CHAPTER «SOCIAL COMMUNICATIONS»

METHODOLOGICAL RISKS OF EVALUATING THE QUALITY OF SCIENTIFIC CONTENT

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Abstract. One of the top research problem in the field of scientific communication is the search for optimal approaches and tools for evaluating scientific content. After all, the "proper" use of scientometric methods and means is the key to identification and disseminatiom qualitative scientific knowledge. Publication of research results should be considered as a process of scientific communication. Factual confirmation of the implementation of scientific communication between researchers is a citation. The citation is not only evidence of the acquisition of new scientific knowledge by the recipient researcher but also is recognition of its quality and importance to the scientific community. The methodology of traditional metrics for evaluating the results of scientific activity involves citation counting as equivalent to the researcher's impact and the importance of scientific content. However, such quantitative assessment does not guarantee the completeness and complexity of scientometrics research, because it does not take into account all the possible results of the scientific communication process. The purpose of this study is to formulate new approaches for evaluating scientific content through the citation analysis. The object of the study is the evaluation of scientific content based on citation analysis. The subject of the study is the identification of methodological risks of using traditional metrics for evaluating scientific content. To achieve this goal, the following tasks were accomplished: to analyze the process

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of forming a citation for identification and nomination of groups of its physical characteristics; to analyze the variability of the implementation of the scientific communication process; to identify segments of scientific communication that are not accounted by traditional metrics for evaluating scientific content. The methodology of research consists of general scientific methods as analysis, synthesis, descriptive method, and a special method of categorical-conceptual analysis. Analysis and synthesis have been used to develop conceptual frameworks for variative citation analysis and to identify segments of scientific communication that are not accounted by traditional metrics for evaluating scientific content. The method of categorical and conceptual analysis has been used to nominate and justify the concepts of citation's physical characteristics and methodological risks of traditional metrics. A descriptive method has been used to present the results of the study. Through the analysis of multivariate results of scientific communication, the methodological risks, which accompany the use of traditional metrics in systems for accounting and evaluation of research outputs, have been discovered. These include the risk of negative citing, the risk of citing a citation, the risk of distorted citing, the risk of potential citing, the risk of an incomplete citing. By the analysis of the process of citation forming the conceptual apparatus of variative citation analysis, which we qualify as the higher level of citation analysis, has been presented. It is determined by taking into account the totality of both the identified methodological risks of traditional metrics and the potential ones. Variative citation-analysis will cover the quantitative and qualitative assessment of researcher's publication activity and citability.

1. Introduction

The continuous expansion of the researcher's scientific interests and the improvement of the tools of scientific research are factors of intensification of the accumulation of scientific knowledge, presented in numerous scientific publications. This process is characterized by a certain bipolarity: the availability of a large number of sources facilitates satisfying the information needs of consumers of information, but does not guarantee the acquisition of complete and true scientific knowledge. This is because the consumer of information is unable to independently process 100% of scientific content and objectively evaluate its completeness and quality.

The active search for optimal methods and tools for evaluating scientific information has contributed to the emergence of scientometry as an autonomous field of research, which is actively developing in different directions. An important aspect of scientometry is that it is beyond the scope of discipline because the issue of assessing the quality of science is of the interest for researchers of all scientific areas, librarians and information technology professionals. This is evidenced by the constant increase in the number and geographical diversity of scientific collaborations between specialists in various fields of activity [4; 23; 25].

Today, there are a lot of metrics (scientometrics, bibliometrics, cybermetrics, altmetrics, webometrics) that are positioned as "traditional" and "alternative". Therefore, it is difficult for a scientist not to get lost in this diversity of indices, indicators, methodologies, as well as systems for accounting and evaluation of scientific content, which are extremely dynamically changing and become more complicated [2]. In particular, the problem of interpreting terms and concepts in the field of scientometry by the non-English-speaking scholars because of lack of unity of scientific opinion in regional scientific publications and the dissemination of unreliable scientific knowledge among consumers of this information.

Despite the existing differences in approaches, tools and criteria used to evaluate scientific content, the basis for determining the level of a scientist, scientific journal or organisation is a quantitative indicator – the frequency of citing [20].

The quantitative assessment of scientific content involves the consideration of science as a communication system [19]. The communication process within the system takes place according to the classical scheme of H. Lasswell [17]. Using a scientific journal as a communication channel, the communicant researcher sends to the recipient researcher an informative message – the publication of the results of his research. After receiving the information message, the recipient becomes a communicator by publishing the results of his/her research, organizing scientific collaboration, realizing a scientific grant, etc.

In this way, a communication network is formed between the participants of the communication interaction, the equivalents of which are citations. The effectiveness of this communication, estimated in the number of citations traditionally used to determine the level and productivity of a researcher [3].

However, in recent years, more and more authors have criticized traditional methods of quantifying the scientific level of researchers [9; 11]. The imperfection of the evaluation methodology is evidenced by the existence of significant differences between the researchers' indicators based on the number of citations obtained in different systems [14; 25]. Researchers note that quantitative indicators do not reflect the basic criteria for evaluating research results, and only a comprehensive assessment – qualitative and quantitative – can provide a holistic reflection of research by the following criteria: 1) quality of scientific cooperation, 2) creativity in science, 3) mastery in the choice of methods, 4) technical base in analysis, and 5) ability to interpret [1].

2. Recent research in evaluating scientific content

The need to develop and apply qualitatively new methodological approaches for evaluating scientific content is certainly a topical scientific problem. Researchers attribute this to many limitations that accompany traditional metrics [10]. That is why a significant layer of bibliometric research is associated with identifying methodological limitations and shortcomings of traditional metrics and developing ways to eliminate them.

Thus, Petersen A.M., Pan R.K., Pammolli F. and Fortunato S., using the concept of "citation inflation", emphasize that the real value of a citation depends on the time it has been created relative to the cited source. That is, the inability to convert nominal citation values into real citation values leads to errors in measuring scientific impact. To solve this problem, the authors have developed a citation deflator method that demonstrates a significant difference between total citations and h-index scores depending on the reduction of citation scores. Using the citation deflator method, researchers indicate that citation inflation should be taken into account during the preparation and analysis of citation reports. We find it interesting that the authors proposed for scientific journals to limit the number of content references, depending on the volume of the publication. This aimed at reducing the total volume of citations and the abuse of self-citation [21].

Xie J., Gong K., Li J., Ke Q., Kang H. and Cheng Y. note that there is no single scientific position today to apply citation metrics. Therefore, it is important to understand the factors that affect citation. Researchers have created original schemes for identifying and linking factors that are significantly related to articles, authors, references and citations. Based on an analysis of the

6 most relevant for citation factors the authors suggested possible strategies for identifying high quality and most influential articles [24].

Another layer of bibliometric research is related to the development of alternative approaches to evaluating research results.

In particular, Braithwaite J. and his colleagues introduce the Comprehensive Researcher Achievement Model (CRAM) – a generic model designed to minimize the risk of using any number of metrics. The authors note that any model for evaluating scientific achievement should include a quantitative component, and the evaluation process should be difficult to manipulate. In their work, researchers emphasize that no traditional metric meets these criteria. To reduce the potential disadvantages of traditional metrics, the authors propose to use the altmetric toolkit and expert analysis in parallel to evaluate more diverse concepts of impact. At the same time, the authors emphasize that the use of alternative approaches to assessing research requires further standardization [7].

Zhao F., Zhang Y., Lu J., Shai O. developed a new algorithm for ranking authors through measuring academic impact using heterogeneous author-citation networks. This algorithm is an alternative to the PageRank algorithm used to give more weight to citations from more influential papers. Researchers suggest adding authors to a citation network so that the importance of authors and works is recursively evaluated in one frame. The proposed method demonstrated a negative correlation of the best authors' rating with the citation rating and the work count rating [27].

The field of bibliometric research related to the development and use of normalized scientific impact indicators remains relevant. In particular, the work of Steinbrüchel C. is devoted to the improvement of traditional metrics. The author proposes a new hPI metric, which is a normalized analogue of the Hirsch index. The researcher proposed the concept of principal investigators (PIs). According to the concept, the authors of the article are divided into two groups: PIs and non-PIs. A PI is defined as a scientist who supervises an individual research program. Steinbrüchel offers a differentiated approach to evaluate the impact of a scientist by dividing the citations of each article of specific PI by the number of PIs among the authors of a certain article [22]. Bornmann L. and Marx W. study the normalization of bibliometric indicators by time and discipline. The authors notice that time limits and discipline peculiarities affect the calculation of citations, which do not depend on the

quality of the publication. They offer methods for obtaining normalized citation impact scores. The method of checking the adequacy of the proposed normalized indicators is of interest. The authors compare the normalized indicators of specific publications with the peers' assessment [6]. Bornmann L., Leydesdorff L. and Mutz R. study the possibilities and boundaries, the advantages and disadvantages of using percentiles in bibliometrics for obtaining a normalized citation impact of publications [5].

Researches in the field of citation investigation and analysis as a phenomenon are of interest. Such studies complement the quantitative component of bibliometrics by analyzing the peculiarities and causation of the citation process. Ke Q., Ferrara E., Radicchi F. and Flammini A. explore the characteristics of publications, called sleeping beauties, the scientific importance of which remains unrecognized for a long time after emergence and is therefore not supported by citations with a subsequent surge in popularity. The authors set themselves the important task of finding a means of identifying such publications and propose a parameter-free method to quantify the publication's belonging to a group of sleeping beauties. The results of the study allow scientists to talk about the complex feature of citation dynamics and the lack of attention to this aspect of scientific communication in modern bibliometrics. They also provide empirical evidence against the use of short-term citation in quantifying scientific impact [12]. Costas R., van Leeuwen T.N. and Bordons M. focus their attention on the analysis of the phenomenon of self-citation. The authors' differentiated approach to self-citation evaluation, which they do not explicitly regard as a negative phenomenon, is a matter of interest. Researchers regard author and co-author's citations as a source of valuable information about the development of the scientific activity of an individual scientist (each subsequent publication is a continuation of the cited one) and about the process of scientific communication. As a final recommendation for librarians analyzing self-citations, they propose to analyze the causes of self-citation at the individual level [8].

Thus, recent research in the field of exploring the quality of scientific content indicates the need for a systematic review of the methods used to evaluate the impact of citation. Dettori J.R., Norvell D.C. and Chapman J.R. emphasize that the future evaluation of research results will include a more balanced approach, both quantitative and qualitative.

3. Methodology

The methodology of research is based on the use of such general scientific methods as analysis, synthesis, descriptive method, and a special method of categorical-conceptual analysis. Analysis and synthesis have been used to develop conceptual frameworks for variative citation analysis and to identify methodological risks of traditional metrics for evaluating research results. The method of categorical and conceptual analysis has been used to nominate and justify the concepts of citation's physical characteristics and methodological risks of traditional metrics. A descriptive method has been used to present the results of the study.

4. Findings

Research hypothesis. Publication of scientific results is considered as a communication process. It shows up through the formation of a branched network of links between communicant researchers and recipient researchers. The communicant researcher is the author of the scientific publication – the primary source. The recipient researcher is the author of the publication – the secondary source (Figure 1).

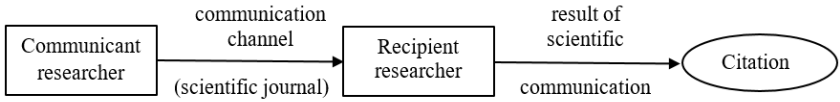

Figure 1. Model of scientific communication based on Lasswell's model [17]

The primary source is considered as a scientific article, a preprint, a monograph, a thesis, where the results of scientific research are presented. As the secondary source, we understand the scientific publication, which cites the primary source. The fact of implementation of scientific communication is confirmed by citing. The citation serves as a link between the communicant researcher and the recipient researchers. It is confirmed by the bibliographic reference.

The number of citations is the basis for the quantitative assessment of the scientific communication process, which we differentiate into evaluating:

– the importance of primary source;

– the impact of the communicant researcher.

The measure of the importance of a certain primary source is its citability, that is, the number of citation-links given in the secondary sources.

We consider the impact of the communicant researcher as a collective concept, defined by statistical indicators during the whole time or determined period of the scientific activity:

– total number of publications, which is equivalent to the researcher productivity;

– citability of each publication;

– total number of citations of all publications.

These statistics are the starting point for calculations within the methodology and tools of traditional metrics. Statistics of publication activity and citability are obtained through the basic citation analysis.

Basic citation analysis is defined as the process of identifying and accounting citations of a primary source by content analysis of bibliographic references in secondary sources. The basic citation analysis as source of traditional metrics for evaluation of scientific content does not cover the possible variability of the results of scientific communication.

Identification of risks of traditional metrics. In our opinion, the importance of primary source and the impact of the communicant researcher cannot be adequately assessed only by the stats obtained through the basic citation analysis. Therefore, in order to increase the objectivity of evaluating the results of scientific activity, we consider it necessary to introduce the concept of "variative citation analysis".

Variative citation analysis is defined as the process of detailed citation analysis, taking into account the qualitative component of citation evaluation, which is a manifestation of scientific communication. In order to move to the variative level of citation analysis, it is necessary to identify the "blind zones" of traditional metrics.

The "blind zone" is a segment of scientific communication that is not accounted by traditional metrics because it is shaped by the multivariative results of scientific communication.

Traditional metrics for scientific content processing use the "de visu" method for identifying and accounting citations at the bibliographic level. The following segments of scientific communication remain out of focus:

– axiological segment that reflects the evaluation of the primary source by the recipient researchers (positive, negative, neutral);

– cognitive segment that illustrates the possibilities of various transformations of scientific knowledge obtained by a recipient researcher from the primary source;

– source segment, which is formed due to incorrect citation (referencing to the secondary sources);

– statistical segment, which is formed due to the considerable uneven distribution of the number of citations between all publications by one author.

Each of these segments, or a combination thereof, displays different variations in the exchange of scientific information. Their list is not exhaustive since scientific activity can give other, new phenomena of knowledge and its presentation in a scientific context.

"Blind zones" of traditional metrics limit the objectivity, completeness and complexity of evaluating the results of scientific activity in general. These limitations are a potential source of the inaccuracy of scientometrics indicators. Unaccounted "blind zones" actually causes risks to the functioning of automated citation indexing. The realization of these risks can have a negative impact on:

– business and scientific reputation of authoritative citation indexing services;

– objectivity of ranking of scientific institutions, scientific schools, researchers and publication;

– approval of academic virtue;

– motivation of scientific activity.

The identification of "blind zones" makes it possible to discover the methodological risks that accompany the use of traditional metrics in systems for accounting and evaluation of research outputs. We refer to them the risk of negative citing, the risk of citing a citation, the risk of distorted citing, the risk of potential citing, the risk of an incomplete citing.

Features of the concept of "risk" and its evaluation. According to F. Knight's concept, risk assessment is based on:

– tools of objective quantitative methods (formal logic, mathematical calculations, statistics);

– subjective unformalized approaches (evaluative judgments, predetermined by the state of objective reality) [13].

However, according to N. Luman, not all risks can be expressed using mathematical and statistical tools. According to his theory, the risk is a

dynamic phenomenon that is constantly transformed, complicated by the influence of non-linear socio-cultural dynamics, self-organization of the social environment and correlated with the objective realities of danger. The sociologist proposes a differentiated approach to the concepts of "risk" and "danger", laying the basis of their definitions in the origin of the negative factor. The concept of "danger" is interpreted as a result of external influence or actions that are outside the subject area. In contrast, N. Luman interprets the concept of "risk" as a consequence of decision-making [18].

Thus, we focus on the characteristics of risk, such as awareness and imperativeness, which are manifested in the compulsory compliance and implementation of decisions.

Conceptual apparatus of variative citation analysis. We believe that scientific communication can be regarded as a complex system since it is characterized by openness, ability to self-organization, hierarchy of the conceptual apparatus [16]. The process of scientific communication is inherent by the dynamic complexity. It manifests itself in the non-synchronous development of various components of the system, which complicates its analysis, detection of the patterns and features of information exchange. Dynamic complexity is increased by the synergistic effect of multivariate scientific communication's results that are not covered by traditional metrics.

The study of the multivariate results of scientific communication can be realized through a comprehensive analysis that takes into account the methodological risks of using traditional metrics. We believe that basic citation analysis is the first level of evaluation of the results of scientific activity. It is determined only by quantitative characteristics through the accounting of the number of publications and their citations. To ensure objectivity, completeness and complexity, it is necessary to move to the variative level, which we qualify as the higher level of citation analysis. It is determined by taking into account the totality of both the identified methodological risks of traditional metrics and the potential ones. This leads to an expansion of the number of criteria that will cover the quantitative and qualitative assessment of publication activity and citability.

A qualitative assessment of the research results involves a multifaceted analysis of citation, not as a bibliographic record in the list of references, but as a complex object. Citation components are determined by generally accepted rules and guidelines for citing.

We distinguish the following components of the citation, stratified in hierarchical order to ensure the completeness of citation:

(a) a fragment of the primary source's text or its interpretation;

(b) an in-text reference to the primary source as a citation;

(c) a bibliographic record of primary source in the list of references as an element of a scientific search;

(d) critical appraisal of the primary source;

(e) an in-text designation of the author or primary source title (Figure 2).

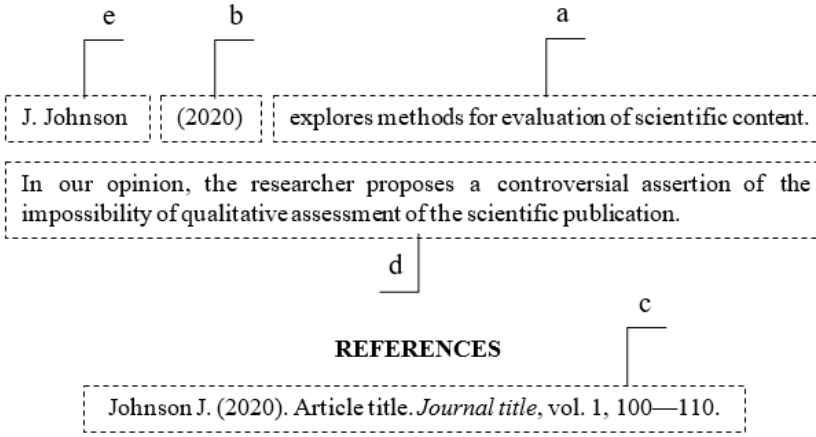

Figure 2. An example of a citing using APA style

Components (a–d) make up the body of the citation because it is a mandatory, integral structural unit. The absence of at least one of the mandatory components violates the integrity of the citation, which may make the difficulty of its identification. We consider component(s) as additional because its presence contributes to the detail and completeness of the citation, and the absence does not impair its integrity.

The considered components are the constituent units of citation at the physical level, that is, as a fragment of printed text. We believe that these components form groups of physical characteristics of a citation:

– factual;

– contextual;

– content.

Factual group of physical characteristics of a citation is defined as a set of published meanings and their interpretations, which make it possible to identify the fact of the occurrence of the citation and its bibliographic confirmation.

The factual group of the physical characteristics of citation is formed by the required and additional components:

A) required elements:

– fragment of a full-text secondary source, which contains a fragment of the primary source's text or its interpretation;

– an in-text reference to the primary source;

– bibliographic record of primary source in the list of references;

B) additional components:

– the author's name and / or primary source's title.

The nomination of a factual group of physical characteristics of citation is justified by the validity of the interpretation of all the above required and additional components as facts of scientific communication. According to the conceptual nature of the documentary subsystem's content in social communication proposed by M. Komova, the fact is an obvious changing of objective reality in space and time, objectified and interpreted in the system of social communication for the cognitive activity of a person. In our opinion, a citation can be considered as a certain manifestation of a fact: as a phenomenon that is a manifestation of the change of original author's content to another author's borrowed thesis and its interpretation.

Let us compare the essential characteristics of the phenomena "fact" and "citation".

According to the concept of M. Komova, the fact is interpreted as a complex, systemic phenomenon, which is realized in space and time, it has epistemological, dialectical, social and communication basis. The epistemological aspect of the existence of a fact is based on the thesis that the cognitive activity of a person is the primary basis of obtaining knowledge, skills that correspond to the real state of things. Subject to the correspondence of knowledge and reality, categories such as truthfulness, truthfulness, truthfulness are revealed. These categories are of key importance for establishing the essence and requirements of the social-communication concept of fact. The same categories are basic for quoting and putting it into scientific circulation. The dialectical aspect of the

existence of a fact is based on the dialectical theory of interconnections and development, which focuses on the study of the substantive characteristics of being things, processes, phenomena, as well as the relationships between them that ensure the existence of the thing, its functioning and development. It is the dialectical paradigm of development that predetermines the use of citation as existing knowledge to reasonably create new knowledge. The social communication aspect of the existence of a fact is based on its understanding as reliable knowledge that can be verified. This approach involves a communication component, since the statement of affirmation, i.e., declaration (true or false), is a communication act and covers key elements of the communication scheme. Citation is an organic component of scientific communication that requires mandatory bibliographic confirmation [14].

Comparison of the categorical apparatus of the concepts of fact and citation gives grounds to claim that they correlate as general and partial.

Comparison of features' characteristic of fact and citation determines the peculiarities of these phenomena (similarity or difference) and reveals their objective nature, belonging to objective reality (Table 1).

Table 1

Comparison of features of fact and citation

Feature	Fact's features	Citation's features
Temporality	the fact that had already happened in the past as a single act or as a chain of homogeneous components of a phenomenon	the citation is a fragment of primary source published in a secondary source
Locativity	the fact always takes place in real action	the citation always relates to a specific primary and secondary source
Mobility	the fact manifests itself in constant simultaneous correlation with spatiotemporal coordinates, undergoing interpretative transformations	the appearance and frequency of the citation in secondary sources correlates with the spatiotemporal coordinates, undergoing interpretative transformations

Comparison of properties inherent in fact and citation defines their essence concerning other things, reveals correlation with cognitive (thinking) processes (Table 2).

Table 2

Comparison of properties of fact and citation

Property	Fact's properties	Citation's properties
Objectivity	the ability to objectify information through the social communication system, ie the ability of certain real-world phenomena to be distinguished from others in space and time, and recorded in documents	the ability to objectify a fragmented primary source by publishing in a secondary source
Interpretability	ability to interpret the following strategic and tactical interests	the ability to interpret differently according to the reader's purpose of the content of the secondary source
Controllability	the ability to be material for manipulative technologies in the control of public consciousness	the ability to be an argument, proof and affirmation of the secondary sources authors' position
Resultativity	the ability to be indissoluble in the causal-consequent character of its appearance	ability to be in constant cognitive link with context and general content of the secondary source

Contextual group of citation's physical characteristics is defined as a set of published meanings and their interpretations, which make it possible to identify the appraisal judgment of the primary source. This group of physical characteristics forms contextual field of citation.

The content group of citation's physical characteristics is defined as a totality of all published meanings and their interpretations, which make it possible to evaluate the integrity, completeness and accuracy of a citation

The naming of the notions of "contextual" and "content" groups of physical characteristics is determined by the direct correspondence of the group name to the certain set of meanings (Table 3).

Methodological toolkit for variative citation analysis. We consider the methodological toolkit of the variative component of complex evaluation of scientific activity as:

– methods of identifying markers, which we define as signs of a scientist's "propensity" to a particular type of methodological risk;

– methods of calculating indicators, which are defined as a measure of the weight of detected individual markers and their totality;

– determination of the individual approach to the complex evaluation of the results of the scientist's activity.

Table 3

Correspondance of citation's groups of physical characteristics

Citation's components	Factual group	Contextual group	Content group
Fragment of the primary source or its interpretation	+	–	+
Author name / source name	+	–	+
In-text reference to primary source	+	–	+
Bibliographic record of primary source in the list of references	+	–	+
Critical appraisal of the primary source	–	+	+

The principle of individuality in the evaluation of a scientist will add objectivity to the functioning of accounting systems for evaluation of the results of scientific activity and will help to secure a high reputation.

In order to formulate a methodological toolkit for the variative component of the scientific activity results' evaluation, it is necessary to analyze the identified methodological risks of traditional metrics (negative citing, citing a citation, distorted citing, potential citing, incomplete citing) because methodological risks of traditional metrics will make the subject areas of variative citation analysis.

The risk of negative citation is defined as the probability of increasing the number of citations of a primary source when citations have been formed through the opposition by researcher-recipient.

The reason for this risk appearance is the identification and accounting of citations outside their context. Thus, the citation given by the opponent as an example of a negative, alternative scientific position contributes to the increase in the number of citation of the controversial scientific results. Therefore, the researcher-recipient may not appeal to such primary source, fearing to increase its citation's number. At the same time, a neutral reference that does not contain a clearly expressed critical judgment (positive or negative) should be considered as positive and as such that does not cause this kind of risk.

Thus, the subject area of the variative component of evaluating the quality of research results, taking into account the risk of negative citation, is the detection of the citation's context.

The risk of citing a citation is defined as the probability of reducing the number of citations of a primary source in the case of its indirect citing through a referencing to a secondary source where the primary source is cited.

The occurrence of a phenomenon such as citing a citation may be caused by factors with different origin but common in the result. All these factors cause restrictions on access to the primary source. They include such aspects:

– technical (no technical means for reproducing information placed on outdated media);

– commercial (possibility of acquaintance with the information only on subscription terms, in particular, when using commercial scientific databases);

– territorial (territorial remoteness of the primary source on traditional media);

– legal (the source contains restricted information);

– competent (non-observance by the researcher recipient of the generally accepted rules, norms of citing).

Thus, the subject area of the variable component of evaluating the quality of research results, taking into account the risk of citing a citation, is to identify the mediation of the citation of a publication.

The risk of distorted citing is defined as the probability of levelling out the importance of single high cited publication in the case of significant variation of the citation's number of all publications of a certain researcher.

Its appearance may be caused by the following factors:

– widespread distribution (high visibility) of certain publication of the researcher and difficult access to his other publications;

– a small number of high-quality, topical publications against the background of the researcher's high publication activity;

– the presence of scientific work, for example, a monograph, which most fully and thoroughly presents the results of long-term researches, which were previously published in parts.

Thus, the subject area of the variative component of quality assessment of research results, taking into account the risk of distorted citing, is to determine the uniformity of citability of a researcher's publications.

The risk of potential citing is defined as the probability of lowering the researcher's impact in case of neglect of the variety of possible results of scientific communication in favour of citation counting.

Scientific publication as a primary source of scientific knowledge during the cognitive activity of the researcher-recipient undergoes various

transformations that do not always find expression in the citation. On this basis, we detail the model of scientific communication based on Lasswell's model (Figure3).

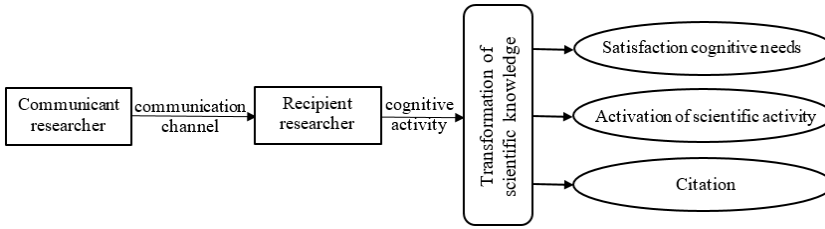

Figure 3. Detailed model of scientific communication

Traditionally, the importance of primary source is evaluated by the number of citations, that does not provide for its completeness, as it reflects only a certain segment of possible transformations of scientific knowledge. The number of views or downloads of a primary source is indicative of the emergence of interest by researchers-recipient (popularity among consumers of information). For example, it can be aimed at satisfying information needs or activating their own scientific activities, which potentially, but not necessarily, may end with citation.

Thus, the subject area of the variative component of assessing the quality of research results, taking into account the risk of potential citing, is to determine the level of scientific and social interest in the researcher and his publications.

The risk of incomplete citing is defined as the probability of reducing the number of citations of a primary source in the case of its mentioning in the secondary source's text without confirmation by the bibliographic record in the list of reference.

The incomplete citing phenomenon is in the same plane as citing a citation phenomenon, because it is also caused by the incorrect formation of the content field of the citation. However, unlike the risk of citing a citation, which is determined by the mismatch of the citation characteristics, the risk of incomplete citing is determined by the incompleteness of the citation's content field due to the absence of a mandatory component – a bibliographic link.

The appearance of incomplete citation can be caused by the following factors:

– competential (non-observance by the researcher-recipient of the generally accepted rules, norms of citing);

– anachronistic (the use of outdated practices of listing authoritative scholars in the literature review without critically analyzing and referencing their publications).

Thus, the subject area of the variable component of evaluating the quality of results of the research, taking into account the risk of incomplete citing, is to establish the completeness of the content group of the physical characteristic of the citation.

5. Conclusion

The publication of the results of scientific research as a manifestation of scientific communication has not always been only the basis for the dissemination of new scientific knowledge but also a powerful driving force for the development of science. The rapid advances in computer technology have made it possible to evaluate scientific activity through automated citation indexing as confirmation of the fact of the realization of scientific communication. That is, citing a certain source of scientific content is evidence to the recognition of its quality by the scientific community, and citation's number is a measure of its importance. Citation counting is a methodological basis for traditional metrics for evaluating the impact of researchers and scientific content.

Rigorous criticism of traditional metrics encourages specialists in the field of scientometrics to seek new approaches and tools for evaluating research results actively. The analysis of the peculiarities of citation formation in the context of the implementation of the communication process between scientists has allowed identifying five methodological risks of traditional metrics, the realization of which can cause inadequate assessment of the authority of the scientist and the weight of the source of scientific content.

Taking into account the risks of negative citing, citing a citation, distorted citing, potential citing and incomplete citing by combining quantitative and qualitative (expert) evaluation of scientific activity will allow to implement a comprehensive approach in scientometric researches.

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