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FUZZY METHODS IN MARKETING RESEARCH: BRIEF LITERATURE REVIEW

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Abstract:

Background: Literature studying is a critical step in research. It allows identified gaps, unresolved issues, research directions, methods, and models for use. Accordingly, publication review is an ongoing task. A lot of poorly defined data makes it difficult to use precise methods, and require new approaches for their processing. One of them is fuzzy modeling. Today it is used little in marketing, therefore there is a need to analyze examples and outline possible it's applications in marketing. Objectives: The object of the review was to study publications describing fuzzy methods for marketing problems. The purpose was to systematize the fuzzy modeling methods for solving marketing problems. Methods: The publications were selected based on content analysis. Then, its' bibliometric data were collected and analyzed, which can be methodologically useful for authors conducting similar studies. Results: The most used fuzzy methods for solving marketing problems were identified. The strengths, weaknesses, limitations, and prospects for using fuzzy approaches in connection with tasks of marketing were indicated. Conclusions: The results significantly complement the general understanding of the place and role of fuzzy methodology in marketing research, and provide practical information regarding the subsequent publication of their results.

Key words: *fuzzy methods, marketing research, literature review, fuzzy marketing model*

1. Introduction

Comfortable In the continuous process of research in any field of knowledge, there is a constant need to be informed both about the results obtained and published by colleagues, and in tracking the methods, approaches, and models they used.

This fully applies to marketing, which requires constant development of both classical techniques and the use of newer approaches and tools borrowed from other areas. Accordingly, the aim of this work was to study the possibilities of applying fuzzy logic to

marketing problems. And the first step for this, as is obvious, is to conduct a review of existing scientific sources and analyze them in various aspects.

The actuality relevance of the search for new marketing research tools, among other things, is determined by the difficulties of obtaining objective market data relating to both consumer behavior and the commercial activities of participants in the globalization of markets. There are also problems of protecting personal information, trade secrets, and other circumstances that often make available information underdetermined, unclear, and indistinct. In this regard, we can observe the use in the social sciences, and in economics in particular, of methods that are new to these areas of knowledge, previously emerged and developed in mathematical, technical, and exact sciences. For example, these are neural networks, genetic algorithms, big data processing, various methods of mathematical and system modeling. One of these methods is also fuzzy logic and approaches based on it.

Fuzzy logic arose and began to develop initially as a theoretical and practical methodology for the exact and engineering sciences in the middle of the last century. However, only relatively recently has it begun to be used to model and solve economic, marketing and management problems (Shepherd, & Shi, 1998; Challoumis, 2015; Ferrer-Comalat et al., 2020). Research gap or novelty of our work is determined by the fact that at the moment there are only a few publications trying to summarize the initial experience of applying various fuzzy logic methods in different areas of marketing. Moreover, the range of issues considered in these works is often limited.

Therefore, in this work we set such tasks as a critical analysis and selection of publications on the use of fuzzy methodology for the problems of studying marketing, identifying the most commonly used fuzzy methods, finding out for which marketing subtasks certain methods are used, as well as in which areas of economic and business activity. These data clarify the practical application of fuzzy approaches to marketing problems in different situations and circumstances. Next, we reviewed the selected publications in terms of their publishers, availability (access), the number of co-authors in an individual article, as well as in terms of authorship from different countries.

This data can be useful both directly in the research process (searching for scientific connections, co-authors on a problem, leading authors), and in preparing and publishing results (choosing a journal, publisher, access option).

As is known, articles devoted to the analysis of various sources of scientific literature occupy a significant place among the entire body of scientific research and publications.

The number of review publications is constantly increasing, which is associated both with the growth in the number of scientific articles in general and with the expansion of information technology capabilities for studying and analyzing the entire body of scientific literature, in particular, the emergence of specialized databases, publication aggregators, and applied software for scientometric analysis. Methodological approaches to solving the problems of review and analysis of publications are also developing.

In the generally accepted understanding, the goals and objectives of publication reviews are a preliminary study of the state of the issue in any study. The main purpose of a literature review is to obtain information about current research and discussions on a particular topic. areas or spheres. A literature review allows to establish key concepts and research methods used in a particular area. The most important role of a literature review in

applied scientific research (in particular, in marketing research) can be considered an analytical function that performs key tasks and largely supports the main stages of scientific research (Ilgaz et al., 2023). In particular, we can mention such points as:

- provides an overview of existing publications and recent trends in a particular field, which clarifies the sequence of development of knowledge and determines the relevance of certain issues;
- facilitates understanding of information in the studied area and displays progress in its study;
- identifies existing contradictions and different opinions regarding concepts, approaches, and research methodologies, and highlights current research gaps;
- determines the possible place and significance of the proposed specific research in the overall picture of scientific knowledge in the field under consideration;
- makes possible to develop a sequence for conducting research, choose tools for checking relevance, supports the continuity logic of knowledge by identifying issues requiring further study and research;
- justifies the main goals of the study and the subsequent stages, components, and sequence of the study;
- confirms or describes the theoretical basis of research, such as generally accepted basic concepts and theories, applied methods and research tools.

Separately, we consider it important to highlight the issue of identifying experts on specific research topics in accordance with the number of publications of authors, their citations, as well as the level of journals where their articles were published.

In this way, it is possible to identify the best experts, consultants, potential reviewers or co-authors in the field of knowledge in question, which is one of the key points of research effectiveness. Another important issue is the type of literature reviews.

The Table 1 shows most frequently encountered types of review classified by speed (time), detailization (methodological depth), risk of bias (lack of objectivity), and comprehensiveness (fullness).

Table 1. The main types of review.

Review types / Characteristics	Speed	Metodoligical details	Risk of bias	Comprehensiveness
Narrative review	Depend on the area	No metods	High	Depend on author
Critically appraised topic	Quick	Fewer methods	Increased	Possible incomplete
Scoping review	⇓	⇓	⇓	⇓
Rapid marketing				
Systematic review				
Meta analysis	Slow	More, deeper methods	Decreased	Comprehensive

Source: Author's elaboration, based on (Brennan et al., 2020)

Narrative (traditional) literature review usually selects and reviews existing publications in a direction (area), which is often quite broad and generalized. In this case, a descriptive style (approach) is mainly used to present the results of the review. It is also possible to analyze the literature on a certain set of topics related in one way or another (methodologically, conceptually, practically, and so on).

Rapid review is an approach that uses a methodology to systematically search and then evaluate publications, followed by identifying the most relevant and advanced ones.

Scoping review has a greater focus on bibliographic and bibliometric indicators; in particular, it analyzes the entire array of available literature on certain topics or their combinations. This type of literature review clearly shows existing gaps in research, existing little-studied areas, gaps of both a methodological and applied nature. Such a review is also particularly useful in the case of multidisciplinary studies, for which searching and analyzing relevant publications often becomes a non-trivial task.

Systematic review is, apparently, one of the most time-consuming and labor-intensive analytical types of review of scientific publication sources. In this case, it is assumed not only a systematic search and evaluation of scientific results, but also a certain synthesis, the development of generalizing conclusions and decisions regarding promising areas of research and one's own place in this process. This type of literature review is often quite specific and highly dependent on the type of study. It often includes various qualitative studies, studies of effectiveness, economic evaluation capabilities, estimates of data accuracy, prevalence, and more.

In our case, it seems most appropriate to use scoping review. Thinking about the need to review literature sources devoted to the application of fuzzy logic methodology to marketing research, we first searched for similar publications in some well-known databases and aggregators of scientific articles.

For example, the Table 2 shows the number of articles in the RePEc (Research Papers in Economics) database on the topics we are considering. In this case, the search was carried out using keywords in the title of the publication. The situation is similar for other publication databases.

Table 2. Review papers in *RePEc* with fuzzy approach for marketing research.

Key words for search	2019	2020	2021	2022	2023 (6 month)
literature review	519	762	992	1046	717
literature review**+**marketing	11	32	26	34	14
literature review**+**fuzzy+marketing	0	0	2	1	1

Source: Own author's elaborations.

In general, it was found that there are quite a few such review articles, and at the same time their number is increasing from year to year. This confirmed our choice of purpose and objectives of the study.

An important issue in literature reviews is the choice of a reasonable time frame for the publications being analyzed. To do this, in our work we relied on the so-called *Journal Usage Half-Lives Time* (Davis, 2013) or *Cited Half-Life Data Years* (Doğan et al., 2022), which in general is various for different branches of knowledge.

According to *Clarivate Analytics* (http://help.prod-incites.com/incitesLiveESI/7766-TRS) the Cited Half-Life is the median age of the citations received by a journal during the year. A citation's age is equal to the publication year of the citing item minus the publication year of the cited item. By definition, half of a journal's earned citations are to items published before the *Cited Half-Life*, and half are to items published after the *Cited Half-Life*.

As shown in the publications (Davis, 2013; Doğan et al., 2022), and accordingly in the Table 3, for publications in the social sciences in general, this time is about five years. Therefore, the same period can be chosen as the time frame for our study.

Table 3. Article's median half-live time (months) by subject category.

Subject category	24-36	36-48	48-60
Health sciences			
Life sciences			
Chemistry			
Computer science			
Energy & Earth sciences			
Engineering			
Social sciences			
Humanities			
Physics & Mathematics			
All subjects			

Source: Author's elaboration, based on (Davis, 2013; Doğan et al., 2022).

Considering all of the above, the purpose of our research was to conduct a review of the segment of article publications in which fuzzy logic methods are used to solve various marketing problems. A five-year literature search time frame was selected. In particular, were solved the tasks of initially searching for relevant publications in the main databases of scientific articles, of determining the structure of the combined breakdown of the found publications by subject areas of marketing, as well as by components (elements) of marketing, of selection of the studied bibliographic characteristics of sources, of accumulation of data on these characteristics with their subsequent analysis.

2. Materials and methods

It should be noted that combining marketing and fuzzy modeling issues in search queries does not give good results when using specialized (economic or information technology-oriented) databases of scientific publications, especially with automated searches. Therefore, we resorted to a manual search, analyzing the relevance of each source (found using keywords in the title and abstract and potentially relevant to our task) based on its full text.

We previewed some of the most recent and comprehensive literature reviews like our study. Among them is publication (Dairo & Szűcs, 2021), where the application of fuzzy sets, fuzzy logic and all related fuzzy methods in the field of marketing is analyzed based on 376 scientific articles. They are divided into five application areas: fuzzy modeling, web analytics, performance analysis, fuzzy clustering and segmentation, fuzzy market analysis. In contrast to this publication, we consider a slightly different division of the analyzed publications into marketing areas.

We also separately analyze the division of articles by area of economic activity. We presented to the reader separate matrix representations of the relationships of various fuzzy methods with the marketing tasks being solved, as well as with various areas of activity.

A generalizing fundamental publication (Hernández & Hidalgo, 2020) is devoted to the use of general fuzzy logic approaches in modeling for various processes in business and

management. The article (Rosário, Dias, & Ferreira, 2023) analyzes 96 studies from SCOPUS on this topic until December 2022.

Observed publications confirm that fuzzy methods are a good tool for improving marketing performance. Kahraman, Yazıcı, & Karaşan (2018) emphasize that fuzzy sets are good at modeling uncertainty and linguistic assessments of consumer behavior in digital marketing. They summarized and classified the literature on the use of fuzzy multi-criteria decision-making methods in digital marketing and gave a description of these fuzzy methods. Publication (Sharma, Sain, & Singh, 2021) also confirms the feasibility of using fuzzy modeling methods, namely, fuzzification, defuzzification, fuzzy decision logic for electronic (online) marketing.

The research (Lin et.al., 2016) proposes a fuzzy development of classical statistical methods for marketing research and decision making. The article (Meftahy & Kabbouri, 2022) presents a systematic review of the literature (from 2000 to July 2022, 24 studies) on the use of neuro-fuzzy systems for market forecasting. It is noted that neuro-fuzzy models often outperform classical methods. Liao et.al. (2023), based on a review of 85 publications on fuzzy decision-making models, confirm the need to use fuzzy modeling to account individual consumer behavior in an uncertain market environment. Analysis of the above literature sources confirms that review studies of publications on the use of fuzzy modeling methods for solving various marketing problems are very relevant.

As a result of the analysis of the articles that we found on the main aggregators of scientific publications, we selected 105 articles, divided according to using fuzzy methods, to 14 subgroups (defined by the authors), which are presented in Tables 4 and 5.

Table 4. Sources with the author's classification by application to marketing sectors.

Marketing sectors	fLogic	fsQCA	fAHP	fDEMATEL	TOPSIS	fDelphi	fANP	Others
Tourism	Vujičić, 2020; D'Urso, 2020	Tarazona 2020	Sharma, 2022	Ho, 2021	Martin, 2021		Ho, 2021	Yamagishi, 2021 (f-cognit. maps) Jin, 2019 (fuzzy clustering) Ghasemi, 2021 (fPROMETHEE)
Agriculture	D'Urso, 2019; Duan, 2021		Yang, 2018; Chen, 2020			Lee, 2021		Puška., 2022; Qi, 2021 (fCRADIS) Zeraatpish, 2020 (fuzzy clustering) Goswami, 2021 (f-cognit. maps) Nedeljkov, 2022 (fMABAC)
Education	Gryshova, 2019	Ullal, 2021	Amini, 2017					
Banks	Xu, 2019		Chiang, 2020; Mosavi, 2018; Yurdakul, 2019		Yurdakul, 2019	Chiang, 2020		
Entrepre-neurship, SME strategy	Velazquez, 2021; Leon, 2021	Jenson, 2020	Kazemi, 2019	Kazemi, 2019; Toklu, 2019			Toklu, 2019	

Source: composed by the authors.

Table 5. Sources with the author's classification by application to marketing issues.

Marketing issues	fLogic	fsQCA	fAHP	fDEMATEL	TOPSIS	fDelphi	fANP	Others
General	Sun, 2017	Pappas, 2021; Liang, 2020		Du, 2020		Chen, 2021; Liu, 2017	Chen, 2021	Rajab, 2017 (neuro-fuzzy)
Consumer behavior	Banerjee, 2022; Xu, 2020; Luo, 2019; Emmaru, 2021	Septianto, 2019; Krishen, 2021; Sun, 2021; Souiden, 2020; Ye, 2021; Lin, 2017; Gligor, 2020	Martínez., 2021; Tin, 2020; Farsijani, 2018		Tin, 2020; Nilashi, 2019			Nilashi, 2019; Kumar, 2022 (neuro-fuzzy) Forghani, 2022; Martínez, 2021 (fuzzy 2-tuple)
Segmen-tation	Sirb, 2018							D'Urso, 2017; Moodley, 2020; Lin, 2021; Hu, 2022 (fuzzy clustering)
Business strategies and decisions	Schüller, 2019; Hsu, 2020; Wang, 2020; Jabbarzad, 2021	Liozu, 2021	Tohidi, 2020; Bhatt, 2021; Tsai, 2022		Shahin, 2020		Tohidi, 2020; Tang, 2018; Tang, 2022	Baykasoğlu, 2017 (f-cognit. maps)
Marketing manageme nt	Lesko, 2017; Leung, 2019		Yan, 2021					Shukla, 2020 (f-cognit. maps)
Product design	Tsafarakis, 2020; Li, 2021; Li, 2018		Li, 2021	Tseng, 2021		Tseng, 2021		
Branding	Sakas, 2022	Capatina, 2018; Torres, 2018; Foroudi, 2018; Chierici, 2021; Rahman, 2018; Wang, 2021						
Distribution , E-commerce	Chou, 2020; Pramanik, 2018; Pramanik, 2019; Rahman, 2020; Alkahtani, 2021	Salonen, 2021	Göçer, 2019; Ghandour 2018; Chirra, 2018; Nazam, 2020	Naser, 2021		Göçer, 2019		
Communi-cation		Bernal, 2021; Frasquet, 2021; Ageeva, 2018	Tandon, 2019					Aswani, 2018 (fuzzy clustering) Tandon, 2019 (fPROMETHEE) Sakas, 2021 (f-cognit. maps)

Source: composed by the authors.

Then we began to accumulate and process bibliographic information about each publication and obtain general summary results for the parameters of interest to us.

3. Results

Free access to scientific information, as is known, is an essential component of the success of any scientific research, both fundamental and applied scientific research.

Table 6 shows the ratio of open access publications to limited access publications (paid, by subscription, through access at the place of work at the university etc.).

Table 6. Sources of open and restricted access and their publishers.

Access	Number	Publishers
open	55	Hindawi, MDPI, PLOS, SAGE, Elsevier
restricted	50	Elsevier, IGI-Global, Inderscience Publishers, Springer, Taylor & Francis, Wiley

Source: Own author's elaborations

This information is especially important when searching for suitable journals to publish articles, and this is especially true for scientists from developing countries.
Regarding the total number of publications over the five-year period shown in the Table 7, it should be noted that their total number is small, and there is a clear upward trend.

Table 7. Years of publication.

Year	Number
2017	8
2018	15
2019	15
2020	23
2021	33
2022	11

Source: : Prepared by the authors (for 2022 only part of the year)

Commenting on the table data for 2022, it should be noted that we collected the actual data (search and selection of articles, their bibliographic information) in the first quarter of 2022. Therefore, only publications that were actually published and became available at that time were processed. It is also necessary to take into account that some articles in indexed journals end up in databases (and, accordingly, are open for analysis) sometimes with a significant delay (although there is also the opposite practice of early publications). Therefore, the final number of publications becomes clear after the certification of the relevant year, and sometimes later, and for 2022 it will be equal to or greater than 2021 year.

The data in Table 8 shows the number of authors per article. Obviously, the interdisciplinary nature of the studies under review necessitates the participation of several authors (providing different components of the research). At the same time, it should be noted that authors do not abuse publications in large groups of authors. The bulk of articles have two, three or four authors.

Table 8. The number of authors in a single publication.

Authors	Value
one	9
two	24
three	24
four	23
five	16
more five – less ten	7
ten and more	2

Source: : Prepared by the authors

As we can see from Table 9, that the main part of the articles is published by three publishers, namely: Elsevier, MDPI, Springer.

Table 9. The number of articles by publishers.

Publisher	Number
Elsevier	23
MDPI	23
Springer	16
Inderscience	10
others	10
Taylor & Francis	7
PLOS	5
Hindawi	3
IGI-Global	3
SAGE	3
Wiley	2

Source: : Prepared by the authors

As for fuzzy logic methods, which are used most often (for different types of problems and marketing issues), the most frequently published articles describe the use of FsQCA and FAHP, as well as articles that generalize or interpret the use of fuzzy logic in general.

As can be seen from Table 10, the general list of possible methods is quite wide. Often, they can be interpreted as a fuzzy development (interpretation, extension, modification) of the corresponding classical, basic, standard methods.

Table 10. The number of articles by methods.

Methods	Number
Fuzzy logic (general)	28
FsQCA	22
FAHP	20
DEMATEL	6
TOPSIS	6
Fuzzy Delphi	6
FANP	6
Fuzzy Cognitive Map	5
Fuzzy c-Means clustering	4
Fuzzy k-Means clustering	3
Fuzzy CRADIS, CRITIC, MABAC	3
Neuro-fuzzy	3
Fuzzy 2-tuple	2
Fuzzy PROMETHEE	2

Source: Collected by the authors

Table 11 provides data on the authorship of the articles. It is obvious that a significant part of the authors is concentrated (affiliated) in a small number of countries, which allows us to conclude that it is necessary to develop intercountry and interuniversity research cooperation.

In this regard, the issue of publication of articles by teams of authors from different countries was studied. For articles with multiple authors, the following results were obtained: authors from 2 countries - 23 articles, from 3 countries - 6 articles, from 4 countries - 3 articles, from 5 countries - 1 article.

Table 11. The number of articles by countries.

Countries	Number
China	18
Taiwan	16
India	14
Iran	12
UK	10
Australia, USA, Spain	8
Italy	5
Turkey	4
Serbia, Canada, Greece, Romania	3
Indonesia, Bosnia, Morocco, Chile, Colombia, México, Finland, Ukraine, Hong Kong, Pakistan, Vietnam	2
Germany, Bahrain, Bangladesh, Czech Republic, France, Denmark, Netherlands, Ireland, Japan. New Zealand, Norway, Philippines, Portugal, Tunisia, UAE, South Korea, Iraq, Saudi Arabia,	1

Source: Collected by the authors

4. Discussion

To context the analysis of the results, it would be useful in future studies to briefly discuss the most commonly used methods in order to provide a general understanding of their basic concepts and approaches. Now we can only state which fuzzy methods and approaches are most often proposed for solving marketing problems.

The largest number of publications considers various applications of FsQCA and FAHP methods in marketing research. Also, a number of publications describe various applications of fuzzy DEMATEL, TOPSIS, Delphi, and ANP methods for solving local marketing tasks. End finally, let us briefly dwell on the common points regarding the advantages and disadvantages of fuzzy logic for marketing research in general, based on the analyzed publications. Without pretending to be complete, we would like to note below the following points.

Among the positive aspects, one can note the possibility of calculation-based obtaining reliable results in conditions of inaccurate, insufficient or underdetermined information. Fuzzy approaches require significantly less information when using data from survey results or expert opinions.

There is specialized computer software that implements various fuzzy methods, and therefore the researcher (or practitioner) is not required to have too deep knowledge of the computational aspects of the approaches used, which simplifies their practical application.
For a number of standard methods, their fuzzy interpretations have been developed, which simplifies the understanding and application of these methods, and at the same time makes them more convenient and better reflecting the actual source data and their mutual influence. At the same time, when using fuzzy methods in marketing research, one should take into account their lower accuracy in certain cases, which is not due to the shortcomings of the methods themselves, but to gaps and inaccuracies in the source information.

In particular, in fuzzy methods based on expert assessments (especially with a small number of experts) data or small samples (insufficient from the point of view of classical statistics), it is advisable to use several methods followed by a critical comparative analysis of the results obtained. In this case, a multi-pass modeling (calculation) process is also used

with refinement of both the initial data and the models themselves (calculation algorithm) with each repetition (iteration) until acceptable results are achieved.

The theoretical implications of this study can be stated as follows. The results of the systematization and subsequent analysis of relevant literature sources presented by us confirm the need and effectiveness of using fuzzy set theory methods for marketing research of both a theoretical nature and a practical orientation.

The article for the first time proposes and implements two separate systematizations for the reviewed publications: by sector and by marketing objectives. This allows you to identify and select the supposedly best fuzzy techniques in a two-parameter mode - taking into account both sides of the problem that requires consideration and solution. It is also possible to outline a circle, a set, a set of several methods, the use of which for similar problems under consideration has already been described and has yielded results.

Also new is the presented data on the number of publications by number of co-authors, affiliation of authors by country, and methods used.

As for the practical implications of the results, it is the next. The presented data allows us to make practical decisions when conducting marketing research regarding the selection of adequate and effective fuzzy logic methods for each specific task under consideration. You can also identify potential co-authors of research or publications, proposed publishers (scientific journals) for publishing the results.

Regarding the limitations of the study, it can be noted that limited access to full texts in some journals and publishing houses does not make it possible to more accurately determine the place of relevant publications in the review, or to more clearly identify the methods used and the nuances of their application. Article abstracts provide sufficiently meager information for a more detailed analysis.

Another limitation, we believe, is the large overall number of articles, which is why literature reviews tend to be divided into two types - large general reviews with articles numbering in the hundreds, and more detailed, detailed ones, paying attention to detail but for a narrower circle methods or areas of their application.

There is also still a scattering of articles across different databases of scientific publications that do not overlap each other. And although the introduction and use of digital object identifiers (DOI) has significantly improved the state of affairs, facilitating the search and systematization of information, there are still some journals outside this system, however, containing relevant and useful publications.

5. Conclusions

To summarize, we note that the presented review of journal publications concerning the use of the fuzzy approach in marketing research showed that this tool is very relevant and is actively used and developed. Moreover, this applies to both fuzzy expansion of previously known classical approaches and the emergence of new ones.

The article carries out and presents a systematization of current methods and models, the description of which is presented in the analyzed literature. This provides both an understanding of research directions in general and the identification of the authors' own future articles in the general flow of publications. The other side is to

determine the essence, prospects and potential application in marketing research of various fuzzy methods and models as such, as a research tool.

Also provided are links to publications describing computational examples of the use of various fuzzy modeling methods for the practical solution of marketing problems in various subject areas and conditions. This allows both academic and practitioner marketers to select, identify and study specific methods and tools that may be useful to them in specific real-world situations.

Regarding the additional limitations of this material and the presented review, it should be noted that they are rather related to the fuzzy methods themselves, determined by their advantages and disadvantages, application features and specific requirements for input, source data.

Finally, among the directions for further research, we would like to highlight the possibility of conducting a more in-depth bibliographic analysis, which involves both covering a larger number of publications and identifying connections between them. This, for example, is expressed in issues of citation, analysis of the works of the most frequently published, active authors and universities, the connection of publications with grant support for research, and others.

In the future, it is planned to use special computer programs for bibliographic analysis, which will allow it to be carried out in a two-stage form. At the first stage, the maximum possible number of relevant publications should be found using machine methods of big data analysis, and at the second, their detailed content analysis should be carried out for further detailed and in-depth substantive review.

In addition, we highlight as a separate task for subsequent research the systematization of literature specifically on the use of computer software products and specialized software in the application of fuzzy methods to marketing problems. This will facilitate the use of methods and models of fuzzy logic in marketing, making this application possible and accessible for practical use by marketers and economists in general.

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