. Otwarty dostęp. Wieczysta archiwizacja.

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ResearchGate's publisher solutions: a new chapter in platform–publisher relations?

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Abstract

Purpose/Thesis: This article presents the services offered by the ResearchGate platform for scientific publishers. Tools such as Publisher Solutions, Journal Home, and Open Access Agreement Upgrade aim to facilitate the legal sharing of content and increase the visibility of publications in the digital environment.

Approach/Methods: The article analyses the services provided by ResearchGate for publishers—ResearchGate Publisher Solutions, Journal Home, and Open Access Agreement Upgrade. It examines the platform's collaboration with publishers and discusses its impact on the dissemination of scientific publications beyond traditional publishing channels.

Results and Conclusions: Solutions such as ResearchGate Publisher Solutions and Journal Home, despite their clear advantages, raise questions about their compatibility with the principles of open science and their actual impact on the long-term accessibility of scientific research.

Originality/Value: The services offered by ResearchGate to publishers represent a new approach to the dissemination of scientific publications outside traditional publishing channels. As this is a relatively recent phenomenon, further analysis and research are needed. This article highlights the issue and may serve as an introduction to future studies.

Keywords

Academic social networks; open access; publishing copyright; ResearchGate; scholarly communication; scientific journals.

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1. Introduction

The aim of this article is to present and analyse the most recent forms of collaboration between the ResearchGate platform and academic publishers, with particular attention to services designed specifically for publishers, such as Publisher Solutions, Journal Home, and Open Access Agreement Upgrade. The article seeks to address the question of whether these initiatives represent a step towards genuinely open

science or instead constitute a new model of commercial control over the circulation of scholarly publications.

The article examines the origins of the conflict between ResearchGate and academic publishers, the nature of the agreements that have been concluded, and the development of new services such as Journal Home and Open Access Agreement Upgrade. The analysis is based on primary sources (press releases, court documents, and publishers' reports), as well as on the relevant literature concerning copyright law, open access models, and self-archiving practices. The research method employed in this study combines qualitative document analysis with a comparison of the solutions implemented by ResearchGate and individual publishers. This approach enables assessment of the extent to which the platform's new services reflect the principles of open science and transparency in scholarly communication.

The author therefore seeks to determine whether the services offered by ResearchGate genuinely support open science or constitute a new form of commercial control over the circulation of knowledge.

2. ResearchGate—a brief history

ResearchGate is arguably the most widely recognized social networking platform for scientists. Founded in Berlin in 2008 by two physicians and a computer scientist, it quickly attracted both a large user base and substantial private investment following its launch (Scott, 2017). As of June 2025, the platform gathers approximately 23 million members from 190 countries worldwide (ResearchGate a, n.d.). The service is free for users, while the platform generates revenue partly through advertising, which appears on the Q&A database webpage, as well as through job listings and conference announcements tailored to individual users.

According to statements on the platform's website, its mission is "to connect the world of science and make research open to all" (ResearchGate b, n.d.). A key feature of ResearchGate is the individual researcher profile, which allows users to showcase and promote their scholarly output. Users can outline their career trajectories, list their research interests, and share information about ongoing projects. Members of the community can follow other researchers' profiles, establish collaboration, and build professional networks. One of the features that particularly attracts users is the ability to share the full texts of their publications. Each publication on ResearchGate is associated with a page containing its metadata, along with a file—typically in PDF format—providing access to the full text. The deposit function for publications constitutes one of the platform's core features. Authors can upload preprint or postprint versions of their articles. ResearchGate also provides article-level metrics, such as the number of downloads or views.

Although such open sharing significantly enhances the visibility and accessibility of research, it has also led to considerable tensions with academic publishers.

3. The conflict between ResearchGate and academic publishers

A standard publishing practice is the Copyright Transfer Agreement (CTA), under which the author transfers the full copyright to the publisher. As a result, the author may not legally share the publication outside channels approved by the publisher, including on social networking platforms such as ResearchGate.

An alternative to the CTA is the Licence to Publish (LTP), which may be granted on either an exclusive or a non-exclusive basis. In this model, the author formally retains property rights to the publication but grants the publisher a licence to publish and distribute the work. In practice, however, problems arise. As shown by Coalition S (Rumsey, 2021, 2022), LTP agreements prepared by publishers often take the form of exclusive licences, which in reality restrict authors' rights almost as strongly as a CTA. Consequently, even when a publication is made available under a Creative Commons licence, the right to decide how it may be disseminated often remains with the publisher.

Many authors inadvertently violate the terms of their publishing agreements because they do not always understand which versions of their texts they are legally allowed to share (for example, the preprint, postprint, or the final published version). For many years, ResearchGate did not implement an effective mechanism to verify whether uploaded materials complied with publishing contracts. Complaints from publishers were met with the argument that authors themselves are responsible for ensuring their publications comply with copyright law.

The ability to easily share publications directly on ResearchGate became one of the main factors behind the platform's popularity. It should be noted, however, that a significant proportion of the PDF files uploaded to the platform are protected by copyright, and sharing them in violation of publishing agreements is illegal. This aspect of ResearchGate's activity provoked strong reactions from academic publishers, who argued that the platform facilitated the unlawful distribution of articles for which copyright had been transferred to publishers.

In 2017, a group of major academic publishers—including Elsevier, the American Chemical Society (ACS), Wiley, and Brill—formed the Coalition for Responsible Sharing (2017). Its aim was to take “formal steps to address the illicit dissemination of enormous amounts of published journal articles on ResearchGate's website” and to pressure the platform to limit unlawful practices. The coalition also referred to the Voluntary Principles for Article Sharing on Scholarly Collaboration Networks, developed by the International Association of Scientific, Technical and Medical Publishers (STM, 2015). In the same year, Elsevier and ACS filed a lawsuit against

ResearchGate in Germany and, in 2018, expanded the legal action by filing another lawsuit in the United States (Coalition for Responsible Sharing, 2018).

Under legal pressure, ResearchGate removed a substantial number of unlawfully shared files from the platform (in 2021, around 200,000 articles belonging to ACS and Elsevier). In 2022, a court in Munich ruled that ResearchGate bears partial responsibility for its users' illegal sharing of protected publications. However, it rejected the publishers' claims for damages, as they failed to demonstrate that they held licensing rights from all co-authors of the disputed articles (Chawla, 2022).

In September 2023, Elsevier, ACS, and ResearchGate reached a settlement that allows articles published by ACS and Elsevier to be legally shared on the ResearchGate platform. Although the details of the agreement remain confidential, it is known that ResearchGate will verify publication rights and determine how articles may be shared. Authors may store their articles in a protected version within their private profiles and share them with other users upon request, while the platform will identify materials that can be made publicly available (ResearchGate, 2023a).

While Elsevier and ACS pursued legal action, other members of the Coalition for Responsible Sharing—such as Springer Nature (Springer, 2018), Cambridge University Press, and Thieme—opted for amicable agreements with ResearchGate. Under these arrangements, ResearchGate declared that it would “promptly remove copyright-infringing content when alerted by publishers” and would work with publishers to educate platform users on the lawful sharing of research outputs (ResearchGate, 2018).

4. Publisher-oriented services on ResearchGate

4.1. *The ResearchGate Publisher Solutions service*

The agreements reached between ResearchGate and academic publishers have enabled the development of the ResearchGate Publisher Solutions service, which consists of three main components:

- Content syndication—allows full-text scholarly articles to be made available to researchers through the ResearchGate platform, both in open access and subscription-based models. Users without full access can view abstracts or the first page of a publication. The service has been operating since 2019.
- Journal Home—a dedicated journal page on the ResearchGate platform, available since 2021, which includes, among other elements, publisher branding, editorial recommendations, and statistics on user activity.
- Open Access Agreement Upgrade (OAAU)—a communication and analytics tool launched in 2024 that informs authors about open access publishing conditions under their institutions' transformative agreements.

Until recently, institutions could access content offered by publishers through two main models. The first consists of subscription agreements signed directly with publishers, in which case publications are available on the publisher's website. The second option involves subscribing through an aggregator that serves as an intermediary in content distribution. The aggregator licenses materials from the publisher and then resells access to institutions that sign agreements with the aggregator. In such cases, the content is hosted on the aggregator's platform (rather than the publisher's), meaning users have access only to materials available through that platform, not directly on the publisher's website.

In the content syndication model, institutions continue to subscribe to content from publishers. At the same time, the publisher additionally distributes the subscribed content through digital platforms, potentially reaching a larger and more diverse audience. For authors, this means that their work is made available not only in traditional journals but also on digital platforms, where access is significantly easier, and the potential reach is broader.

The syndication mechanism involves the publisher transferring a version of the publication known as the version of record (VoR) to a selected platform, where the text is made available and automatically linked to the author's profile—for example, on ResearchGate. In the case of open access publications, the content is freely available to all users. For subscription-based or hybrid publications, access is regulated by user permissions: authorized users can view the full text, while users without access can view abstracts, figures, or the first page of the publication. Authentication is usually multi-stage (this mechanism has been implemented on ResearchGate). First, the user's IP address is checked; if authentication does not occur in this way, the system verifies the user's affiliations and email address.

4.2. *The ResearchGate Journal Home service*

In 2022, ResearchGate expanded its offer for publishers by introducing the *Journal Home* service. This feature provides centralised ResearchGate landing pages for selected journals. These pages include publisher branding, links to the publisher's official website, editorial information, featured or recommended articles, and updates for followers about newly published content. Publishers can also use the *Editor's Pick* feature, which allows editors to highlight up to three articles per week. In addition, ResearchGate provides publishers with detailed statistics on publication usage, audience demographics, and engagement indicators.

Articles are automatically aggregated on the journal page based on metadata such as the ISSN, publisher information, and DOI records. For journals participating in the *ResearchGate Syndication* programme, article metadata and full texts are synchronised directly from the publisher's feed and linked to the authors' profiles.

4.3. ResearchGate Open Access Agreement Upgrade

In October 2024, ResearchGate introduced the Open Access Agreement Upgrade service (ResearchGate, 2024). This service functions as a tool for both communication and analysis. It enables ResearchGate users who are interested in publishing with a given publisher to obtain direct information on the platform about whether they are eligible to publish an article in open access in a given journal under the agreements held by their institutions (for example, Read & Publish or Transformative Agreements). For publishers, the service acts as a way to promote their open access publishing agreements and to reach potential authors. In addition, publishers receive statistical data on the number of researchers who have browsed journals, interacted with them, or were eligible to publish in open access under existing agreements.

5. Publishers' response

ResearchGate concluded its first content syndication agreement with the publisher Springer Nature in 2019. In 2020, the agreement was extended to include all titles from the Springer catalogue (the previous five years) and from Nature (the previous three years) (Springer, 2020). The publisher decided to expand collaboration following the success of the pilot programme. As indicated in a report jointly prepared by ResearchGate and Springer Nature (Hawkins et al., 2020), downloads increased from 0.6% to 19.5%, and more than 90% of the 700 surveyed authors supported continuing the partnership.

In 2021, a similar agreement was concluded with the publisher Wiley, initially covering 17 open access journals and later expanded to more than 700 titles. As stated in the announcement, “the expanded partnership includes nearly all open access journals published by Wiley, including association journals from the American Geophysical Union (AGU) and the Institution of Engineering and Technology (IET), as well as a broader range of hybrid journals” (ResearchGate, 2023b). In addition, Wiley syndicates 102 subscription or hybrid journals.

A survey of authors publishing with Wiley found that 98% of respondents were satisfied with the visibility of their research on ResearchGate. In 2023, more than 3,800 authors participating directly in the Journal Home programme published over 4,000 articles in Wiley journals. Among these authors, 1,300 had never previously published with Wiley, and 700 had not published with Wiley during the two years preceding the survey. This impact is confirmed by another survey of Wiley authors, in which 91% indicated they would be more likely to submit articles to a journal if they knew their work would be automatically shared on ResearchGate (2023b).

Taylor & Francis has also established cooperation with ResearchGate under the *Journal Home* model. The partnership covers all open access journals and platforms published by Taylor & Francis, including titles published under the Routledge, Dove, and F1000 imprints, as well as a broader range of hybrid journals (ResearchGate, 2024b). In this case as well, the publisher reported considerable success from the collaboration: increased engagement was observed from certain regions (such as Africa and South America), and more than 2,400 authors were encouraged through *Journal Home* to submit articles (Taylor & Francis, 2025).

Other publishers have also entered into cooperation with ResearchGate, including De Gruyter (an agreement from February 2023 covering 437 open access journals), IGI Global (a 2022 agreement covering its full open access portfolio), as well as publishers such as Hindawi, PLOS, and IntechOpen, and the following associations: the American Academy of Pediatrics, the American Meteorological Society, and the American Psychological Association.

Since 2019, ResearchGate has established cooperation with 58 academic publishers worldwide. These agreements primarily concern content syndication and the *Journal Home* service for journals published under full open access or hybrid models. Fourteen publishers have opted for full cooperation, syndicating all their publications on the platform. In addition to Springer Nature, this group includes Hindawi, the open access publishers PLOS and IntechOpen, as well as the American Academy of Pediatrics, the American Meteorological Society, and the American Psychological Association. Among this group, the Royal Society reported a 64% increase in article usage through *Journal Home*, with more than 70% of engagement coming from early-career researchers, doctoral candidates, and postdoctoral researchers (ResearchGate, 2023d). In the Polish academic publishing market, the publisher Termedia has also begun cooperating with ResearchGate, including thirteen fully open access titles in the *Journal Home* programme.

The publishers that have signed agreements for the Open Access Agreement Upgrade service include Taylor & Francis, De Gruyter, Brill, AIP Publishing, Cambridge University Press, SAGE Publishing, Royal Society, Wiley, BMJ, IOP, and Canadian Science Publishing.

6. Publisher services from ResearchGate: a bittersweet success

The solutions offered by ResearchGate, such as *Publisher Solutions* and *Journal Home*, appear, at first glance, to be attractive to both publishers and authors. Publishers gain greater control over what is shared and when it is made available outside their distribution channels, while authors can legally share their work without concerns about violating their publishing agreements.

However, the agreements between publishers and the platform seem to benefit only authors and their institutions. These arrangements are concluded without the active participation of authors, which means that publishers—not authors—continue to decide how and to what extent publications may be shared. Notably, in most cases, syndication covers only selected journals, and the criteria for title selection are not transparent. As a result, some authors publishing in a given journal may be able to share their work on ResearchGate, while others—even within the same publishing house—do not have this possibility. Such practices raise questions about fairness and transparency.

Another concern arises from restricting the legal sharing of publications to a single platform. This mechanism may limit the potential reach and impact of scientific research. In practice, it means that the communication channel is effectively confined to the community gathered around ResearchGate, excluding other repositories and social media channels.

It is understandable that reaching agreements with publishers was the only viable step for ResearchGate to avoid further lawsuits and to continue its operations. From an open science perspective, however, this form of distribution raises serious concerns. Making publications available in a partially open model—within subscription-based or hybrid journals—does not fully realize the idea of open access. ResearchGate also fails to meet several key requirements of Open Access infrastructure, such as long-term preservation, metadata interoperability, open standards, and transparent governance, as defined by the FAIR principles (Bilder, Lin & Neylon, 2020). ResearchGate was not designed as a long-term repository, and its terms of service permit the removal of content or even the complete closure of the platform, without any guarantee of continued access to the resources hosted there.

Such a centralized, commercial distribution channel, therefore, does not favour open science or the broad dissemination of knowledge. On the contrary, it may further restrict equitable access to research results. In practice, control remains in the hands of corporate actors, offering no assurance of the long-term availability of publications or service stability.

In its press releases announcing agreements with publishers, ResearchGate frequently refers to the idea of open access. In practice, however, the platform's operational model does not fully meet the definition of open access as formulated in the Berlin Declaration (2003), which emphasizes free and unrestricted access to publications without financial or technical barriers. Access to ResearchGate resources requires creating a user account, which poses a clear technical barrier. While such an account is currently free of charge, there is no guarantee this will remain the case in the future. Despite its declarations, the platform also fails to fulfil the principle of the democratization of science.

Moreover, ResearchGate's marketing is directed primarily at the academic community. Individuals outside this community are often unaware of the platform's

existence, which further limits its potential reach. It is estimated that there are approximately 8.8 million active scientists worldwide, and when doctoral candidates and other research staff are included, the number may reach as many as 15 million. ResearchGate, by contrast, reports around 23 million registered users. It should be noted, however, that not all of these accounts belong to active researchers; some belong to students, engineers, practitioners, or inactive users. Consequently, the platform's actual reach may cover only about 40–60% of the global population of researchers, depending on discipline and region.

It is also worth noting that the agreements concluded between publishers and ResearchGate do not represent a broader shift in publishers' general approach to authors' control over their work. Publishing agreements continue to restrict authors' control over their own work, for example, by requiring the transfer of economic rights or by structuring license-to-publish clauses so that the right to further distribute the publication remains with the publisher (Rumsey, 2021, 2022). Authors have repeatedly been warned that sharing full texts on ResearchGate without the publisher's consent may constitute a breach of their publishing agreements, particularly in cases where copyright has been transferred. The agreements concluded between publishers and ResearchGate do not fundamentally change this situation: publishers, as copyright holders, still decide where and in what form a publication may be made available.

Moreover, a review of publishers' policies reveals no significant changes in self-archiving rules following the agreements with ResearchGate. For example, on the websites of publishers such as Wiley (including Hindawi), Springer Nature, or Taylor & Francis, the traditional rules still apply: the submitted version may be self-archived at any time, while the accepted author manuscript may be self-archived only after an embargo period (usually 6–24 months), and that only applies to private or institutional repositories, not to commercial social networking platforms. There may be an exception, as in a brief note on the Taylor & Francis website in the section "Sharing versions of journal articles," titled "Post about article on scholarly collaboration networks (ResearchGate, Academia.edu, etc.)." It indicates that authors may share the AAM version on such platforms after the embargo period. On the Springer Nature website (in the section *Open access policies for journals*), under *Publisher deposition of papers published open access*, there is no reference to syndicating content to ResearchGate. Instead, the information concerns the transfer of content to PubMed Central (PMC) and Europe PubMed Central.

From a legal perspective, the actions of publishers fall within the boundaries of existing regulations. One may nevertheless ask whether they are ethical. Authors who transfer rights to their scholarly output should have full knowledge of where and in what form their publications will subsequently be distributed by the publisher, especially when this occurs through commercial platforms. In many cases, however, authors are not informed—either at the stage of signing the publishing agreement or afterwards—that their publication will be transferred for syndication within

ResearchGate or another platform. This creates a sense of opacity and weakens trust in publishers, particularly in environments where open communication and open science are promoted as fundamental values.

Moreover, there are no mechanisms that allow authors to withdraw consent to the sharing of their publications under such agreements if they do not agree to their work being made available on platforms such as ResearchGate. This represents another example of the transfer of full control to publishers, which runs counter to the idea of open science, in which authors should retain meaningful influence over the fate of their work.

For this reason, despite certain benefits arising from ResearchGate's agreements with publishers, these arrangements should not be regarded as fully consistent with the values of open access as defined by the Berlin Declaration or the FAIR principles. In its current model, ResearchGate remains primarily a social networking platform that facilitates collaboration among researchers and the exchange of knowledge, but it does not function as an open, long-term, and democratic infrastructure in the full sense of the term.

ResearchGate is a for-profit company whose services are designed to generate revenue. From the outset, however, it has cultivated the image of a space created *by and for* researchers, intended to facilitate the sharing of research results beyond the traditional, closed system of scholarly publishing. Researchers themselves were meant to form both the foundation and the driving force of the platform. On the platform's website, one can still read: "We put the researcher first." Yet the conclusion of agreements with commercial publishers, without transparent communication with authors, raises doubts about the actual implementation of this declaration. ResearchGate thus becomes a space increasingly shaped by publishers rather than by the community of researchers.

At the same time, publishers' control over how content is shared through ResearchGate may prove to only be ostensible. Journals that rely heavily on ResearchGate as a channel for reaching readers risk losing direct control over their audiences. If ResearchGate changes its terms or algorithms, the visibility of these journals may suffer. Nor does the service truly democratize access to scientific content. Journals that are not partners in the *ResearchGate Syndication programme* may not have access to the platform's full functionality, creating inequalities among journals on the platform.

7. Conclusion

The *Journal Home* feature on ResearchGate represents an important step toward balancing the interests of authors, publishers, and readers. It may help reduce copyright infringement by enabling the legal, controlled sharing of content while

increasing the visibility of scholarly research. In the long run, it may also contribute to changes in the standards of publishing agreements, thereby promoting greater transparency and respect for authors' rights to their own work.

From a long-term open access perspective, however, the solutions implemented by ResearchGate appear to be merely half-measures. The platform operates as a closed channel dependent on commercial decisions—both those of publishers and of the company itself—which may limit equal access to knowledge. Journals that do not have an agreement with ResearchGate may be unable to benefit from the same level of visibility and functionality, potentially deepening inequalities within the scholarly community.

The cooperation between ResearchGate and publishers, therefore, appears to be a compromise solution, but one burdened with significant limitations. It does not offer full openness, does not guarantee stable access to publications, and does not ensure transparency in decision-making. From the perspective of open science and authors' rights within the academic community, further critical reflection and debate are needed.

Ultimately, although ResearchGate has played an important role in promoting the sharing of research results, its current model of cooperation with publishers does not guarantee either genuine openness or the long-term accessibility of publications, leaving authors still subordinate to the decisions of commercial actors.

Translated by Katarzyna Laurent

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Usługi dedykowane wydawcom na ResearchGate: nowy rozdział w relacjach między platformą a wydawcami?

Abstrakt

Cel/Teza: Artykuł przybliża ofertę platformy ResearchGate dedykowaną wydawcom naukowym. Usługi Publisher Solution, Journal Home i Open Access Agreement Upgrade mają na celu usprawnienie prawnej wymiany treści i zwiększenie widoczności publikacji w przestrzeni cyfrowej.

Koncepcja/Metody badań: W artykule opisano ofertę platformy ResearchGate: ResearchGate Publisher Solution, Journal Home oraz ResearchGate Open Access Agreement Upgrade. Przedstawiono współpracę platformy z wydawcami oraz zarysowano jej wpływ na upowszechnianie publikacji naukowych poza obiegiem wydawniczym.

Wyniki i wnioski: Rozwiązania takie jak ResearchGate Publisher Solution i Journal Home, pomimo niekwestionowanych zalet, stawiają pytania dotyczące zgodności z zasadami otwartej nauki i ich rzeczywistego wpływu na długoterminową dostępność badań naukowych.

Oryginalność/Wartość poznawcza: Oferta dla wydawców platformy ResearchGate to zupełnie nowe podejście do kwestii rozpowszechniania publikacji naukowych poza obiegiem wydawniczym. Ze względu na to, że jest to dość nowe zjawisko, konieczne będą dalsze analizy i badania. Niniejsza publikacja sygnalizuje temat i może posłużyć jako wstęp do dalszych badań.

Słowa kluczowe

Akademickie sieci społecznościowe. Czasopisma naukowe. Komunikacja naukowa. Otwarty dostęp. ResearchGate. Umowy wydawnicze.

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Has AI written this paper? – A case study in „plagiarism detection”

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Abstract

Purpose/Thesis: The paper evaluates the use of GenAI content detectors in the context of verifying academic integrity. The main thesis is that content detectors cannot distinguish AI-generated text from human-authored content that has been stylistically edited only by large language models. Consequently, high detection scores do not constitute reliable evidence of plagiarism.

Approach/Methods: A case study method was employed. A biography of a fictional character was created by a human and subsequently edited using ChatGPT and Claude, with precise instructions that limited the AI to a purely editorial role. All versions were analysed using the ZeroGPT detector.

Results and conclusion: The original text scored a 0% probability of being AI-generated, while the versions edited by ChatGPT and Claude achieved 96.7% and 100%, respectively. Detectors identify stylistic features characteristic of well-edited texts, rather than the actual origin of the intellectual contribution.

Practical implications: The findings indicate the need to revise academic policies in light of AI detectors. Institutions should promote transparent rules for using AI as a supporting tool rather than relying on unreliable technologies that can lead to unfair assessments.

Originality/Value: The work provides empirical evidence of the unreliability of AI detectors in the context of plagiarism detection, establishes a clear ethical boundary between using AI as a tool and academic dishonesty, and promotes a conscious approach to new technologies in academia.

Keywords

AI content detection. Case study. Editorial tools. Ethics in science. Generative artificial intelligence (GenAI). Large language models (LLM). Plagiarism. Scholarly communication.

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1. Introduction

“Has AI written this paper?” This question and similar ones, while reading academic papers, have currently been asked by more and more people: reviewers and editors of scientific magazines, as well as lecturers who examine the works of their students. It results from the fact that the emergence and rapid popularisation of generative artificial intelligence (GenAI), especially large language models (LLMs), are among the most significant moments in the modern history of technological development. Their influence on the creation, processing and consumption of content is undisputed, and affects nearly every field of life, including, in a particular and multidimensional way, the academic community (Tillmanns *et al.*, 2025; Yusuf *et al.*, 2024). LLMs, such as the GPT family from OpenAI or Claude from Anthropic, ceased to be a technological curiosity and became advanced tools that can serve as assistants in research, programming, data analysis, and, above all, working with text.

However, such a technological transformation became the source of a fundamental conflict. On the one hand, scientists and authors received unprecedented support during the writing process, enabling them to improve the clarity of their works and, consequently, to make the content easier to understand and to reduce the likelihood that they will be misinterpreted by potential readers. It has a positive influence on the process of popularising scientific knowledge and thereby serves the goodwill of the academic community. On the other hand, the ease with which LLMs can generate broad, linguistically consistent texts on any topic has raised justified concerns about academic dishonesty, the integrity of scientific research, and even a new form of plagiarism (Francis *et al.*, 2025). To address such threats, numerous programmes have emerged to detect content allegedly generated by GenAI. It led to a phenomenon that may be called “moral panic”, where the usage of a tool that detects if the text was edited by an LLM seems to be a simple and effective remedy to the complex ethical problem.

However, this paper puts forth a thesis that relying uncritically on such assumptions and solutions is not only ineffective but even harmful to the process of scholarly communication. The following study questions have been asked in this work:

- (1) Can a text which has essentially been written fully by a human being be incorrectly qualified as a work of AI only after correcting it linguistically via an LLM?
- (2) Where is the boundary between using AI ethically as an advanced editorial tool and academic dishonesty?
- (3) What are the potential consequences of relying on AI detectors for students, teachers, researchers, reviewers, editors of magazines and the entire scientific ecosystem?

The main argument of this paper is a statement that the usage of an LLM as a “digital editor” is a natural and logical evolution of many tools that have assisted

us in writing for a long time, and is not plagiarism itself. At the same time, the current detection systems are not naturally able to distinguish generated content (where AI is the essential author) and edited one (where AI is only used as an editorial assistant), which poses a significant risk of false accusations and may restrain the development of good practices in the scholarly communication. To prove this claim, the follow-up to this paper presents a case study that illustrates the problem under controlled conditions.

2. Theoretical background and literature review

Technological assistance in the writing process is not a new phenomenon. Its history dates back to the first text editors equipped with simple spell-checking mechanisms. The next step was the implementation of grammar correctors, which could analyse basic sentence structures (Oakman, 1994). A breakthrough came with tools such as Grammarly, which, thanks to analysing large-scale data collections, offered stylistic suggestions, synonyms, and proposals to improve the text's fluency (Barrot, 2022). From this point of view, LLMs are the next, though much more advanced, link in the same evolutionary chain, if we look at it from both functional and technological perspectives. Their ability to identify contexts, linguistic nuances, and complex narrative structures makes them well-suited to the role of an advanced editorial assistant, not just a passive proofreader. Treating them as a completely new, unacceptable category of tools ignores this historical context of the technological development. Voices opting for the complete exclusion of adopting this technology, though justified, especially among people who fail to understand it and are afraid of it as a result, are in contradiction with the general idea of progress. This phenomenon is repeatable in general, and the humanity has experienced it with the appearance of every landmark innovation. However, after the stage of scepticism and fear, questions are usually asked not whether but how to use such a technology for the good of the civilisation and the balanced development of the humanity.

In light of rising controversies in the area of using GenAI tools in educational and research practices, it becomes necessary to precisely determine where the role of GenAI as an admissible tool ends, and where its usage related with academic dishonesty begins, which requires reconsidering the classical definition of plagiarism in the era of LLMs (Luo, 2024).

The classical definition of plagiarism, deeply rooted in academic ethics, refers to the appropriation of the ideas or data of others and presenting them as one's own, without proper reference to the source (Helgesson & Eriksson, 2015). Therefore, the crucial element is the origin of the intellectual contribution: the content of the paper on its merits. When the author uses an LLM to correct punctuation,

reformulate an unclear sentence or find a better synonym, there is no appropriation of the ideas of others. The author remains fully responsible for every fact, argument and claim contained in the paper. Its author is the source of knowledge, and the language model only assists with putting this knowledge into a more accessible language form. Within this context, the role of the LLM is functionally identical to the role of a human editor or a friend asked to read and give their opinion on the legibility and clarity of the text.

Unfortunately, despite the ethical purity of such usage of GenAI, the academic community quickly addressed this phenomenon, focusing not on the intent of the author but on the technological signature of the text, which directly led to the development of online services offering the possibility to detect AI-generated texts, being rapidly developed. However, numerous studies and technical reports show fundamental problems with their effectiveness and reliability. It was found that these tools tended to generate many false positives, marking human-written texts as AI-generated. This problem is particularly severe in case of texts that are structured by nature and use a specialist, repeatable language, which is visible in scientific, legal and medical texts.

Furthermore, these detectors often identify a feature called low perplexity, which indicates a high level of predictability of consecutive words in a sentence, as “artificial”. This is a distinguishing feature for LLM-generated texts, but, at the same time, this is a desired property of a clear and well-written text, as clarity and unambiguity are necessary in science to precisely convey results and replications of studies, as well as to build knowledge. It means that the scientific text should be predictable syntactically (so it should have low perplexity), so that the reader can focus on the merits, not on interpreting linguistic intricacies. As a result, the more effort the author puts into writing fluently, consistently and comprehensibly, the bigger risk is that their text will be marked by a detector. It creates a paradoxical situation in which tools intended to uphold quality may, in fact, punish the author for pursuing it.

From another point of view, treating the results of AI detectors indiscriminately as proof of dishonesty immediately brought a counter-reaction; namely, the development of tools intended to “humanise” a text. The purpose of these tools is to deliberately disrupt the fluency of a text generated by GenAI. They are tasked with implementing elements with high perplexity (simulating mistakes, inconsistencies, or excessively sophisticated vocabulary) to produce consistent, logically predictable phrases, which aims to reduce the indicator of detection by AI detectors. This process, fully automatic and large-scale, lets one instantly “spoil” content generated by artificial intelligence in order to simulate human editorial imperfections. The existence of such a category of tools proves that, under current technological circumstances, it is no longer an issue to have automatically generated content masked from detectors, also automatically and on a large scale, which additionally exposes the uselessness of the latter as an arbitrator of academic ethics.

3. Methodology of the case study

To empirically verify the research thesis, an experimental case study has been conducted. Such a choice of research method is justified by the need to achieve reliability and precision through a controlled course of the study, while at the same time ensuring a deeper, qualitative look typical of such a study. The ability to thoroughly analyse the phenomenon under strictly controlled conditions facilitates an ambiguous illustration and precise exemplification of the problems with the unreliability of AI detectors.

For the study, a text was written: a “raw” biography of a fictional character, Polish jazzman, Bronisław “Borsuk” (Badger) Wierzbicki, supposedly active during the post-war thaw. It can be assumed, though, that this profile has been written by a hypothetical historian based on barely accessible, non-digitalised sources, therefore, absent online as well (archives, interviews, press of the period). Thus, undoubtedly, the merits of this biography, being a synthesis of the specialist knowledge, reflect the intellectual contribution of the hypothetical author. This author, while creating a work-in-progress note, treated it as a research draft, not paying due attention to the fluency of the descriptions at this point, and even allowing themselves to make orthographic and stylistic errors absent-mindedly. The choice of such a fictional character as Bronisław “Borsuk” Wierzbicki was a deliberate methodological measure aimed at demonstrating that models can support editing a text on a topic unknown to them. What is important, the first name and surname of the character were deliberately duplicated with the identity of another well-known online fictional character (meaning he is potentially present in the models’ training data): a character from the TV series *Father Matthew* (*Ojciec Mateusz*). Such a measure aims to conduct the most convincing test: to prove that an LLM’s knowledge in a given field can be completely omitted with precise prompts, using the model only as a helpful editorial assistant and placing particular pressure on its linguistic skills. At the same time, it constituted an additional test of the models’ ability to follow prompts accurately and avoid a tendency to hallucinate or include external information in the text.

The draft prepared by the hypothetical researcher is presented below. As it was mentioned, it includes purposely introduced deficits in terms of grammar, stylistics and orthography, which was to simulate the natural structure of a draft, created by a human being, before its final edition:

Base (human) text: Bronisław “Borsuk” Wierzbicki was one of the most enigmatic jazz musicians during the thaw and 60es. He was respected as a tenor saxophonist and as a composer, and gained the status of a legendary titan of improvisation who combined the American hard bop with the subtle Slavic melancholy. It gave him an unofficial name of the “Polish Coltrane”. He had a band “Echa Północy” (Echoes of the North) with which he was giving concerts on Jazz Jamboree Festival and was successful. Besides, he was giving concerts outside the iron curtain with restrictions which was rare. The top of his career ended with a plot twist that was sudden and happened in 1968. While having

a tour in France, unclear incidents took place after which he did not decide, as many his friends, to stay in the west but returned to the country just to completely withdraw from public life within several next months and quit making music, and begin to work in warsaw as an RTV repairment technician. The reasons for such withdrawal are not known, and rumours on the topic concern being blackmailed by the Security Service and hypotheses on a spiritual crisis that was to be deep. They have remained a topic for speculations of musik historians until today. Which casts a shadow on his earlier legacy, which was splendid.

Before the tasks involving editing the text were carried out, the knowledge bases of the language models chosen for the study, i.e., ChatGPT and Claude Opus 4.1, had been verified. The goal of this procedure was to confirm that the models do not possess knowledge of a fictional character, Bronisław “Borsuk” Wierzbicki, which was an important element of the research project. The answers obtained from both models, confirming that they have no knowledge of the alleged jazzman (see Figure 1 and Figure 2), have guaranteed that their role was limited to linguistic and editorial skills, not to generate the merits.

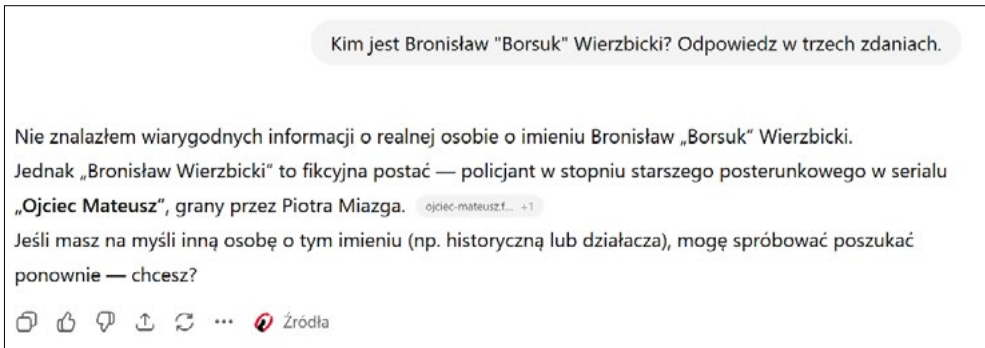


Figure 1. The answer of ChatGPT to the question about Bronisław “Borsuk” Wierzbicki.

Source: own elaboration

(Translation of figure 1):

Who is Bronisław “Borsuk” Wierzbicki? Answer me in three sentences.

I have not found reliable information on a real person called Bronisław “Borsuk” Wierzbicki. However, “Bronisław Wierzbicki” is a fictional character. He is a Senior Police Constable in a TV series *Father Matthew*, played by Piotr Miazga. If you mean a different person having this name (e.g., a historical one or an activist), I can try to search them again. Do you want it?



Figure 2. The answer of Claude Opus 4.1 to the question about Bronisław “Borsuk” Wierzbicki.

Source: own elaboration

(Translation of figure 2):

Who is Bronisław “Borsuk” Wierzbicki? Answer me in three sentences.

Based on available search results, the most probable Bronisław “Borsuk” Wierzbicki is a Senior Police Constable from the TV series Father Matthew, who appears regularly in the third, fourth, fifth, and sixth seasons, as well as sporadically in the seventh. Before he began working at a police station, he had worked in the traffic police. In one of the episodes, he moves to a police station in Kielce because of his mother’s illness.

Then, the base text, containing deliberately introduced deficits, served as the input data for ChatGPT and Claude Opus 4.1, with the option to use the formal style. In both cases, an identical prompt was applied, which is presented below.

The prompt conveyed to the models: As a proficient Polish language proofreader working in a scientific publishing house, edit the source text below, so that 1) it will lose no information in the target text, 2) orthographic, grammar, punctuation and stylistic errors will be corrected, 3) the general flow of the content will be corrected, so that the text will be of a formal nature and easy to read by a potential reader at the same time, 4) adjust the sentence order and move information among sentences to improve the fluency of the utterance, 5) do not use any formatting (bold, italics, numbered/point lists, markdown); it is to be a normal text, separated with paragraphs at the most.

For ChatGPT, the following edited version was received after processing the entry text:

Text edited by ChatGPT: Bronisław “Borsuk” Wierzbicki was one of the most enigmatic jazz musicians of the thaw period and the 60s. He was respected both as a tenor saxophonist and a composer. He gained a legendary reputation as a master of improvisation who combined the American hard bop with the subtle Slavic melancholy. This is the reason why he was called the “Polish Coltrane” since then. He was a leader of a band “Echa Północy” (Echoes of the North), with whom he gave performances on Jazz Jamboree Festival, being significantly successful. He also performed, though with restrictions, on both sides of the iron curtain, which was rare those days.

However, the top of his career was ended with a sudden and unexpected twist in 1968. During a tour in France, unclear incidents took place after which Wierzbicki, unlike many his friends who decided to migrate, returned to the country. Within several next months, he completely withdrew from public life, quitted making music, and began to work in Warsaw as an RTV repairment technician. The reasons for such an extreme decision have remained unknown. Diverse speculations have circulated, including a presumed blackmail from the Security Service and hypotheses on his deep spiritual crisis. They have remained a subject matter of discussions among music historians until today, casting a shadow on the legacy of this artist, though it has unquestionably remained outstanding.

For Claude Opus 4.1, the editorial process fruited with the following version of the text:

Text edited by Claude Opus 4.1: Bronisław “Borsuk” Wierzbicki belonged to the circle of the most enigmatic jazz musicians of the thaw period and the 60s. As a tenor saxophonist and composer, he gained recognition and the status of a legendary master of improvisation who was able to combine the American hard bop with the subtle Slavic melancholy. Thanks to such a unique style, he obtained an unofficial title of the “Polish Coltrane”.

Being the head of a band “Echa Północy” (Echoes of the North), he gave performances on the prestigious Jazz Jamboree Festival, being significantly successful. Moreover, he performed outside the iron curtain with restrictions, which was indeed rare those days. However, the top of his career was ended with a sudden plot twist in 1968. During a tour in France, unclear incidents took place after which Wierzbicki, unlike many his friends, did not decide to stay in the West but returned to the country. Within several next months, the artist completely withdrew from public life, quitted making music, and began to work in Warsaw as an RTV repairment technician. The reasons for such extreme withdrawal have remained unknown, and rumours circulating include hypotheses on being blackmailed by the Security Service and theses regarding his deep spiritual crisis. These speculations have been a subject of interest of music historians until today, casting a shadow on the earlier, splendid legacy of this artist.

Ultimately, the author’s raw draft and both texts corrected by the LLMs have been assessed by ZeroGPT.

4. Results

The edition of the base text carried out by ChatGPT benefited from significant improvements in fluency, consistency, and compliance with the standards of formal language. Those changes were purely stylistic and grammatical, and they fully satisfied the prompt, without introducing new information on the merits.

The model corrected formal and orthographic mistakes, eliminating spelling errors such as “60es” (changed into “60s”), “in warsaw” (into “in Warsaw”) and “musik” (into “music”) as well as improving the incorrect punctuation. One of the crucial interventions was improving consistency and reducing redundancies. The model

eliminated such structures, for example, by changing the sentence regarding the top of his career: “The top of his career ended with a plot twist that was sudden and happened in 1968” into the brief: “However, the top of his career was ended with a sudden and unexpected twist in 1968.” The LLM improved the lexical consistency by replacing repetitions and general statements with a more precise vocabulary. It also changed an informal phrase: “He had a band «Echa Północy»” into a more formal “He was a leader of a band «Echa Północy».” The stylistic and syntactic changes included dividing several long, complex sentences into shorter units, thereby increasing the text’s legibility and transparency. Syntactic inversion was introduced, sentence structures were diversified, and grammar and collocation errors were corrected. To sum up, the version edited by ChatGPT is semantically identical to the base text but shows significantly higher linguistic quality, featuring reduced perplexity (greater predictability and fluency) and higher syntactic consistency, in compliance with the standards of a professional publication.

Claude Opus 4.1 presented as high ability to improve the quality of a text base as ChatGPT, but operated on slightly different, though complementary, editorial strategies. As the previous model, Claude eliminated all the orthographic errors (“60es” into “60s”, “in warsaw” into “in Warsaw”, “musik” into “music”) as well as corrected punctuation and grammar. In the scope of syntax, the model significantly improved the structure of the opening paragraph. For example, the excessively condensed first sentence of the base text has been converted into a more fluent sequence: “Bronisław ‘Borsuk’ Wierzbicki belonged to the circle of the most enigmatic jazz musicians of the thaw period and the 60s” and “As a tenor saxophonist and composer, he gained recognition and the status of a legendary master of improvisation...”

In terms of stylistics, Claude Opus 4.1 focused on improving lexical formality and precision. It replaced less formal phrases, such as “He had a band «Echa Północy» with which he was giving concerts...” with “Being the head of a band «Echa Północy», he gave performances...” The model eliminated excessive adjectives, e.g., by converting “with a plot twist that was sudden and happened in 1968” into a brief “with a sudden plot twist in 1968.” Also, the improvement of the ending clause is visible, where “rumours on the topic concern being blackmailed by the Security Service and hypotheses on a spiritual crisis that was to be deep” was changed into a more formal: “rumours circulating include hypotheses on being blackmailed by the Security Service and theses regarding his deep spiritual crisis.” To sum up, the edition made by Claude Opus 4.1 does not change the text on its merits, but achieves a very high level of fluency and consistency, typical for professional editing.

Although both models achieved the same goal, which was eliminating formal errors and improving the fluency of the text to the publishing standard, a detailed analysis lets us observe subtle differences between their editorial strategies. Both ChatGPT and Claude Opus 4.1 successfully corrected orthographic and grammatical errors and removed pleonasms, thereby reducing the text’s perplexity.

In several places, ChatGPT seems to pursue greater brevity and stylistic elegance, introducing, e.g., a phrase about a “sudden and unexpected plot twist” instead of the original, more lengthy description, or changing a “legendary titan of improvisation” into a “legendary reputation as a master of improvisation.” In turn, Claude Opus 4.1 presented a slightly greater tendency to maintain the original semantic structure, making softer changes but introducing more formal and encyclopaedic phrases at the same time, such as “he belonged to the circle of the most enigmatic jazz musicians” and “he obtained an unofficial title.”

Ultimately, while both results are almost perfect, the text generated by Claude Opus 4.1 makes an impression of being slightly more systematised and polished in terms of syntax and vocabulary, achieving the “ideal” level of fluency that is characteristic for machine-assisted generating. Owing to the slight advantage in scope of lexical consistency and formal tone, it can be stated that in this specific editorial assignment, Claude Opus 4.1 is slightly ahead of its competitor, delivering a text of an exceptionally low perplexity.

The subjective opinion, indicating the higher fluency and optimisation of the text by Claude Opus 4.1, has been empirically confirmed by measures carried out with usage of an AI detector, ZeroGPT. The base text, being an author draft, has been correctly identified by the tool, with a 0% probability that it was generated by artificial intelligence (see Figure 3). In this way, it has been verified that the linguistic signature of the entry text was unambiguously human.

On the other hand, although both LLMs, as instructed, fulfilled only the editorial role and made no contribution to the merits, their influence on the text’s syntax and fluency immediately prompted the detector to react. The version edited by ChatGPT received 96.7% of the detection rate (see Figure 4) while the text processed by Claude Opus 4.1 was indicated with the maximum result of 100% as AI-generated (see Figure 5).

These results have unambiguously proven that the detector does not identify the intellectual origin of the content (contribution to the merits) but only focuses on stylistic and syntactic features of the text (low perplexity), which are the effect of linguistic optimisation.

5. Discussion

The results of the case study provide an unambiguous answer to the first research question: a text that has been written entirely by a human may be incorrectly classified as a work of AI only after linguistic correction via an LLM. Therefore, the basic conclusion is that the current tools for detecting content generated by artificial intelligence are unable to distinguish between intellectual contribution and stylistic editing. These algorithms, instead of analysing the sources of their

merits, focus on identifying language patterns that correlate with high editing quality: fluency, consistency, and low perplexity. Paradoxically, these features are not only a hallmark of machine-generated texts but also the goal of each author who wants to create a clear and professional scientific text. Consequently, the more effectively the author, assisted with an advanced tool, will correct their text, the more probable is that it will be incorrectly marked as a work of a machine.

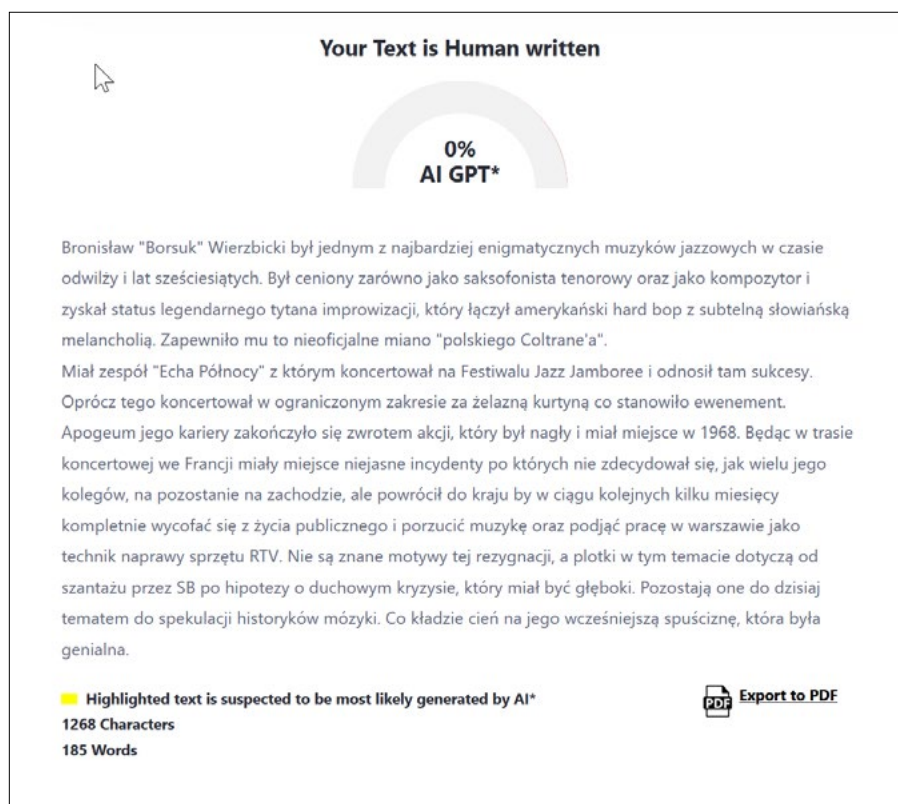



Figure 3. The result of detection of the human text by ZeroGPT.

Source: own elaboration

It directly leads to the second research question, concerning the boundary between the ethical usage of AI and academic dishonesty. Based on the analyses conducted, it should be stated that this boundary lies not in the mere use of the tool itself but in the intent and manner in which it is used. The usage of an LLM as an advanced proofreader whose function is similar to that of a human editor is completely ethical. Academic dishonesty begins when the author assigns responsibility for the intellectual contribution, i.e. generating theses as well as arguments, analysing data and drawing up conclusions, to the machine, and then attributes the

authorship to themselves. Therefore, the origin of the ideas is crucial, not a tool used to improve them in terms of language.

Your Text is AI/GPT Generated



**96.68%
AI GPT***

Bronisław „Borsuk” Wierzbicki był jednym z najbardziej enigmatycznych muzyków jazzowych okresu odwilży i lat sześćdziesiątych. Ceniono go zarówno jako saksofonistę tenorowego, jak i kompozytora. Zyskał legendarną opinię mistrza improwizacji, łączącego amerykański hard bop z subtelną, słowiańską melancholią. To właśnie dzięki temu zaczęto określać go mianem „polskiego Coltrane’a”.

Był liderem zespołu „Echa Północy”, z którym występował na Festiwalu Jazz Jamboree, odnosząc tam znaczące sukcesy. Występował również, choć w ograniczonym zakresie, po obu stronach żelaznej kurtyny, co w tamtych czasach stanowiło ewenement.

Apogeum jego kariery zakończyło się jednak nagłym i nieoczekiwanym zwrotem w roku 1968. Podczas trasy koncertowej we Francji doszło do niejasnych incydentów, po których Wierzbicki, w przeciwieństwie do wielu kolegów decydujących się na emigrację, powrócił do kraju. W ciągu kilku następnych miesięcy całkowicie wycofał się z życia publicznego, porzucił muzykę i podjął pracę w Warszawie jako technik naprawy sprzętu RTV.

Motywy tej radykalnej decyzji pozostają nieznanne. Krążyły różnorodne spekulacje – od domniemanego szantażu ze strony Służby Bezpieczeństwa po hipotezy o głębokim kryzysie duchowym. Do dziś pozostają one przedmiotem dyskusji historyków muzyki, rzucając cieniem na spuściznę artysty, choć ta bezsprzecznie pozostaje wybitna.

Humanize Text

Make Your Text Human With Undetectable AI

Highlighted text is suspected to be most likely generated by AI*

1370 Characters

181 Words



 **Export to PDF**

Figure 4. The result of detection of the ChatGPT's text by ZeroGPT.

Source: own elaboration

Your Text is AI/GPT Generated



100%
AI GPT*

Bronisław "Borsuk" Wierzbicki należał do grona najbardziej enigmatycznych muzyków jazzowych okresu odwilży i lat sześćdziesiątych. Jako saksofonista tenorowy oraz kompozytor zyskał uznanie i status legendarnego mistrza improwizacji, który potrafił łączyć amerykański hard bop z subtelną słowiańską melancholią. Dzięki temu unikatowemu stylowi otrzymał nieoficjalny tytuł "polskiego Coltrane'a".

Na czele zespołu "Echa Północy" występował na prestiżowym Festiwalu Jazz Jamboree, odnosząc tam znaczące sukcesy. Ponadto koncertował w ograniczonym zakresie za żelazną kurtyną, co stanowiło w tamtych czasach prawdziwy ewenement. Apogeum jego kariery zakończyło się jednak nagłym zwrotem akcji w 1968 roku. Podczas trasy koncertowej we Francji doszło do niejasnych incydentów, po których Wierzbicki, w przeciwieństwie do wielu swoich kolegów, nie zdecydował się na pozostanie na Zachodzie i powrócił do kraju.

W ciągu kilku kolejnych miesięcy artysta całkowicie wycofał się z życia publicznego, porzucił muzykę i podjął pracę w Warszawie jako technik naprawy sprzętu RTV. Motywy tej drastycznej rezygnacji pozostają nieznanne, a krążące plotki obejmują hipotezy od szantażu ze strony Służby Bezpieczeństwa po teorie dotyczące głębokiego kryzysu duchowego. Spekulacje te do dziś stanowią przedmiot zainteresowania historyków muzyki, rzucając cień na wcześniejszą, genialną spuściznę artysty.

Humanize Text

Make Your Text Human With Undetectable AI

Highlighted text is suspected to be most likely generated by AI*

1386 Characters
180 Words


 [Export to PDF](#)

Figure 5. The result of detection of the Claude's text by ZeroGPT.

Source: own elaboration

Relying uncritically on AI detectors, which do not recognise this boundary, results in numerous negative consequences for the entire scientific ecosystem, which is the answer to the third research question. For students and researchers, it means making a ridiculous choice between pursuing linguistic perfection and the risk of false accusations. For teachers, reviewers, and editors, the temptation to use a detector as a fast and seemingly objective arbiter may lead to unfair assessments and the rejection of valuable papers. From a broader point of view, scientific institutions,

by creating policies based on unreliable indicators, do not build a culture of trust but promote an atmosphere of suspiciousness, which leads to the pathological “cat-and-mouse game” with tools intended for “humanising” texts.

An additional problematic layer is imposed on this image, and it is connected with the ethical and legal status of the detection services themselves. A lot of those platforms operate under unclear terms of service, not guaranteeing what happens to the content sent to them. Forwarding unpublished scientific papers, student essays, or research data to external commercial entities poses a significant risk of infringing copyright, compromising research secrecy, or simply losing control over the intellectual property. The situation becomes even more complicated when the verifier (e.g., a lecturer or reviewer) is not the author of the text, which may lead to infringement of third parties’ rights.

6. Conclusions

This research, despite its pilot nature, provides empirical evidence that the high probability that a text was AI-generated cannot serve as reliable proof of academic dishonesty. The use of a large language model as a digital editor is an authorised and ethically permissible support in the creative process, and the final responsibility for the content, its authenticity, and the originality of the thoughts is always borne by a human being. Therefore, the main message of this paper is the necessity of fundamentally changing the paradigm: from the question “Has artificial intelligence written it?” to “Does the author bear full responsibility for this paper?” Promoting transparency about the tools used, together with education on their capabilities and limitations, is a significantly more constructive approach than creating policies based on unreliable, easily manipulable detection technologies.

It should be emphasised that, although the paper focuses only on a narrow, editorial use of GenAI, the problem should be perceived in a much broader context. Fuelling the phenomenon of “**GENfear**” in academic communities, which is a fear of adopting generative artificial intelligence, poses an actual risk for the competitiveness of the Polish science on the international stage.

While the Polish institutions still debate basic principles, the scientific world does not wait. The admission of GenAI to the broad spectrum of research assignments is becoming the norm. Leading global scientific magazines are withdrawing from prohibitive regulations, focusing on transparency (Wang & Zhao, 2024): they only require that authors declare the scope in which AI has been used, similar to how the contributions of particular authors in papers written by several people are declared. Moreover, leading foreign universities have actively developed comprehensive policies on the ethics of using AI, precisely setting boundaries between the permitted, the support for the application of this technology in both research

and didactics, and the abuse of ethical boundaries. Even the crucial academic infrastructure integrates those changes: the suppliers of scientific databases, such as Scopus and Web of Science, directly implement GenAI technologies into their search interfaces.

Meanwhile, this delay is also a problem in our own backyard: we have observed significant progress even at the national level, in both commercial sectors and public administration. It is visible in the development and ongoing improvement of national large language models (such as Bielik and PLLuM), as well as in the development of policies and pilot integrations of those technologies with governmental infrastructure, at both the central and local levels. Exclusion and stigmatisation of GenAI by the Polish scientific community at the moment may have far-reaching consequences. The science in free-market and democratic systems is to serve society, not to serve itself. If the scholarly communities are going to pretend that the elaborated technological turn does not apply to them, the social justification for their existence and their ability to serve as a catalyst for national progress will be called into question.

However, strictly returning to the editorial use of GenAI, the potentially worst effects of this moral panic should be noted. The reason is that only the suppliers of online services that “humanising” texts, which allow AI detectors to be cheated, are the actual beneficiaries of this situation. We should be aware that the long-term effects of extensive use of such platforms may be highly negative. The texts “spoilt” deliberately to simulate human imperfections will gradually feed into future training data, which may lead to the degradation of large language models and the erosion of the quality of natural language in digital space in the long term. It seems that an effective medicine to the above-mentioned “GENfear” is to make policies of integrating GenAI technologies with didactic and research processes, both in an ethical and active way, by particular academic units.

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Czy ten artykuł napisała sztuczna inteligencja? – studium przypadku „wykrywania plagiatu”

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Słowa kluczowe

Detekcja treści SI. Duże modele językowe (DMJ). Etyka w nauce. Generatywna sztuczna inteligencja. GenSI. Komunikacja naukowa. Narzędzia redakcyjne. Plagiat. Studium przypadku.

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In search of best practices – a usability analysis of Internet Recruitment of Candidates services

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Abstract

Purpose/Thesis: The aim of the study is to identify good practices in the usability of the Internet Recruitment of Candidates (IRK) services used at Polish universities and, on that basis, to develop recommendations aimed at increasing user satisfaction for study candidates.

Approach/Methods: The analysis covered key components of IRK services: the homepage and pages dedicated to individual recruitment processes. Each of these pages was compared across selected university IRKs to identify examples of good practices. The study applied best-practice benchmarking and expert evaluation.

Results and conclusions: The analysis identified several best practices across the linguistic, visual, and structural layers of IRK services. These primarily relate to message clarity, navigation consistency, and the reduction of distracting elements, which together enhance the transparency of the recruitment process and strengthen institution identification. Some findings still require verification in user-based studies.

Originality/Cognitive value: The study highlights the potential of applying best practice benchmarking to improve web services built on a shared software platform. The formulated recommendations may be adopted both by MUCI (the University Centre for Informatization) to develop the central system and by individual academic institutions to refine their own implementations.

Keywords

Best practices benchmarking. Internet Recruitment of Candidates Systems. Usability.

The text received on the 16th of September, 2025.

1. Introduction

Internet Recruitment of Candidates (IRK) is a service for study candidates, created and supported by the University Centre for Informatization (MUCI, www.muci.edu.pl). MUCI is a consortium of Polish higher education institutions (HEIs),

established by the Conference of Rectors of Universities in Poland on the 10th of November 2001 to foster the development of information systems supporting school management (*About USOS, n.d.*). The consortium's main project is the USOS – the University Study-Oriented System. IRK is part of that project. HEIs which pay contributions to the USOS project can use the software without additional fees. At present, 82 academic institutions use this module (*USOS in numbers, n.d.*), most of which – 89% (73) are public entities. Compared to all Polish public academic institutions, the number of which was 135 in the 2024/2025 academic year (*Wszystko Co Najważniejsze, 2024*), this constitutes more than half, 54%.

The Internet Recruitment of Candidates service enables the presentation of an online catalogue of degree courses and programmes offered. In addition, it allows for the remote organisation of formal requirements at an early stage of the admission process, which is especially helpful for candidates living far from the institution's main location. The system interfaces with the Central Registry of Maturity Examinations, from which it retrieves information on the maturity examination results of study candidates. The data for individuals accepted into degree programmes are then transferred directly from the IRK to the USOS system (*About USOS, n.d.*).

The recruitment platforms of individual higher education institutions that use MUCI-provided software are similar in appearance and functionality, particularly in their menu structures and course search engines. This is undeniably helpful for study candidates, as they can browse the various HEI services they visit in a similar manner. The websites of individual schools still differ in implementation details and in how they cover additional information about recruitment. These differences affect the usability of the websites visited by candidates, and hence their browsing satisfaction.

The objective of this article is a comparative analysis of the Internet Recruitment of Candidates services of selected HEIs from the perspective of study candidates, with the aim of identifying best practices that can later be used to improve the usability of both the basic software provided by MUCI and the implementations realised by individual schools. Usability is understood as a measure of efficiency, effectiveness, and user satisfaction in achieving the intended objectives when using the system (ISO, 2018).

Scientific literature relatively rarely analyses the usability of academic institutions' admissions services; most studies focus on academic websites in general. The rare exceptions include research on recruitment webpages and application forms, which indicate problems with navigation and communication (Huang & Bilal, 2019; Stark, 2017), as well as a comparative study of usability evaluation methods, emphasising the benefits of a combined approach (Liu & Jiang, 2025).

2. Purpose and research method

The aim of the research was to prepare project recommendations to increase user satisfaction among the study candidates using IRK services. To achieve the assigned goal, a comparative method was chosen, which is well-suited to this type of analysis. It makes it possible to identify areas requiring improvement and indicate best practices used by various entities. As part of the comparative method, best practice benchmarking was used, which entailed an analysis of various solutions adopted by the surveyed institutions and isolating practices that could serve as general recommendations.

In management literature, best practice benchmarking is defined as a process of identifying, analysing, and adapting solutions considered particularly effective in a specific area (Jetmarová, 2011, p. 78). Unlike performance benchmarking, which aims to identify leaders achieving top economic results, best practice benchmarking focuses on the qualitative aspects of the analysed processes and project solutions, thereby enabling the transfer of effective patterns between organisations (Alderman & Murray, 2025, p. 26; APQC, 2025).

Benchmarking in the traditional sense aims to improve a single organisation by comparing its activities with leaders' and adapting proven solutions to increase the efficiency of the institution. Best practice benchmarking can be used both at this scope and across an entire sector, where analysis of multiple institutions allows patterns to emerge, enabling the development of universal recommendations. In this approach, benchmarking is not limited to supporting a single organization; instead, it serves a methodological function, making it possible to formulate recommendations which can be applied by all interested organisations (e.g., Buzdygan & Pietrukowicz, 2022; Pulikowski, 2018, pp. 184–196; Sapa, 2005).

Because the research was directed at seeking best practices with a potential for wider application rather than identifying leaders, there was no pre-determined, closed list of elements to be evaluated. The analysis thus remained open to solutions that emerged during the research. The best practice identification process was accompanied by expert evaluation, the purpose of which was especially to formulate optimization recommendations absent from the surveyed services. Expert evaluation was conducted in reference to accepted guidelines for interface design, inspired by Nielsen's classic usability heuristics (1995).

3. Research procedure

In benchmarking research, the analysis of all available objects is not always possible or practical, as increasing the number of institutions makes comparisons more complex and time-consuming. For IRK services, apart from the number of objects

(82), the strong similarity between the systems being compared, due to their use of the same basic software provided by MUCI, was also significant for this research. That is why, in addition to typical representatives, the services selected for research were the ones distinguished by original, functional solutions. They were mostly the platforms of large schools, with a vast and varied course offer. In the end, the recruitment systems of the following 15 institutions were selected for comparisons:

- The Academy of Physical Education in Katowice (AWF),
- The Koszalin University of Technology (PK),
- The Silesian University of Technology (PŚl),
- The Warsaw University of Technology (PW),
- The Wrocław University of Science and Technology (PW_r),
- The University of Economics in Katowice (UEKat),
- The Cracow University of Economics (UEKr),
- The Poznań University of Economics and Business (UEP),
- The Jagiellonian University (UJ),
- The Cardinal Stefan Wyszyński University in Warsaw (UKSW),
- The University of Lodz (UŁ),
- The Maria Curie-Skłodowska University in Lublin (UMCS),
- The Nicolaus Copernicus University in Toruń (UMK),
- The University of Silesia in Katowice (UŚ),
- The University of Warsaw (UW).

The research was conducted in the first half of September 2025. It covered publicly accessible (no login required) IRK webpages in their desktop versions. Due to the high responsiveness of the interface developed by MUCI, it was not necessary to analyse mobile solutions separately, though several points in the article present mobile screens to indicate specific issues that may arise when using them, as well as purely for illustration. The research covered the following elements: the homepage and pages dedicated to specific recruitment processes. Each page was compared across the IRK services of selected academic institutions to identify best practices. The usability analysis of the examined webpages was complemented by expert evaluation.

4. HEIs IRK services usability analysis

4.1. Page title in the browser tab

The page title displayed in the web browser tab helps users quickly identify the websites they are visiting and facilitates switching between multiple open webpages.

The default IRK homepage title is “Internet Recruitment of Candidates” (“*Internetowa Rekrutacja Kandydatów*”). Its content does not fit into the tab length.

The title is preceded by a default “R” icon. This generic tab appearance is prevalent (10 out of 15 examined services). Figure 1 shows several selected methods of displaying information in the browser tab. The first two tabs are indistinguishable to the user; the next two stand out thanks to the school logo, while the last one includes an abbreviation of the university’s name along with the logo.



Figure 1. Recruitment page tab examples in the Firefox web browser

Source: own elaboration

As we can see, the default icon can be replaced with an institution logo, as was done in the IRK webpages of the Wrocław University of Science and Technology, the University of Warsaw and UMCS. Replacing the current homepage title with the phrase “Recruitment” and an abbreviation of the HEI name, as in the solution adopted by UMCS, is also worth considering. Such a title fits into the tab, it is simpler and contains words potentially entered by candidates into the Google search engine. One must keep in mind that the page title, stored in the <title> metatag in the HTML code, impacts how it is indexed in search engines, and thus the recruitment platform’s visibility on the Internet.

4.2. Homepage

The IRK homepage comprises three elements: a page header, a list of available recruitments, and a footer. Figure 2 displays the desktop version of the University of Warsaw’s recruitment service homepage and a mobile screen for comparison. Specific elements will be analysed in later sections.

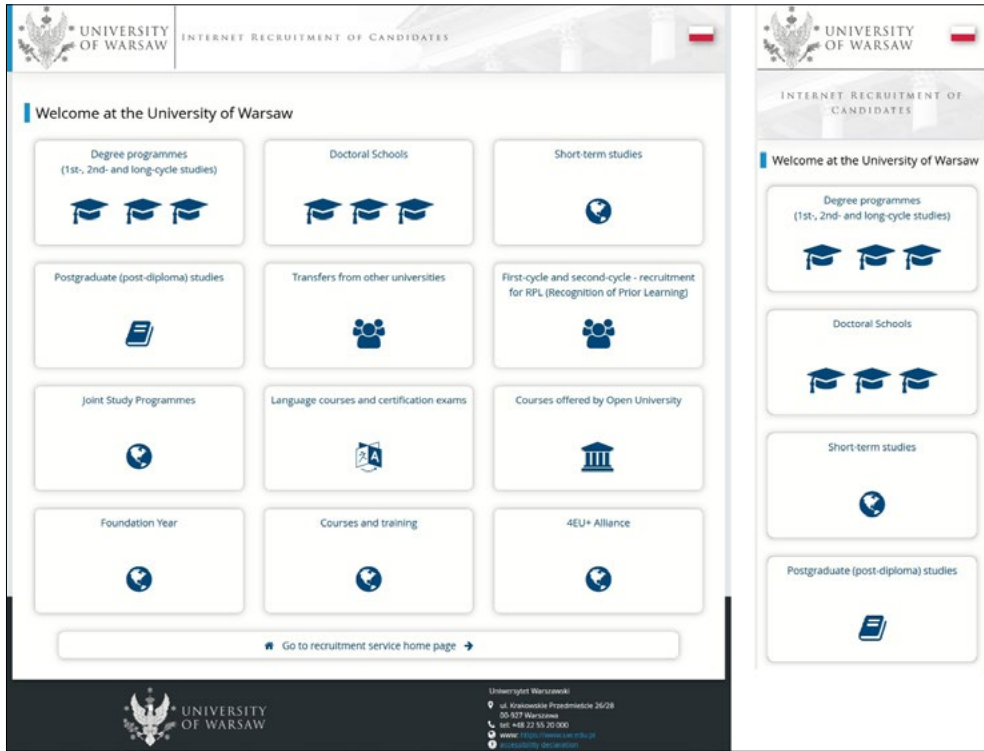


Figure 2. The IRK homepage of the University of Warsaw

Source: own elaboration based on: <https://irk.uw.edu.pl>

4.2.1. Homepage header

The homepage header of a recruitment platform typically contains the academic institution's logo, the name of the service, background graphics, and a British flag icon, symbolizing the option to switch the language of the page to English. Although the headers of individual HEIs are similar, they differ in detail. Modifications pertain primarily to two elements: the service name and background graphics. The names come in several variations:

- INTERNET CANDIDATE RECRUITMENT (UEKat, UEKr, UW, UKSW),
- INTERNET CANDIDATE REGISTRATION (UŚ),
- INTERNET CANDIDATE RECRUITMENT SYSTEM (PW_r, UJ),
- RECRUITMENT (PŚI, UEP, UŁ, UMK),
- RECRUITMENT and year: 2025/2026 (PK),
- RECRUITMENT and school name/abbreviation (PW, UMCS).

The default typeface used for the name, present in the majority of services, is Trajan Pro Regular in 15 px with 4 px character spacing. This typeface is elegant, yet has relatively low contrast, which is why some institutions have decided to

modify the default settings. In the IRK of the Cracow University of Economics, the font size has been increased by 5 px – from 15 px to 20 px, while the webpages of the University of Lodz and the Warsaw University of Technology utilise a different typeface – Open Sans in the bold variant. Trajan Pro only supports capital letters, which is why all service names are written in capital letters. Additionally, the font has inbuilt small capitals support, which allows the name written in the page code as “Recruitment” to be displayed as “RECRUITMENT,” with the first letter always in its appropriate size and the remaining letters slightly smaller. Such a service title will be visually smaller than one written in the page code in all capital letters, though they will both be set to the same size, such as 15 px. This difference is clearly visible in Figure 3 (the top and middle page header – UW and UEKat).



Figure 3. Homepage headers for the IRKs of UW and UEKat

Source: own elaboration based on: <https://irk.uw.edu.pl> and <https://irk2.ue.katowice.pl>

The first two header examples from Figure 3 show that, regardless of the chosen font size, the title is fairly indistinct. This issue applies to the majority of recruitment services. The core reason is the font colour, which is grey rather than black, reducing contrast.

The administrators of HEI webpages can easily modify the style settings of the elements displayed. The third header, located at the bottom of Figure 3, illustrates an example of such changes. The subtle effect of small capitals has been preserved, the font size was increased to 18 px, character spacing was decreased to 3 px, the colour was changed to black and a semi-transparent (0.2), slightly blurred (1 px) shadow was added. This last modification, described in the stylesheet as `text-shadow: 0px 0px 1px rgba(0, 0, 0, 0.2)`, is a necessary alternative to a bold variant, which would disrupt typeface proportions for a font optimized for low text weight (Trajan Pro Regular).

Service name legibility in the page header depends not only on the text's attributes but also on its background. There is a reason many HEIs use semi-transparent, tonally reduced graphics in the header background (UW, UEKat, UEKr, PWr; see figure 3), while some refrained from filling the background at all (AWF, PW, UJ, UŁ,

UMCS). On mobile devices, for pages with a distinct background, text may overlay the graphics, leading to a significant drop in contrast. This case is illustrated in Figure 4 (first image on the left). The name has become nearly illegible. Applying the contrast-increasing methods described above improves legibility (middle image), but using only semi-transparency for the background image achieves a satisfactory result (image on the right). This problem pertains not only to the UŚ IRK, but also PK, PŚL, UEP, UMK, UKSW and many other HEIs not covered by this research.



Figure 4. Impact of background graphics on webpage header text contrast

Source: own elaboration based on: <https://irk.us.edu.pl>

A minority of HEIs use an expanded header form, utilised in website subpages by default (see 4.1), on their homepage. An example of this approach – on the UKSW recruitment page – can be seen in figure 5.

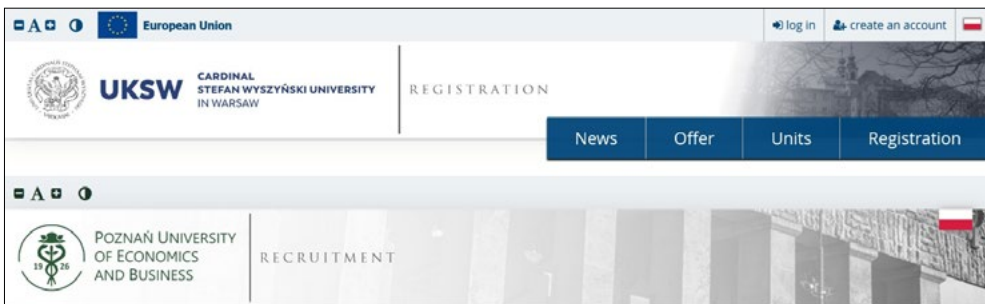


Figure 5. Homepage headers for the IRKs of UKSW and UEP

Source: own elaboration based on: <https://irk.uksw.edu.pl> and <https://e-rekrutacja.ue.poznan.pl>

This solution has both advantages and disadvantages. The advantages include accessibility aid icons (font and contrast changes) as well as the option to log in for users with accounts already in the system. The disadvantage is that it distracts candidates entering the page for the first time, as they may feel overwhelmed by superfluous information, particularly the presence of a menu. The basic function of a homepage is to select a recruitment process; thus, informational minimalism is safer in this case. Most schools present such an approach in their recruitment services. However, a halfway solution is also possible and was used by the Poznań

University of Economics and Business (Figure 5). The only additional function still present is accessibility aids, enabling persons with impaired sight to comfortably use the homepage as well.

4.2.2. Recruitment selection

The key part of the IRK homepage is the recruitment process list. It is often preceded by a greeting directed to study candidates (see Figure 2). The greeting on the UW webpage is addressed to the entire institution. This kind of greeting can also be found on other IRK webpages (e. g., UŚ, UEKr, AWF), but other solutions also exist:

- A greeting into the recruitment system, e. g.:
 - Welcome to the recruitment system of the Nicolaus Copernicus University in Toruń
 - The University of Lodz welcomes you to the Internet Recruitment of Candidates!
 - Welcome to the recruitment page of the Poznań University of Economics and Business,
 - Welcome to the Internet Recruitment of Candidates System (PW),
- No greeting of any kind, different kinds of recruitment processes are displayed for selection straight away (e. g., UMCS, PWr, UJ, PK),
- IRK UKSW – contains the instruction: “Select recruitment process” instead of a greeting.

The greeting into the recruitment system serves as an interaction opener, which, in linguistic pragmatics, is tied to strategies of politeness fostering distance reduction (Brown & Levinson, 1987, pp. 101–129). It evokes positive emotions and makes it easier for the candidate to come in contact with the system. The lack of a greeting, let alone replacing it with a dry command to select a recruitment process, decreases user comfort, as the system utilises prescriptive language rather than the greeting language natural to the user. This solution violates Nielsen’s classic heuristic that the system should match the user’s actual language (Nielsen, 1995).

Below the greeting, the homepage displays tiles representing different kinds of recruitment processes. This is the standard mode of presentation used in all IRK services. The tiles are arranged in a way enabling their dynamic adaptation to the available space – the number of elements per row changes depending on the browser window width. Each tile contains the name of the recruitment process and an accompanying graphic element.

The naming conventions for the main types of recruitment processes across different HEIs’ services are similar due to a uniform nomenclature. This consistency significantly facilitates the candidates’ use of multiple platforms. The only significant difference in naming conventions is the splitting of certain IRK recruitment processes into first- and second-cycle studies (UEKat, UEKr, PWr,

PŚl, UMK). Both solutions have advantages and disadvantages, but neither is significantly preferable to the other.

The graphic elements accompanying recruitment process names can be divided into two main types. The first is a set of standard icons representing the type of education provided by a given recruitment process – a graduate cap, a book, a globe. Given that a large part of the services (AWF, UEKat, UŁ, UMK, UŚ, UW) use the same icons, we may assume this is the default solution, integrated into the basic IRK system template developed by MUCI. The second type consists of graphic illustrations, which many HEIs (PW, PŚl, PW, PK, UEKr, UEP, UMCS) have introduced instead of template icons. Using these illustrations significantly changes the webpage’s visual impact, giving it a more unique character. Figure 6 juxtaposes both types of graphic elements.

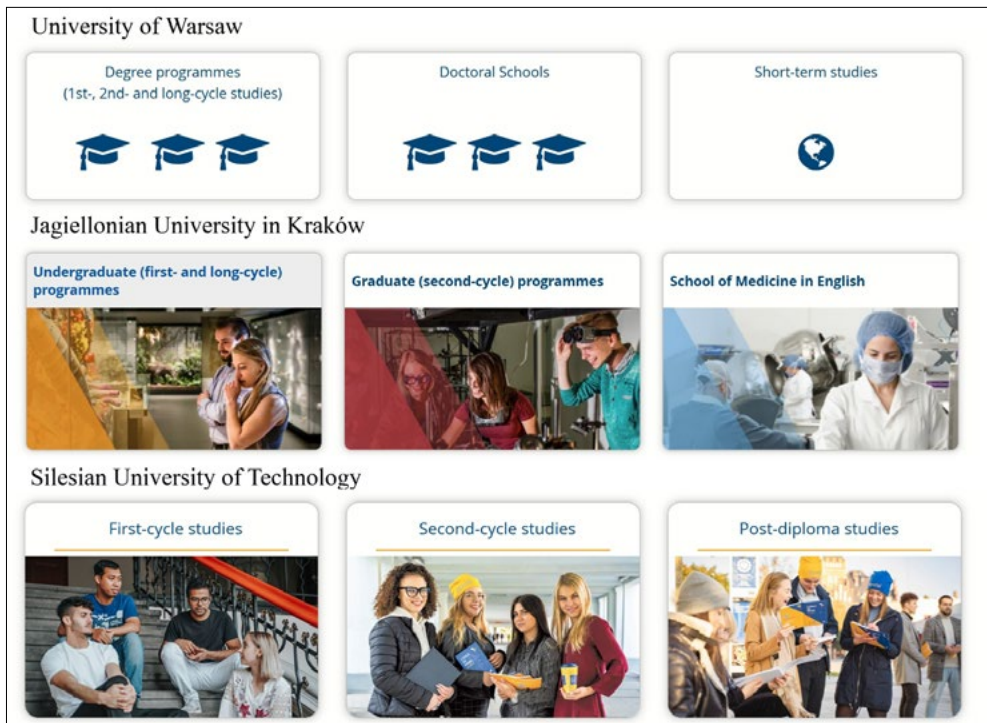


Figure 6. A comparison of icons and graphic illustrations

Source: own elaboration based on: <https://irk.uw.edu.pl>, <https://irk.uj.edu.pl>, <https://irk.polsl.pl>

4.2.3. Footer

Footers in IRK services have a unified structure imposed by the template and a very similar content scope. They include basic contact information (postal address, telephone number, homepage address) and technical links such as a sitemap, accessibility statement, or a contact form. This kind of data is of an informational-formal nature and serves a supplementary function to the main contents of the service. Due to their schematic character, the footers will not be subjected to further analysis. Figure 7. shows an example of the appearance of a footer.

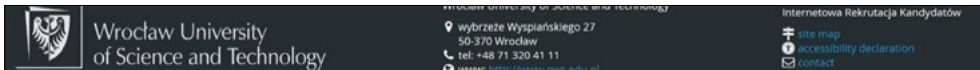


Figure 7. Wrocław University of Science and Technology IRK Footer

Source: <https://irk.usos.pwr.edu.pl>

4.3. The webpages of selected recruitment processes

Upon selecting a recruitment process, a separate module dedicated solely to that process opens. It consists of four pages included in the menu – News, Offer, Units, and Recruitment- and, optionally, an additional homepage that loads first. Figure 8 displays the appearance of the homepage loading after selecting the recruitment process of first-cycle, second-cycle and uniform master's studies in the AWF IRK. Some HEIs (PK, UMK) choose not to create separate homepages and, after the recruitment process selection, direct candidates straight to the contents of the Offer menu. This solution may stem from wanting to avoid repeating content included in guides provided separately. Still, this approach is an exception. Most HEIs examined take this opportunity to provide support to candidates.

The header on the subpages of a selected recruitment process varies somewhat from the header present on the homepage. It has a menu at the bottom, while the top has a narrow additional toolbar with accessibility settings (font size, contrast), information about the project being financed through European Funds, login options, and a British flag, which on the homepage header was displayed below the header. The expanded form of the header is present on the IRK services of all HEIs.

Below the expanded header, many homepages place an image, often serving as a promotional banner. For the AWF website in figure 8. that is a swimming pool, but it can also be a beautiful, historic building of the HEI (UEKr, UKSW) or simply a visually attractive graphic element or photograph (PŚI, PK, PWr, UJ, UW). Despite having a homepage for individual recruitment processes, some institutions (UŁ, PW) have decided not to display this additional image there. This solution can also be considered beneficial, especially when there is no appropriate concept to manage this space. Notably, this banner does not appear on pages opened from the menu level.

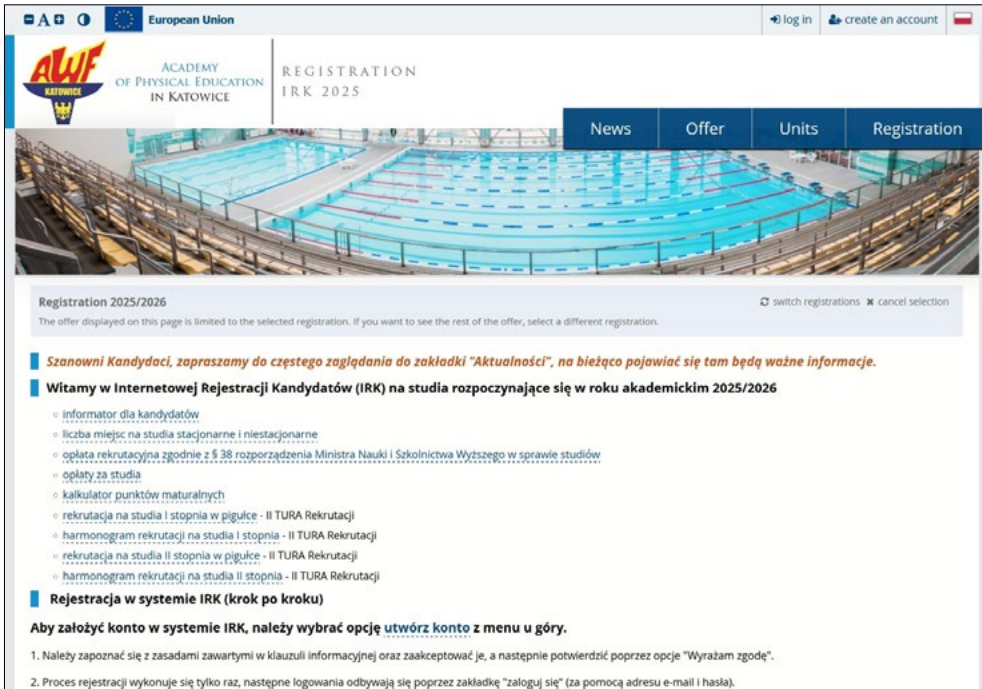


Figure 8. Homepage for first-cycle, second-cycle, and uniform master's studies in AWF

Source: <https://www.rekrutacja.awf.katowice.pl/pl/home/REKRUTACJA-2025>

The context bar, situated below the header, and the graphic banner contain the name of the currently viewed recruitment process and allow the user to change it via navigation buttons placed on the right side of the bar. The function of the “change recruitment process” button is unambiguous, whereas the function of the “cancel selection” button is problematic. Using it results in an empty page with a link to the recruitment process selection, which simply duplicates the first button’s function and adds an additional step. From a usability perspective, it would be beneficial to remove the “cancel selection” button.

The most important element of the context bar is the name of the currently viewed recruitment process. Due to its potential length, placing it in the page title could be problematic. It is, however, relevant information, so decreasing contrast by using a font in shades of grey is difficult to justify. Changing the font to black clearly improves legibility and expressiveness, as illustrated in Figure 9.

The context bar for the chosen recruitment process is displayed not only on the homepage but also on all pages selected from the menu. It has the same form in all the analysed services.

The content published on the homepages of recruitment processes varies significantly between academic institutions. The varied information posted there is often

taken from other services directed to candidates, and it also includes procedures and pointers for creating an account in the IRK system and multimedia content, including instruction videos.



Figure 9. Comparing the contrast of the context bar contents

Source: own elaboration based on: <https://irk.uw.edu.pl/pl/home/PELNE2025>

4.4. Menu items

The key content for individual recruitment processes is available at the menu level, where we find the same elements across all IRKs: News, Offer, Units, and Recruitment.

News takes the form of links to various types of messages related to the recruitment process being viewed. For most HEIs (PK, PŚl, PWr, UEKat, UEKr, UEP, UŁ, UMCS, UW), over the several months of running recruitment processes, such a list gathers no more than ten or twenty positions. It may sporadically reach tens of positions (AWF, UJ and UMK), and sometimes the list is simply empty (UŚ, UKSW). A typical example is displayed in Figure 10.



Figure 10. Example of a news list from the UEKat IRK

Source: https://irk2.ue.katowice.pl/pl/news/25_26_KS/

The Offer menu, alongside Recruitment, is the key element. Upon selection, the website presents an alphabetical list of courses of study offered by the HEI. The list is clear and easy to read. The only problem with the Offer page is that the area occupied by filters is too large. They are expanded by default, which is justified because otherwise they might become invisible to many users. Yet it might be advisable to consider collapsing the filters by default, as they currently visually dominate the content and push the course list out of the main field of vision. This is particularly problematic in the mobile version, where the filter blocks occupy the entire working area of the screen, and the actual course list appears only after scrolling through a large part of the page. Figure 11 is a good illustration of how much the expanded filters cover up content significant for candidates.

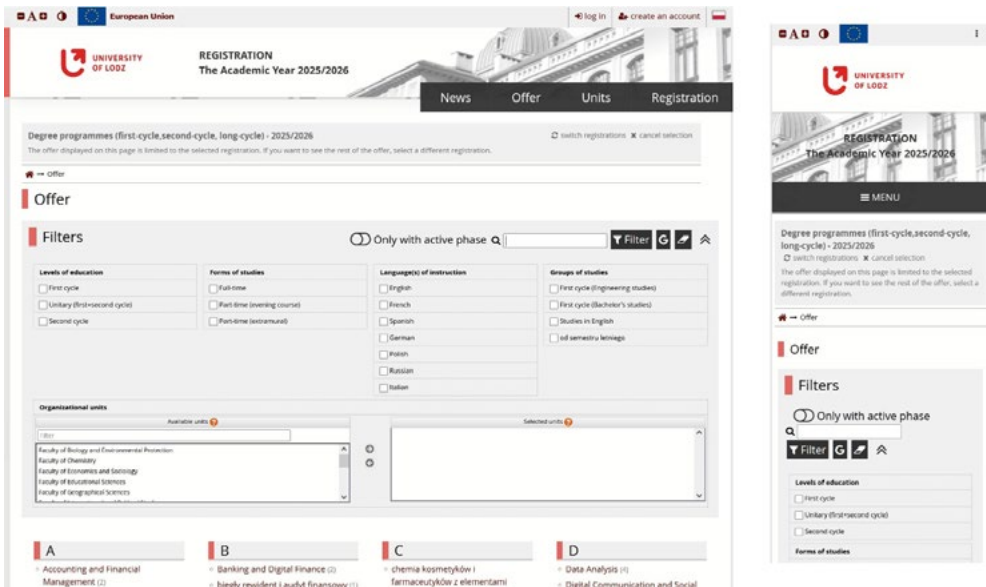


Figure 11. The issue of offer filters dominating the contents, as illustrated by the UŁ IRK

Source: own elaboration based on: <https://rekrutacja.uni.lodz.pl/pl/offer/WYZSZE2025>

The filter issue can be fixed by collapsing them by default or partly reducing their number, which would limit the space they occupy. However, choosing the optimal variant would require running separate research with users.

The third menu item is Units. Given the presence of organisational units in the offer filters, one could question whether it is reasonable to identify them again in a separate module. More so because the number of units, even in big HEIs, is not large, and a study candidate usually views an IRK page to acquaint his- or herself with the current course offer. Since there is an option to filter by units while browsing the offer, one can hardly point to a reason for the user to additionally use

a separate menu serving the same function. This solution is made even less explainable by the fact that the Units module uses the same expanded filters, in which the organisational unit criterion appears once again. The user can thus narrow his results to a chosen faculty, obtaining a list comprised of a single item. Such functional duplication seems unreasonable from the perspective of system usability.



Figure 12. The Units menu on the US IRK webpage.

Source: <https://irk.us.edu.pl/pl/offer/SW-2025-Z/units/>

Considering that all the elements of the menu refer to the selected type or recruitment process, the choice for the name of the last item – Recruitment – is incomprehensible. The candidate may only get an idea of its contents upon clicking. A more adequate name for this menu would be: Recruitment phases or – better yet – Recruitment schedule. A longer name would not be a problem if the Units menu were removed. Interestingly, recruitment phases do appear as the subtitle of this page (see Figure 13).

Analogously to the Offers and Organisational units menus, upon loading the Recruitment page, even on a large monitor, the space is dominated by filters almost to the very bottom of the screen. Figure 13. shows the page content layout when the filters are collapsed. Even more space could be gained if the unnecessary description was removed and Recruitment and Phases of Recruitment were replaced with a single name. If the filters were to remain collapsed by default, it would be advisable to add a more accessible mechanism of expanding them than an icon situated at the edge of the user's field of vision, at the end of the row of filters. The

simplest solution would be to make the Filters label a clickable element, serving as a switch.

| No. | Offer | Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 |
|-----|--|--|--|--|--|---------|
| 1 | Administration, full-time, first-cycle studies | from: 02.06.2025 12:00 to: 11.07.2025 23:59 | from: 28.07.2025 07:00 to: 11.09.2025 23:59 | | | |
| 2 | Administration, full-time, second-cycle studies | from: 02.06.2025 12:00 to: 19.07.2025 23:59 | from: 30.07.2025 07:00 to: 18.09.2025 23:59 | from: 30.09.2025 07:00 to: 07.10.2025 23:59 | | |
| 3 | Administration, part-time, first-cycle studies | from: 02.06.2025 12:00 to: 11.07.2025 23:59 | from: 20.07.2025 00:00 to: 11.09.2025 23:59 | from: 18.09.2025 07:00 to: 22.09.2025 23:59 | | |
| 4 | Administration, part-time, second-cycle studies | from: 02.06.2025 12:00 to: 18.09.2025 23:59 | from: 30.09.2025 07:00 to: 07.10.2025 23:59 | | | |
| 5 | Applied Computer Science, full-time, first-cycle studies | from: 02.06.2025 12:00 to: 11.07.2025 23:59 | from: 21.07.2025 12:00 to: 27.07.2025 23:59 | from: 29.07.2025 07:00 to: 11.09.2025 23:59 | | |
| 6 | Applied Geology, full-time, first-cycle studies | from: 02.06.2025 12:00 to: 11.07.2025 23:59 | from: 24.07.2025 12:00 to: 27.07.2025 23:59 | from: 31.07.2025 07:00 to: 11.09.2025 23:59 | from: 18.09.2025 07:00 to: 22.09.2025 23:59 | |
| 7 | Applied Linguistics, full-time, first-cycle studies | from: 02.06.2025 12:00 to: 11.07.2025 23:59 | | | | |
| 8 | Aquamatics - Interdisciplinary Management of Water Environments, full-time, second-cycle studies | from: 02.06.2025 12:00 to: 18.09.2025 23:59 | from: 22.09.2025 07:00 to: 07.10.2025 23:59 | | | |

Figure 13. Recruitment menu on the UŚ IRK webpage.

Source: <https://irk.us.edu.pl/pl/offer/SW-2025-Z/registration/>

5. Summary

Conducting a comparative analysis of Internet Recruitment of Candidates (IRK) systems has enabled the identification of several best practices across the linguistic, visual, and structural layers of IRK services. The most notable ones include customizing browser tabs (favicon, title), information minimalism in the header and using a greeting in a neutral, friendly tone. It is also beneficial to shift away from template icons in favour of simple, individualized graphic solutions, which support user orientation and boost HEI identification.

With regard to recruitment pages, several improvements are recommended: eliminating elaborate banners, simplifying the context bar, and providing a clearer indication of the current status of the recruitment process. Introducing mechanisms to organise the News section, making the filters in the Offer module less dominant, and avoiding repetition of functionalities in the Units module are also

recommended. In the Recruitment module, it would be beneficial to maintain a clear structure and consistent naming across other parts of the service.

These results partly confirm observations familiar from previous studies on recruitment webpages and application forms – regarding both linguistic issues and excessive structure complexity (Huang & Bilal, 2019; Stark, 2017). Unlike those papers, this analysis focuses on the IRK module, embedded in the USOS ecosystem, which enables the formulation of recommendations tailored to the specific needs of Polish academic institutions. An analysis of best practices in this particular context provides a better understanding of the design and organizational conditions.

The recommendations formulated here are practical implications and can be used both by MUCI in the further development of IRK software and by individual HEIs to improve their own implementations. User-based research should be the next step, which would make it possible to verify the postulated solutions empirically and indicate the optimal directions for further development.

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Use APA 6-th Edition as a citation and reference list format. The references list should only include works that are cited in the text.

Cite references in the text by name of the author(s) and year of publication in parentheses: (Name, Year of

publication), eg. (Dembowska, 1991). If there are two authors, put their names with ampersand (&) mark between: (Name & Name, Year of publication), eg. (Cisek & Sapa, 2007). If there are more than two authors, put the name of the first one followed by abbreviation *et al.*: (Name et al., Year of publication), eg. (Berners-Lee et al., 2001). Edited books are cited by the name(s) of the editor(s) followed by abbreviation *ed(s)*: (Name, ed., Year of publication), eg. (Bellardo Hahn & Buckland, eds., 1998). If there is no author or editor information, put the first word from the title and the year of publication : (Word, Year of publication), eg. (Biblioteki, 1976). Use the following pattern when referring to specific pages in the cited publications: (Dembowska, 1991, 15) or (Cisek & Sapa, 2007, 40–42) or (Bellardo Hahn & Buckland, eds., 1998, 18).

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2.6.1. References List Examples

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