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Management of research institutions in socially critical areas: risks of information dishonesty and digital verification of knowledge

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Abstract: The article studies the management of research institutions as a system of organizing, financing, expert evaluation, and digital verification of knowledge in socially critical areas. It is substantiated that the shortcomings of science management have consequences not only for academic reputation, but also for the quality of human capital, trust in medicine, law, social policy, education, psychological support, and worldview communication. The key risks in the process of conducting scientific research are identified, including the formalization of peer review, pressure from quantitative indicators, insufficient research funding, weak verification of primary sources, cascading citation of unverified statements, a shortage of information systems for source cross-checking, and the absence of interdisciplinary assessment of social consequences.

According to the latest available international statistical data, in 2024 Ukraine's expenditure on research and development amounted to approximately 0.37% of GDP, whereas the average indicator in 2024 was 2.24% of GDP. At the same time, at the global level, the latest aggregated indicator was 1.92% of world GDP in 2023. This indicates that a significant gap persists between the level of research and development funding in Ukraine, the European Union, and the global average. It has been established that this gap increases the dependence of science on short-term publication incentives and limits the possibilities for digital quality control of knowledge.

A risk-oriented model of research institution management is proposed, combining registers of primary sources, automated reference checking, research integrity institutions, open expert review, cross-sectoral councils for socially critical topics, and the financing of IT solutions for scientific verification. The practical significance of the results obtained lies in the formation of a managerial approach under which a research institution is responsible not only for producing publications, but also for preventing information errors capable of provoking social distrust, psycho-emotional losses, reduced work capacity, and a deepening innovation lag.

Keywords: science management; research institutions; research integrity; socially critical areas; human capital; digital verification; information systems; innovation infrastructure.

1. Introduction

Today, the management of research institutions goes beyond administrative planning, the allocation of staff positions, the preparation of reports, and the monitoring of publication activity. Such management is transforming into a system of public security, since scientific conclusions are used for the formation and implementation of economic policy, medical protocols, legal norms, educational programmes, psychological recommendations, and public communication. If a scientific text contains an unverified source, an incorrectly translated concept, a norm taken out of context, or an erroneous interpretation, its consequences may extend far beyond academic discussion.

A particular danger arises in socially critical areas where individuals make life-important decisions: whether to seek medical care (medicine), how to protect their rights (jurisdiction), whether to trust state institutions (public administration), how to assess their own professional capacities (psychology), and how to respond to an economic crisis or information pressure (economics). Under such conditions, a defect in science becomes a defect in social governance. An error in a scientific text, reproduced through journals, educational materials, social networks, and popular videos, can generate distrust, fear, the stigmatization of particular groups, professional burnout, or the rejection of evidence-based practices.

The relevance of the topic is further intensified by the growing number of unreliable publications. For example, in 2023, the number of retracted scientific articles exceeded 10,000, setting a new record, with fake papers, peer-review manipulation, and research fabrication cited among the causes [12]. This means that research institutions should manage not only the production of knowledge, but also the risks of its distortion, especially in areas where a scientific conclusion is rapidly translated into practice and influences the behaviour of the population.

2. Object and subject of research

The object of the study is the system of management of research institutions and the related publication and expert infrastructure in fields of increased social sensitivity, such as healthcare, psychology, law, labor economics, social protection, education, public administration, security, and cultural and worldview communication. These fields are united by the direct influence of scientific information on human behavior, trust in institutions, and readiness for productive participation in public life.

The subject of the study is the organizational, financial, ethical, and digital mechanisms through which research institutions can prevent the distortion of primary sources, poor-quality citation, the fabrication of the source base, formal peer review, and the uncontrolled transfer of erroneous conclusions into social practice. In this study, a research institution is considered not as an isolated producer of publications, but as a node within the state's evidence-based infrastructure.

In some foreign analogues, research management is increasingly combined with academic integrity tools. The *OECD Frascati Manual* (2015) guidelines define R&D as systematic creative activity aimed at increasing the stock of knowledge and creating new applications [7]. *COPE* (2024, January 18) considers systematic manipulation of the publication process as practices that may include improper influence on peer review, false authorship, and the fabrication of publication outcomes [1]. The *STM Integrity Hub* (2025) is developing a digital cross-publisher infrastructure that uses reference checking, duplicate detection, the identification of signs of "paper mills," machine-paraphrased phrases, and suspicious metadata [13].

The shortcomings of the object under study include the fragmentation of responsibility among authors, reviewers, and the editorial boards of scientific journals, which is caused by the weak integration of research institution management with social risk management due to a shortage of human, financial, material, technical, and information resources for the digital verification of sources; the dependence of career incentives on the number of publications; and, consequently, insufficient institutional attention to the process through which errors in scientific texts are transformed into behavioral and economic consequences.

3. Target of research

The target of research is to substantiate a risk-oriented model of research institution management in socially critical areas, aimed at reducing information misconduct, strengthening the digital verification of sources, and protecting human capital from the consequences of unreliable scientific conclusions.

Achieving the stated target requires the fulfilment of the following objectives:

- to identify socially critical areas in which a scientific error has an increased social cost;
- to summarize statistical indicators of science funding, research personnel, the innovation capacity of business entities, and labor productivity;

- to reveal the mechanism of the cascading spread of distorted sources from scientific publication to social behavior;
- to systematize the shortcomings of research institution management that intensify information risks;
- to propose managerial solutions for digital verification, institutional responsibility, interdisciplinary expertise, and the financing of the IT infrastructure of science.

4. Literature analysis

Contemporary scholarly literature considers research integrity not only as the individual responsibility of the author of a scholarly publication, but also as an institutional function of managing the quality of knowledge production.

So, the systematic manipulation of the publication process is a set of practices that may include fictitious authorship, peer-review manipulation, unreliable data, artificial citation, and other actions that distort the scientific record [1]. This is particularly important for the management of research institutions, since the formal acceptance of a manuscript for publication does not yet guarantee the reliability of the primary sources used, the correctness of interpretations, or the social safety of the conclusions.

In Ukraine, the problem of research integrity is intensified by institutional and resource constraints. The *European Research Area* for Ukraine emphasizes the need to modernize the system of science management in the context of strengthening research infrastructure, integration into the European research area, and improving the effectiveness of science policy [2]. At the same time, Eurostat comparative statistics indicate a significant gap between Ukraine and the European Union in terms of research and development funding, since the average R&D intensity indicator in the EU amounted to 2.24% of GDP in 2024 [3]. Therefore, the management of research institutions should be assessed not only through the number of publications, but also through the ability to ensure the quality, verifiability, and practical significance of research results.

Empirical studies of retractions confirm that violations of research integrity are not isolated, but systemic in nature. So, a significant proportion of retracted scientific publications is associated not with accidental errors, but with misconduct practices, including fabrication, falsification, and plagiarism [4]. This conclusion is complemented by the methodological position, that the unreliability of published findings may be caused by weak research design, small sample sizes, publication bias, statistical distortions, and conflicts of interest [5]. In this case, the classical sociology of science remains methodologically relevant, since the norms of universalism, collectivism, disinterestedness, and organized skepticism form the basis of responsible scientific production [6]. Of particular importance for this article is the norm of organized skepticism: a research institution should ensure not only the publication of scholarly works, but also their systematic verification.

Measuring the effectiveness of scientific activity requires unified methodological approaches. There are the defined principles for collecting and interpreting data on research and experimental development, including R&D expenditure, human resources, the sectoral structure of funding, and the performance of scientific activity [7]. They provide a basis for international comparison; however, quantitative indicators do not fully cover the problem of the quality of scientific content. *OECD* data on Ukraine's public research system further indicate the need to strengthen public governance of science, modernize the institutional structure, and enhance the capacity of research institutions to operate under resource constraints [8]. Therefore, the methodology for assessing science should combine quantitative indicators with mechanisms for controlling the substantive reliability of scientific content.

The latest stage in the development of scientific communication demonstrates that manuscript verification is gradually becoming a distinct infrastructural function. The publishers are increasingly investing in specialized research integrity systems, manuscript screening tools, and the verification of images, citations, peer review, and indicators of artificial or manipulative text origin [9]. For

Ukraine, such an infrastructural logic is particularly important, since *UNESCO* estimates the needs for restoring Ukraine's scientific infrastructure after the destruction caused by the war at more than USD 1.26 billion [10]. This means that the recovery of science should include not only laboratories, buildings, and equipment, but also digital mechanisms for verifying scientific results.

Global statistics also confirm the uneven development of scientific systems. In its 2026 release, there was provided aggregated data on global R&D expenditure, according to which global R&D intensity amounted to 1.92% of world GDP in 2023 [11]. Against this background, the low level of R&D funding in Ukraine creates a dual risk: on the one hand, it limits the ability of research institutions to produce competitive results, while on the other hand, it narrows the possibilities for creating systems to verify the quality of scientific information. At the same time, more than 10,000 scientific articles were retracted in 2023, setting a record and demonstrating the scale of contamination of the scientific record by unreliable or manipulative publications [12]. One of the practical directions for responding to these threats is the creation of digital integrity platforms. The modern publishing and research ecosystems are moving from manual, fragmented verification toward shared technological solutions capable of detecting signs of paper mills, citation manipulation, suspicious textual similarity, unreliable images, and other risks before publication [13]. For research institutions, this means the need to reconsider the managerial logic according to which integrity should function not as a declarative requirement imposed on the author, but as an embedded procedure within the research life cycle – from the formulation of a hypothesis to the dissemination of results in society.

The statistical data on Ukraine's R&D expenditure as a share of GDP make it possible to assess the financial basis of the scientific system and identify its structural vulnerability [14]. No less important is the indicator of the number of researchers in R&D per million people, since human resource capacity determines a country's ability to create new knowledge, verify scientific results, and support critical areas of research [15]. In socially critical fields, such as medicine, law, psychology, economics, public administration, and worldview-related issues, a shortage of qualified researchers and experts increases the risk of spreading simplified, unverified, or distorted interpretations.

A separate area of the study concerns the relationship between the information environment, mental health, and labor productivity. The mental health is a significant factor in work capacity, while depression and anxiety cause the loss of approximately 12 billion working days each year and cost the global economy about USD 1 trillion due to reduced productivity [16]. In this respect, distorted scientific communication in socially critical areas may have indirect economic consequences by increasing distrust in institutions, intensifying fear of evidence-based support, causing social stigmatization, emotional exhaustion, and the rejection of rational decisions. Ukraine's position in the Global Innovation Index 2025 demonstrates that the country's innovation potential depends not only on individual technological achievements, but also on the quality of institutions, human capital, research infrastructure, and the ability to transform knowledge into practical solutions [17]. The report on supporting Ukraine's innovation and creative sectors and intellectual property system further emphasizes the importance of international assistance, the recovery of the innovation ecosystem, the protection of intellectual property, and the development of institutional capacity [18].

Therefore, the shortcomings of research institution management in socially critical areas cannot be reduced merely to the problem of insufficient funding or low publication activity. Rather, they involve a complex managerial gap between the production of scientific texts, the verification of primary sources, the quality of interpretations, the digital infrastructure of integrity, and the social consequences of knowledge dissemination. For this reason, a modern model of science management should combine R&D funding, the development of human resource capacity, institutional responsibility, automated verification of scientific materials, and the assessment of the social safety of research results. All this will make it possible to conduct a qualitative check not only for plagiarism, but also for the level of disinformation due to distorted interpretations of quotes from used sources.

5. Research methods

The choice of methods is determined by the interdisciplinary nature of the problem, since the study combines socio-economic, information and communication, institutional, educational, psychological, ethical, and regulatory aspects of research institution management. The specificity of the problem under study lies in the fact that the shortcomings of science management manifest themselves not only within the scientific system, but also in socially critical areas where distorted or unverified information may influence citizens' behavior, the level of trust in institutions, the psycho-emotional state of the population, labor productivity, and the state's innovation development.

In the course of the study, a set of general scientific and special methods was applied, which made it possible to reveal the management of research institutions as an open institutional system connected with the social consequences of the dissemination of scientific information:

1) system analysis – the consideration of research institution management not merely as internal administrative activity, but as an open system of knowledge production, verification, interpretation, and dissemination; this approach made it possible to establish the interrelationship between the quality of a scientific text, the reliability of primary sources, publication procedures, digital verification, and the social consequences of using scientific conclusions;

2) structural and functional method – identifying the role of individual elements of the scientific ecosystem, where research institutions are considered as actors in the creation of knowledge; journals and publishers as institutions of public legitimization of scientific results; universities as an environment for forming research culture and critical thinking; state bodies as actors responsible for funding, regulation, and strategic planning; digital platforms as channels for disseminating scientific and science-related information; and professional communities as a mechanism of expert control and organized skepticism;

3) institutional analysis – examining managerial shortcomings in the functioning of research institutions, in particular the formalization of publication activity, the weakness of mechanisms for verifying primary sources, insufficient responsibility for the quality of interpretations, the limited development of digital integrity infrastructure, and the gap between the scientific status of a text and its actual evidential validity;

4) comparative and statistical method – summarizing international data on research and development expenditure, R&D human resource capacity, Ukraine's innovation indicators, global retraction trends, the scale of investment in research integrity, and economic losses caused by psycho-emotional risks;

5) source studies and bibliographic analysis – focusing attention on the problem of the verifiability of scientific sources, the correctness of references, the reliability of citation, the availability of primary documents, and the correspondence of conclusions to the content of primary sources, since an erroneous reference, incorrect translation, or distorted interpretation may acquire the status of a scientifically confirmed statement and subsequently be reproduced in publications, educational materials, expert opinions, and digital content;

6) content-analytical approach – distinguishing between scientifically substantiated information that contributes to improving the quality of managerial, educational, medical, legal, or social decisions, and information that may create disorientation, false expectations, fear, distrust in institutions, stigmatization, or rejection of evidence-based assistance;

7) causal method – identifying the relationship between an initial defect in a scientific text and its subsequent social consequences, where the initial defect is considered to be an incorrect concept, an unverified reference, a fictitious source, an erroneous translation, an improper generalization, or formal citation – as an informational impulse that may spread through journals, educational materials, social networks, managerial decisions, and the behavior of the population; in socially critical areas, such an impulse may be amplified by fear, uncertainty, high personal risks, and citizens' limited ability to independently verify primary sources;

8) modelling – constructing the logic of the spread of information misconduct in the scientific environment and its transition into social and economic consequences through the proposed indicative

model of integrated risk of information misconduct, as a framework for the initial audit of research institutions, journals, or research projects in socially critical areas;

9) grouping method – systematizing the main risks of research institution management, such as resource-related, personnel, publication-related, digital, ethical, socio-psychological, and innovation risks, in order to reflect the shortcomings of science management, which are complex in nature and cannot be explained solely by insufficient funding or low publication activity;

10) graphical method – visualizing complex interrelationships between the elements of the system under study, in particular between a research institution, the publication process, digital verification, social networks, citizens' behavior, human capital, and public expenditure, which forms the mechanism of transition from an unreliable scientific statement to broader social and economic consequences;

11) forecasting method – identifying possible directions for improving research institution management that underpin the strengthening of institutional responsibility for the quality of scientific texts through the development of digital source verification systems, including the use of machine-readable formats for checking scientific materials; taken together, this requires enhancing the professional competence of research personnel and establishing specialized research integrity units, with due regard to the social safety of research results.

The combination of the above methods made it possible to comprehensively examine the management of research institutions as an institutional system that integrates scientific, educational, publication-related, digital, ethical, socio-regulatory, and innovation functions. On this basis, the need to move from formal control of publication activity to a model of responsible science management is substantiated, within which the quality of primary sources, the correctness of interpretations, digital verification, personnel capacity, and the social safety of knowledge are considered as interrelated conditions for the sustainable development of the scientific system.

6. Research results

In scientific management, there is often an assumption that the authors are responsible for the content of the materials, and that the journal or institution only ensures the procedure for accepting materials for publication in accordance with the requirements of the design. However, such requirements are insufficient, and in socially critical areas they have a great risk of being used by readers in later life due to constant borrowing by other scholars [1; 6]. After all, if an author refers to a non-existent source, incorrectly transcribes a fundamental text, or uses a secondary interpretation as a "last resort," subsequent authors can copy this statement without checking.

According to international statistics, the problems of science management cannot be reduced to the individual responsibility of a single author. They are formed within an environment in which funding, human resource capacity, digital verification systems, and publication incentives either create or limit the possibility of conducting research with integrity. Statistical indicators at the global, European and Ukrainian levels indicate a double gap: between countries and regions in terms of the amount of funding for science and between the speed of dissemination of scientific texts and the speed of their quality verification. In socially critical areas, this second gap is the most dangerous, since a text with an erroneous reference or distorted term can be used as an argument in practical medicine, law enforcement, social policy or public psychological communication (Table 1).

Table 1. Comparative statistical indicators of scientific capacity: world, EU, Ukraine

Indicator	Year	World	EU	Ukraine
Research and development expenditure as a share of GDP, %	2023	1.92	2.26	0.32
	2024	-	2.24	0.37

Continued from Table 1

Absolute volume of research and development expenditure	2023	USD 2.78 trillion	EUR 389.2 billion	UAH 21.3 billion
	2024	USD 2.87 trillion	EUR 403.1 billion	UAH 28.3 billion
	Growth rate, %	3.24	3.57	32.7
Innovation position according to the Global Innovation Index	2025	Covers 139 economies	Compiled by national economies	66/139, including 15/36 in the upper-middle-income group, 35/39 in Europe

Source: developed by the author based on [2, p. 6; 3; 10; 11; 14; 17]

So, against the background of the growing role of science in the global economy, one can observe a deep inequality of scientific capacity between countries. As for the *UNESCO Institute for Statistics* (2026, March 18), 73% of countries do not even reach 1% of GDP on R&D [11], which indicates limited opportunities for the development of laboratories, digital verification, expert teams, repositories and verification systems of research results. For socially critical areas, such inequality creates a risk of dependence on external sources, secondary citations and weak local expertise. In 2023, more than 10,000 scientific articles were retracted [12]. Such retractions demonstrate the scale of the contamination of the scientific record. They do not always indicate deliberate fraud, but they indicate the need for constant quality control of data, images, references, peer review and authorship: for the management of research institutions, publication activity cannot be a self-sufficient indicator of performance without assessing the reliability of the content.

The EU has a much stronger resource base to support research institutions in developing scientific infrastructure with the creation of digital registers to improve peer review and publication integrity. However, the indicator of 2.24% of GDP remains below the strategic target of 3%, which indicates the insufficiency of science funding even for developed scientific systems [3]. For Ukraine, this indicator is an important benchmark for integration into the *European Research Area* [2, p. 6].

In Ukraine, compared to the previous indicator of 0.32% of GDP in 2023, there is a slight improvement (0.37%). Moreover, the growth rate of science funding significantly exceeds the global and European level, but it does not change the overall picture of chronic underfunding of science [11; 14]. At this level of spending, it is difficult to simultaneously support fundamental research, applied developments, digital verification systems, international integration, proper remuneration of researchers and the restoration of destroyed infrastructure. This increases the risk of formalization of scientific activity and dependence on quantitative publication indicators instead of the substantive quality of research. As for the *World Bank Group* (2025b), the latest available international figure was 586 researchers in R&D per 1 million population in 2022 [15]. The *UNESCO* (2024, March 11) estimates that since the start of the full-scale war, 10,429 researchers from 524 institutions and universities have been forced to relocate within Ukraine or abroad; the number of researchers in the public sector has decreased by 5.3%. The cost of restoring public scientific infrastructure is estimated at over $1.26 billion: 1,443 buildings and laboratories at 177 research institutions, as well as 750 units of scientific equipment, were damaged or destroyed [10]. As *WIPO* (2025) shows, Ukraine has a better position in terms of innovation results than resources. In the Global Innovation Index 2025 the country has an innovative potential even in wartime, but resource, personnel and institutional constraints hinder its implementation [17]. This confirms the need to transition from formal science management to a model in which improved science funding will contribute to the digital verification of scientific works not only for plagiarism, but also for the correct interpretation of previous texts, which will strengthen research integrity and social responsibility for the release of intellectual property objects [8; 18, p. 18].

The human resource block is one of the most vulnerable elements of science governance. The low number of researchers per 1 million population compared to the global average indicates a limited capacity not only to create new knowledge, but also to verify already published results. Relocation of researchers, loss of access to laboratories, funding cuts and forced part-time work create the risk of long-term weakening of scientific schools. The destruction of infrastructure means not only the physical loss of buildings and instruments, but also the disruption of the full cycle of scientific activity: from experiment to verification of results. In socially critical areas, this is especially dangerous, since without a laboratory, digital and expert base, it is more difficult to distinguish evidential knowledge from assumptions, secondary interpretations or unreliable conclusions.

According to the *STM* (2026, January 13), by 2026, individual publishers will have dedicated integrity teams of over 100 professionals, screening millions of manuscripts annually [9]. The *STM Integrity Hub* brings together publishers and technology solutions to detect paper mills, peer-review manipulation, duplication, suspicious images, and citations [13]. This is how a cascade of distortion is formed, when the primary error passes into a secondary publication, then into an educational material, a public lecture, a video on social networks and a practical recommendation. The peculiarity of this cascade is that each subsequent citation increases the visibility of the statement, which does not necessarily increase its reliability, because frequent repetition creates the illusion of scientific consensus. For a non-professional reader, the presence of a journal, DOI or a list of references can be a signal of truth, even if some of the sources are not opened, the authors are incorrectly indicated or the original text has been altered. The problem is that the research institutions often judge results by the external fact of publication, rather than the quality of the source chain [4, p. 17030; 5, p. 0699].

Therefore, it is necessary to shift the focus from the number of publications to the traceability of evidence: each key statement should be linked to a verified primary source, a correct translation, a reliable context, and a clear limit of application. In this case, the verification of scientific text turns into a separate infrastructural function. In other words, responsibility cannot be shifted only to the author. Research institutions, journals, publishers, universities, funding organizations and state regulators should form a single circuit of responsibility for the quality of primary sources, the correctness of methods and the social safety of conclusions.

The *World Health Organization* (2024, September 2) notes that 15% of working-age adults had a mental disorder in 2019. Depression and anxiety cause an estimated 12 billion workdays lost each year and cost the global economy an estimated $1 trillion in lost productivity [16]. These data do not imply a direct, automatic link between misinformation and mental health disorders. However, they do show the economic cost of mental health risks. In medicine, law, economics, public administration, education, psychology and worldviews, misinformation or intimidating scientific communication can foster distrust, anxiety, stigmatization, withdrawal from evidence-based care, and reduced employability. In relevant areas, scientific text can influence not only academic discussion, but also human behavior. Inaccurate or incorrectly interpreted information can increase fear, distrust of institutions, refusal of evidentiary support, emotional exhaustion and social tension. Therefore, the social safety of knowledge should become a separate criterion for the management of research institutions.

In real life, funding R&D should also have a certain incentive when there is trust in the researchers themselves from the readers, in particular, applicants for both educational levels and scientific degrees [7, p. 122]. It is worth noting that information in scientific sources, in particular monographs, articles and author's studies, can be both useful for the perception of obtaining new knowledge and harmful. The latter can cause a feeling of depreciation of one's own results due to the trigger of comparison, unprofessionalism in the relevant field and, mainly, the constant habit of analyzing texts and videos on social networks, without checking with real data on the official websites of enterprises, institutions or organizations, and without consulting with real specialists. All this leads to distrust of scientific sources in particularly important areas, which discourages public authorities from providing investment support and, subsequently, creates huge risks for investors to lose money from investment due to unpredictable consumer behavior. After all, today a person may be in demand for scientific services, and tomorrow – completely abandon this type of consumption.

The visually generalized mechanism of the information crisis in science governance appears as a crisis loop of information dishonesty in the management of research institutions (Fig. 1).

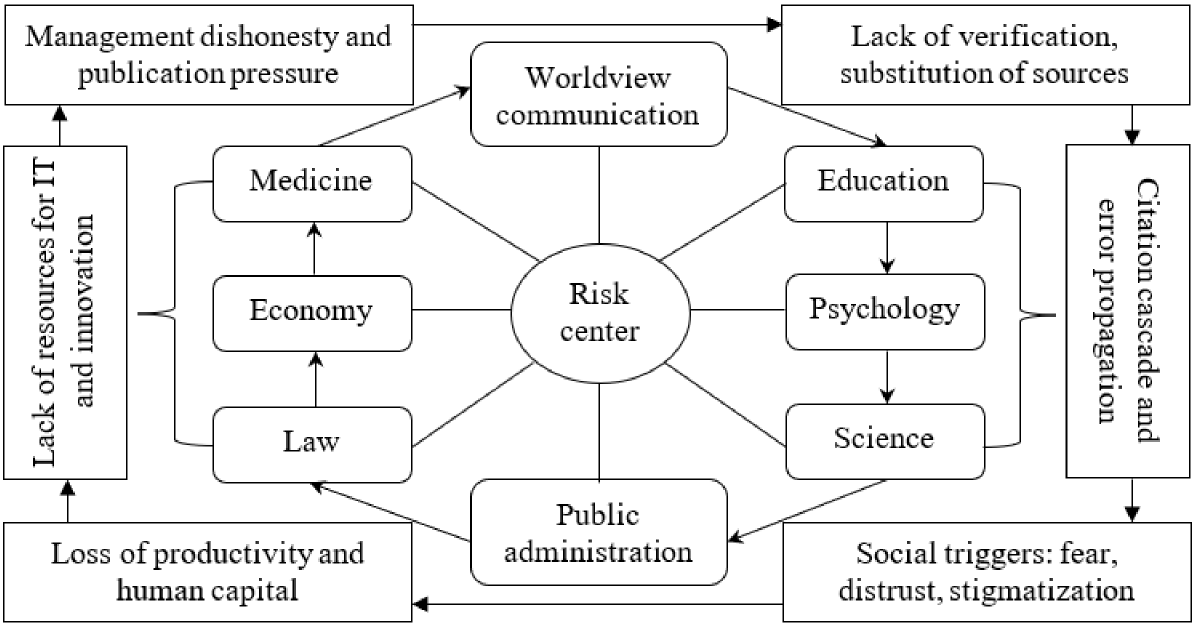

Fig. 1. Crisis loop of information dishonesty in the management of research institutions
Source: developed by the author

As we can see, a misunderstanding of the prescribed principles of the use of goods, services or technologies leads to irreversible consequences, which subsequently affect the human capital.

So, the quality of public administration influences the adoption of laws, which shapes the public's perception of certain legal provisions. Misquoting norms, decisions or doctrines creates a sense of legal impasse. If complex legal texts are presented without context, exceptions and protection procedures, the citizen may perceive the law as a purely punitive system. This reduces the willingness to resort to legal protection mechanisms and increases the risk of social aggression or shadow practices. As a result, in labor economics and management, distorted ideas about productivity, stress resistance, "success" or the norm of career behavior can contribute to professional burnout. A person compares his own reality with artificial norms, forms a sense of inadequacy and loses motivation.

As for the *World Health Organization* (2024, September 2), psycho-emotional risks already have a huge economic price, so scientific communication in labor relations should be especially responsible, in particular in medicine [16]. After all, here, incorrect publications can increase fear of doctors, distrust of diagnostics, the search for "universal" methods of treatment or, conversely, self-attribution of symptoms without an evidentiary basis. The managerial problem lies in the need to protect medical science not only from obvious falsification of data, but also from popularized simplifications that change patient behavior, which ultimately leads to loss of productivity and human capital. As a result, managerial dishonesty and the pressure of formal publications on education seekers and scientific and pedagogical personnel form a distorted worldview of the informationally vulnerable part of the population, in particular primary and secondary school pupils, students and course participants under programs to improve the level of professional competence. It negatively affects the psychological development of individuals in the further educational process, interpersonal and collective relationships, and ultimately leads to distrust of official scientific sources, the veracity of which is proven and even tested at the international level. All this reduces the number of citations, as it serves as a cascade of information about the unreliability of the sources being picked up by other scientists. In these terms, the number of people willing to engage in science decreases, which negatively affects the innovative and scientific and technological development of the country.

Thus, scientific dishonesty arises as a factor in further distorting the worldview of modern scholars and, consequently, in disinforming the socially sensitive part of the population, especially through social networks, generating triggers of fear, distrust, and stigmatization. If public text, as well as audio or video content, presents complex personal, cultural, or religious phenomena in the form of rigid generalizations, a person may transfer their own feelings of guilt, shame, or hopelessness to visible social groups. Such triggers become risk factors for a person to develop depressive states and nervous exhaustion, which significantly reduces their work productivity. Under such conditions, with the increase in this type of information-affected individuals, the state spends more money on social support for the population that needs medical care due to loss of working capacity, while the state simply lacks funds for high-quality education of a healthy, talented population. To further motivate the state to provide investment support for R&D, research institutions should establish ethical review procedures not only for experiments but also for scientific publications that may affect intergroup trust. This also requires some changes to the regulatory framework governing research activities.

Accordingly, for the practical application of managerial influence on research institutions, it is advisable to propose a matrix of typical management problems and corresponding management decisions (Table 2).

Table 2. Problems of managing research institutions and their management decisions

Management problem	Manifestation in scientific practice	Risk for socially critical sphere	Management decision
Formal peer review	The structure of the text is checked, but not the traceability of key sources	Legalization of a false conclusion as “scientific”	Mandatory audit of primary sources for articles with high social sensitivity
Pressure of quantitative indicators	Priority of quick publications over in-depth verification	Cascading citation and reduction of trust in science	Assessment by data quality, openness of materials, repeatability and social responsibility
Deficit of digital infrastructure	Inability to automatically check references, DOIs, archival texts, translations	Proliferation of non-existent or incorrect sources	Creation of digital registers of primary sources and reference checking systems
Fragmented responsibility	The author is responsible for everything, the institution and the journal are limited by a disclaimer	Lack of institutional prevention of errors	Introduction of research integrity offices and protocols of shared responsibility
Lack of interdisciplinary expertise	Texts in medicine, law, psychology or worldview are narrowly evaluated	Unforeseen social triggers and imbalances	Interdisciplinary advice for topics with a high risk of influencing population behavior

Source: developed by the author

Based on the above problems, to improve the management process of research institutions, it is advisable to introduce a digital system for verifying scientific sources, especially in socially critical areas. In this system, each scientific source will be subject to registration after an automated check of the available text information using tools for semantic comparison of citations with the primary text, as well as bibliographic data, DOI/URL, archival copies, and source availability, which will mark the level of evidence of the statements. Moreover, the limits of application of conclusions will be subject to mandatory declaration through open protocols for correcting errors that arose as a result of violations of academic integrity (such as plagiarism, citing non-existent sources or unreliable statistical data, distorted interpretation of the texts of used sources by previous scholars). After identifying relevant text defects, the information is automatically sent to the author for correction these errors and resending it to the editorial office who re-checks the scientific work for integrity. Therefore, in each requirement for research papers, it is important to replace the phrase "authors are responsible for the information in the submitted materials" with "research institutions are responsible for violations of academic integrity by authors."

In countries with a shortage of IT personnel and limited funding for science, such a system cannot be created solely at the expense of individual journals. Government or grant funding for interagency IT projects involving research institutions, universities, libraries, archives, public administration bodies and professional associations is necessary. Investments in digital verification should be considered as investments in human capital, not as technical costs [13].

The proposed model also involves changing management KPIs. It is advisable to include the following performance indicators of research institutions: the share of publications with open data; the share of verified primary sources; the number of errors corrected before publication; the speed of response to justified comments; the number of interdisciplinary examinations of socially critical topics; the impact of research on the quality of management decisions, and not just the number of publications.

7. Prospects for further research development

Further research should be directed at empirically measuring the relationship between the quality of scientific verification and social consequences in specific areas.

The first direction could be to audit publications in economics, medicine, psychology, law, and social policy for nonexistent references, unavailable sources, mistranslations, overgeneralizations, and repeated citations of already refuted claims.

The second direction is to create a pilot information system for automated source verification in scientific journals and repositories. It should combine bibliographic verification, search for archival copies, comparison of citations with the original source, and detection of duplication and risky metadata. Particular attention should be paid to Ukrainian-language and multilingual corpora of texts, since translation errors are often a source of semantic distortions.

The third direction is to rethink the funding of science. In a situation where the state budget is forced to cover significant social and security costs, investments in scientific integrity may seem secondary. However, they are the ones who can reduce the long-term costs associated with distrust of research institutions, rejection of evidence-based practices, psycho-emotional exhaustion, and loss of productivity. Therefore, digital verification of sources should be included in strategies for the recovery of science and innovation infrastructure.

For a preliminary assessment of the integrated risk of information dishonesty, the following formula can be proposed:

$$R_i = 0{,}25F + 0{,}20V + 0{,}20C + 0{,}20H + 0{,}15S\,, \tag{1}$$

where R_i is the integrated risk of information dishonesty;

F is the lack of funding and human resources (as the most important impact);

V is the weakness of digital verification of scientific materials;

C is the intensity of cascade citation and reuse of unverified claims;

H is the potential loss of human capital;

S is the social sensitivity of the scope of application of scientific information (subject to additional research).

The proposed formula does not claim to be a complete metric model and requires further empirical validation. Its purpose is to form an analytical framework for the preliminary identification of areas where the combination of weak funding, insufficient digital verification, cascading citations, risks to human capital, and high social sensitivity may pose an increased threat to the quality of scholarly communication.

8. Conclusions

The management of research institutions in socially critical areas is a component of the national knowledge security infrastructure. Its shortcomings are manifested not only in weak publication indicators, but also in social consequences: distrust in medicine, legal disorientation, professional burnout, stigmatization, loss of productivity, and reduced innovative capacity.

Statistical data on Ukraine compared to EU countries and the world show that the low intensity of R&D spending and the reduction of research staff limit the ability of the scientific system to conduct qualitative self-examination.

Insufficient funding for science reduces human resources, leading to formal peer review of scientific papers due to fragmented responsibility of research institutions, which ultimately causes the pressure of quantitative ratings, leading to weak digital verification of sources, while the lack of interdisciplinary expertise for topics with high social sensitivity leads to losses of human capital.

The proposed risk-based model involves a shift from managing the number of publications to managing the credibility of knowledge. Its practical elements include digital registers of primary sources, automated reference checking, offices of academic integrity, open error correction protocols, interdisciplinary expert councils, and new KPIs for research institutions.

Therefore, academic integrity should be considered as an economic and social resource. Reliable science reduces uncertainty, supports human capital, reduces the risks of panic behavior and creates conditions for innovative development. Unreliable or formally verified science, on the contrary, can trigger a cascade of social costs that exceed the cost of timely digital and institutional verification.

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