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Scientometric and Bibliometric Analysis in Analytical Marketing Research

Keywords: analytical marketing; financial marketing; data-driven marketing; Web of Science; VOS viewer

JEL: M21; M31; C55

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Abstract

Theoretical background: Analytical marketing is at the heart of scientific research because it plays an important role in building the competitiveness of enterprises and is an opportunity for them to grow.
Purpose of the article: The aim of the article is to present the results of a bibliometric analysis of the developing area of analytical marketing.
Research methods: For this purpose, specialist journals published between 1900 and 2021 were searched in the Web of Science database. The scientometric analyses carried out on their basis concern the number of publications, authorship and co-authorship, the number of citations, journals, thematic categories, institutions, countries and keywords. Over 200 publications cited 2,563 times were analyzed.

Main findings: The concept of analytical marketing was taken into account by over 400 authors, with Maria Petrescu authoring the highest number of publications, and Michel Wedel being the most significant author due to the number of citations. An important role, due to the number of publications in this area, is played by institutions based in the USA (over 50%), including the University of Nevada, Las Vegas (UNLV) and the Nevada System of Higher Education (NSHE). Moreover, the conducted research emphasizes the importance of marketing analytics and presents benefits that stem from using it.

Introduction

Analytical marketing based on statistical analyses, supporting all stages of marketing activities, is necessary in the functioning of modern companies. The effective use of knowledge about customer needs allows to deploy marketing resources more efficiently, develop faster and be more successful (Hallikainen, 2020; Sivarajah et al., 2020; Du et al., 2021; Venkatesan et al., 2021). Research shows that companies can use marketing analytics to significantly improve their capabilities and competitiveness by taking advantage of customers' readiness to deliver data (Germann et al., 2013; Decker & Stummer, 2017; Martin et al., 2017; Chen & Wang, 2019; Cao et al., 2021).

The ability to transform knowledge into useful, multi-channel and up-to-date communication is what distinguishes a company from competitors, and the key success factor is the adaptation of activities to the most important results and innovation (Miller, 2011; Rizzo, 2015; Maklan et al., 2015; Papa et al., 2021; Filieri & Mariani, 2021). Many companies have at their disposal data and tools, but find it problematic to use them (Berman et al., 2007; King, 2018; Branda et al., 2018; Jabbar et al., 2020; Morewedge et al., 2021). Bearing in mind the need to develop appropriate metrics and analytical methods to improve data quality, marketing analytics plays an important role in these circumstances (Wedel & Kannan, 2016; King, 2018; Iacobucci et al., 2019). Researchers note that 60% of companies that use analytics to understand customer behavior are successful, exceed their goals, and outperform their competitors. Enterprises that use data only sporadically obtain significantly worse results than expected. The barrier is the lack of analytical knowledge (Rubin & Chang, 2013; Cao et al., 2018; Venkatesan et al., 2021).

The general objective of the work is to present the results of a bibliometric analysis of the developing area of analytical marketing. The specific research objective is to identify publications on analytical marketing in the Web of Science (WoS) in the context of the development of analytical marketing and its impact on corporate governance.

Literature review

Researchers notice a split in the area of analytics, both in theory and practice, taking into account the amount of data that appears and the concepts that define it (analytical marketing, financial marketing, big data, data-driven marketing, etc.) and

the ways in which they are used (Verhoef et al., 2016; Moorman, 2016; Hanssens & Pauwels, 2016; Ritter & Pedersen, 2020; Shi et al., 2020). Despite a long-term upward trend in interest in this field (Figure 1), more research is recommended in the area of marketing, data analytics, computational methods and big data (Hoppner & Griffith, 2015; Kannan & Li, 2017; Wamba et al., 2017; Gnizy, 2019; Yang et al., 2020).

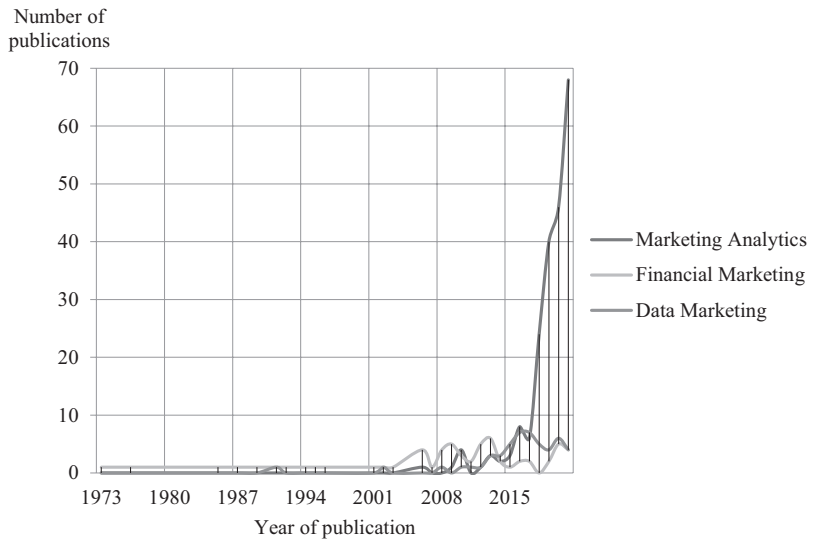

Figure 1. Number of analytical marketing, financial marketing and data marketing publications 1973–2021

Source: Authors' own work based on (Web of Science data, 2021).

There is a number of indicators used for marketing measurements. Hence, the choice of parameters to be tested can be complicated as it is not known which of them will prove to be the most significant. Probably, most resources are spent on collecting data, not analyzing it, so interdisciplinary work between data mining, big data and analytics is important (Miller, 2011; Spillecke et al., 2015; Du et al., 2015; Ketter et al., 2016; Jobs et al., 2016; Verhoef et al., 2016).

Marketing analytics is the science of data and modelling, a tool used to solve problems with marketing resources and business decisions. It presents cause-and-effect relationships in customer behaviour in numerical form (Grigsby, 2018; Iacobucci et al., 2019, Zhang & Watson, 2020).

This study uses both bibliometric and scientometric analysis of analytical marketing, which will allow to guide future scientific research conducted by the authors of this article (Diodato & Gellaty, 2013; Araya-Castillo et al., 2021). The bibliometric analysis of marketing analytics shows the progress of research in this field and is descriptive in its character (Osareh, 1996). In the scientific community, structural aspects are studied using a more detailed analysis such as scientometry (Merigo et al., 2015). A scientometry-based methodology involves the analysis of metadata

from academic research databases published in the Web of Science, one of the most influential sources of scientific information. To the best of the authors' knowledge, this article is the first scientometric analysis of analytical marketing based on this source, although there are other significant reviews of the literature in this area (Iacobucci et al., 2019; Mongeon & Paul-Hus, 2015; Meneghini & Packer, 2020).

The WoS database consists of 68 information fields for each record, which allows to perform a detailed analysis of papers from a selected scientific field. Metadata consists of key factors such as source titles, abstracts, keywords, authors, references, number of citations for a publication, name and address of the publishing authority, language and type of document. This allows to determine cooperation between scientists' papers (co-authorship), impact (bibliographic coupling), the level of cooperation between countries or organizations, as well as shared keywords to determine whether they belong to a given area of knowledge (Araya-Castillo et al., 2021). It is possible to create a network of relationships at a selected time and thematic scope (Zupic & Čater, 2015; Velt et al., 2020). The analysis can also be used to classify journals by defining an equal-sized productivity zone, which enables the identification of the most specialized journals (García et al., 2017).

Research methods

The research methodology is based on bibliometric and scientometric analysis (Mongeon & Paul-Hus, 2015). It is exploratory in nature and consists of five phases: formulation, identification, selection, confirmation, analysis and thematic synthesis (Velt et al., 2020; Diodato & Gellaty, 2013; Araya-Castillo et al., 2021). Formulation is based on posing research questions (Quinn et al., 2016; Paschen et al., 2020; Akter et al., 2021), taking into account the most important issues related to analytical marketing, which are:

1. Who is the most influential author of publications in the studied field (in terms of citations) and who publishes the most?
2. What is the network of relationships between researchers, taking into account co-authorship and citations?
3. Which journals publish the highest number of articles in the field of analytical marketing?
4. Which areas is data-driven marketing most related to? (García et al., 2017; Velt et al., 2020).
5. Which institutions are the most crucial in terms of going deeper into the topic and which countries are responsible for the highest number of publications?

The above questions are research questions that are accepted by the authors for analysis.

The identification was carried out on 6 November 2021 and consisted in a data search in the WoS database. The following keywords were specified: "analytical

marketing" (the most popular term defining data-driven marketing was selected) and the time framework for the searched publications: 1900–2021. The parameters were also narrowed down by selecting the following indexes in the Web of Science: Science Citation Index Expanded (SCI-E), Social Science Citation Index (SSCI) and Emerging Sources Citation Index (ESCI), which was aimed at eliminating abstracts of books and conference materials, leaving only peer-reviewed papers of the highest level of significance for deepening knowledge (Velt et al., 2020; Denyer & Tranfield, 2009; Serrano et al., 2019; Araya-Castillo et al., 2021; Vega-Munoz et al., 2020).

As a result of the search, 207 articles were obtained, published in the database in the years 2006–2021 and cited a total of 2,563 times.

The next step was to confirm the compliance of the data with the searched term. Among the most-cited publications, two were selected, not related to the subject of the search, by Dionissios Neofytos.[1] They concerned the medical field, and analytical marketing was mentioned only in the summary. They were included in the results but were not taken into account in the conclusions.

The thematic analysis and synthesis were based on the comparison of the results with the research questions posed, using specific tools. The following were analyzed: the number of publications, citations, authors, categories, institutions, countries, and keywords. An analysis of bibliometric mapping was also carried out, as well as studies presenting networks of relations, presented in the form of graphs and singled-out clusters, using the VOSviewer program, version 1.6.16. (Zupic & Čater, 2015; Musalem et al., 2018; Van Eck & Waltman, 2010; Velt et al., 2020).

Results

This chapter presents and discusses the results obtained in the scientometric study of analytical marketing, using the Web of Science database and the VOSviewer software.

Publications and citations on analytic marketing at WoS

The first step was to determine the number of articles containing the term "analytical marketing" published over time. 207 publications were identified between 1900 and 2021. The first of them dates back to 2006 in a significant journal *Marketing Intelligence & Planning*, and its author is Angela Stanton. The most influential articles, authors and journals were identified. The published papers were cited a total of 2,563 times. The result illustrates a growing interest in the topic and highlights the importance of analytical marketing over the years (Figure 2).

[1] An infectious disease specialist, Service des Maladies Infectieuses, Hôpitaux Universitaires de Genève, Rue Gabrielle-Perret-Gentil 4, Geneva, Switzerland.

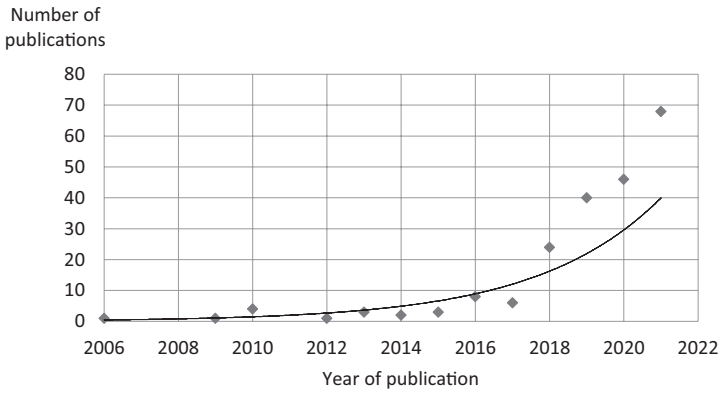

Figure 2. Number of analytical marketing publications in 2006–2022

Source: Authors' own study based on (Web of Science data, 2021).

Figure 2 shows a weak linear growth in 2006–2017. The breakthrough came in 2018 when the number of publications exceeded 20 and continued to grow. The maximum level was achieved in 2021 and amounted to 68 publications. 86% of all publications in this field have been published in the last four years, which proves a high level of interest in analytical marketing.

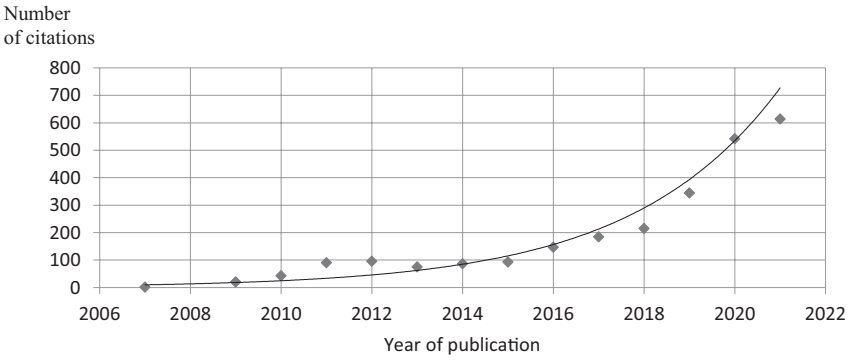

Figure 3. Number of citations in 2007–2021

Source: Authors' own study based on (Web of Science data, 2021).

Figure 3 shows the number of citations related to analytical marketing in the literature over a year. As with the number of publications, there is an upward trend here, and the highest number of citations (614) occurred in 2021. The average annual number of citations is 171.

Table 1. Citation structure of analytical marketing

Number of citations	Number of papers	Percentage of papers
Over 200	3	1.4
100–200	3	1.4
50–100	6	2.9
Less than 50	112	54.1
0	83	40.1
Total	207	100

Source: Authors' own study based on (Web of Science data, 2021).

Table 1 shows the citation index of publications that were in total cited 2,563 times. Three articles with over 200 citations were identified, which represents 1.4% of the published research. The same percentage and number of articles were defined for the 100–200 citations range. Six papers are in the range from 50 to 100 citations, which is almost 3% of the total number. The majority (54.1%) are articles cited in the WoS from 1 to 50 times (112 publications). There are 83 papers that have never been cited, and this accounts for as much as 40.1% of all the published research.

In bibliometric analysis, the *h*-index (the so-called Hirsch Index), which indicates that there is a number *h* of such publications whose number of citations *c* is not lower than *h*. It depends on two parameters: the number of publications and their citation rate. It is used to evaluate researchers and journals (Osiński, 2012). In the study for 207 selected publications, the *h*-index is 19, which means that 19 papers had over 19 citations and they have the greatest impact on the study (Steward et al., 2019). Among the listed publications (Table 2), the most widely cited papers (540 and 285, respectively) are two articles in the field of medicine by Neofytos and they are not directly related to analytical marketing. Hence, positions 3 and 4 in the ranking are considered to be the most influential publications in the field of data-driven marketing. The article, which was written by Wedel and Kannan, has 230 citations, which is 9.1% of all citations (2,563), and was published in the *Journal of Marketing* (Q1). The authors present a detailed analysis of analytical marketing, including its historical outline, application in relation to data, new methods of analytical research, and the emergence of trends in analytical marketing as a discipline. From the perspective of this study, the second important publication is the work by Rust and Huang, with the number of citations at 155 (6.1% of all citations), published in *Marketing Science* (Q3). The key issue indicated by the authors of the article is the impact of the use of analytical marketing by the company on the nature of a relationship with the client and personalized marketing. It is worth noting that the main authors of the articles distinguished in the field of analytical marketing have the *h*-index of 48, which is very high.

Table 2. Most cited papers in the field of marketing analytics

Ranking	Author	Title	Year	Journal	Number of citations
1	Neofytos, Horn, and Marr	"Epidemiology and Outcome of Invasive Fungal Infection in Adult Hematopoietic Stem Cell Transplant Recipients (…)"	2009	*Clinical Infectious Diseases*	540
2	Neofytos, Fishman, and Marr	"Epidemiology and Outcome of Invasive Fungal Infections in Solid Organ Transplant Recipients"	2010	*Transplant Infectious Diseases*	285
3	Wedel and Kannan	"Marketing Analytics for Data-Rich Environments"	2016	*Journal of Marketing*	230
4	Rust and Huang	"The Service Revolution and the Transformation of Marketing Science"	2014	*Marketing Science*	155
5	Xu, Frankwick, and Ramirez	"Effects of Big Data Analytics and Traditional Marketing Analytics on New Product Success: A Knowledge Fusion Perspective"	2016	*Journal of Business Research*	120
6	Ghose and Han	"Estimating Demand for Mobile Applications in the New Economy"	2014	*Management Science*	120
7	Sarstedt and Cheah	"Partial Least Squares Structural Equation Modeling Using SmartPLS: A Software Review"	2019	*Journal of Marketing Analytics*	81
8	Duan and Xiong	"Big Data Analytics and Business Analytics"	2015	*Journal of Marketing Analytics*	77
9	Hofacker, Malthouse, and Sultan	"Big Data and Consumer Behavior: Imminent Opportunities"	2016	*Journal of Consumer Marketing*	67
10	Hanssens and Pauwels	"Demonstrating the Value of Marketing"	2016	*Journal of Marketing*	66
11	Germann, Lilien, and Rangaswamy	"Performance Implications of Deploying Marketing Analytics"	2013	*International Journal of Research in Marketing*	62
12	Breugelmans, Bijmolt, ..., Wunderlich	"Advancing Research on Loyalty Programs: A Future Research Agenda"	2015	*Marketing Letters*	58

Source: Authors' own study based on (Web of Science data, 2021).

The presented results show that analytical marketing is a new concept, considering that the first article was published in 2006. It is worth paying particular attention to the fact that this article is not included in the table of the most cited publications (it contains only 9 citations, which is 0.35% of all citations), and another publication in this area appears as late as in 2009. On the other hand, data-driven marketing is a rapidly growing field and in 2018 there was a sharp increase in the number of publications. Despite the lack of one-person publications, the authors' cooperation network is not widely developed, which indicates that it is worth undertaking further research.

Principal researchers and authors of analytical marketing publications

Research in the area of analytical marketing is based on the work of 447 researchers, thanks to whom 207 publications were created. The results presented in Table 3 show that 10 authors, whose citations account for 71% of all analyzed citations, play a key role in these activities. On the basis of the collected information, it is possible to exclude the influence of Neofytos on the area of analytical marketing research, but it is worth distinguishing three authors such as Michel Wedel, Roland T. Rust, and Marco Sarstedt. Apart from a high number of citations in the field of analytical marketing, they also have the highest *h*-index values. It should be noted that the vast majority of authors are from the United States, indicating an important influence of this country in the development of analytical marketing.

Table 3. Most influential authors in the area of analytical marketing

Ranking	Author	Institution	Papers in the area of analytical marketing	Citations in the area of analytical marketing	Percentage of all citations	*h*-index of the author	Total papers by the author	Total citations by the author
1	Neofytos, D.	University of Geneva	2	825	32.2	26	70	3,636
2	Wedel, M.	University of Maryland College Park	1	232	9.1	48	125	7,248
3	Rust, R.T.	University of Maryland College Park	1	156	6.1	48	125	11,679
4	Xu, Z.-N.	Hebei General Hospital	1	121	4.7	17	32	897
5	Ghose, A.	New York University	1	120	4.7	32	47	5,338
6	Sarstedt, M.	Monash University	2	90	3.5	52	119	28,728
7	Duan, L.	Hofstra University	1	77	3.0	13	30	1,059
8	Hofacker, Ch. F.	Florida State University	1	67	2.6	20	54	1,793
9	Hanssens, D.M.	University of California, Los Angeles	1	66	2.6	31	83	4,508
10	Germann, F.	University of Notre Dame	1	62	2.4	7	7	502

Source: Authors' own study based on (Web of Science data, 2021).

The authors' contributions to analytical marketing research can be described in many ways. Table 4 presents the authors who published more than 3 papers related to analytical marketing. The results include the number of articles published, the

average number of citations for each article, percentage share in all articles, and the author's rating (*h*-index, all publications and all citations) based on WoS data.

It turns out that none of the mentioned authors belong to the list of the most influential authors in terms of the number of citations. There is no relationship between the most influential and productive authors in the field of analytical marketing. It shows how big a split in this area is and how much research still needs to be done in order to obtain consistent and reliable results.

Table 4. Most productive authors in the area of analytical marketing

Ranking	Author	Institution	Papers in the area of analytical marketing	Citations in the area of analytical marketing	Citation per paper	Percentage of all papers	*h*-index of the author	Total papers by the author	Total citations by the author
1	Petrescu, M.	Embry-Riddle Aeronautical University	17	43	2.5	8.2	4	26	47
2	Krishen, A.S.	University of Nevada, Las Vegas	14	20	1.4	6.8	17	84	806
3	Cao, G.	Chinese Academy of Sciences	4	29	7.3	1.9	12	34	513
4	Kato, T.	Saitama University	4	4	1.0	1.9	2	7	11
5	Akter, S.	University of Wollongong	3	53	17.7	1.4	25	64	3,473
6	Iacobucci, D.	Vanderbilt University	3	18	6.0	1.4	25	83	5,310
7	Hossain, Md A.	University of Wollongong	3	12	4.0	1.4	4	13	53
8	Tian, N.	Beihua University	3	6	2.0	1.4	32	90	2,913
9	Mathaisel, D.	Babson College	3	1	0.3	1.4	8	17	314
10	Comm, C.	University of Massachusetts Lowell	3	1	0.3	1.4	3	8	41

Source: Authors' own study based on (Web of Science data, 2021).

The next step is to specify a network of links at the co-authorship level. For this purpose, the collected data from the WoS database were fed into the VOSviewer program. An analysis was performed, on the basis of which the number of all authors was limited to those who collaborated with each other. The obtained result was 106. Out of them, 39 clusters were distinguished, which were not connected with each other in any way. It follows that the concept of analytical marketing is so new that there are many ways and approaches to the area of research that arise with the involvement of small groups of scientists. Collaboration between the authors from these groups (countries, institutions) is not widespread in the field of analytical marketing (Figure 4).

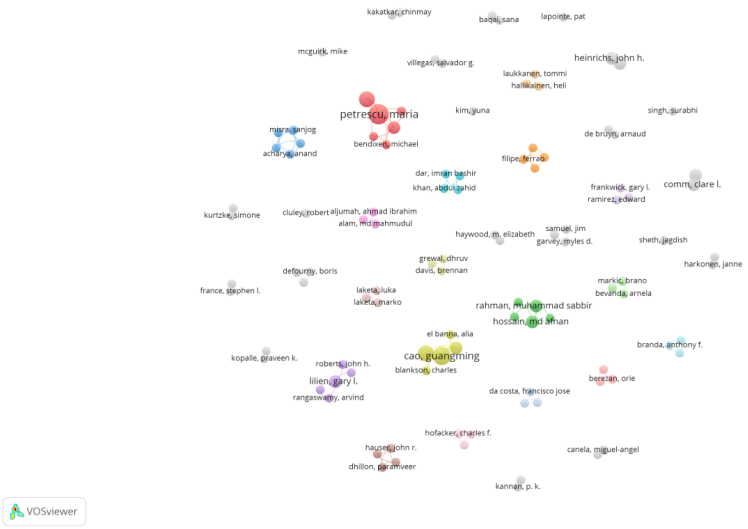

Figure 4. A network of relationships between authors working together

Source: Authors' own study based on (Web of Science data, 2021).

The largest group that was identified consists of the links between six authors, of which one is included twice due to different ways of writing authors' names (Anjala Krishen and Anjala S. Krishen), which is impossible for the system to integrate (Figure 5).

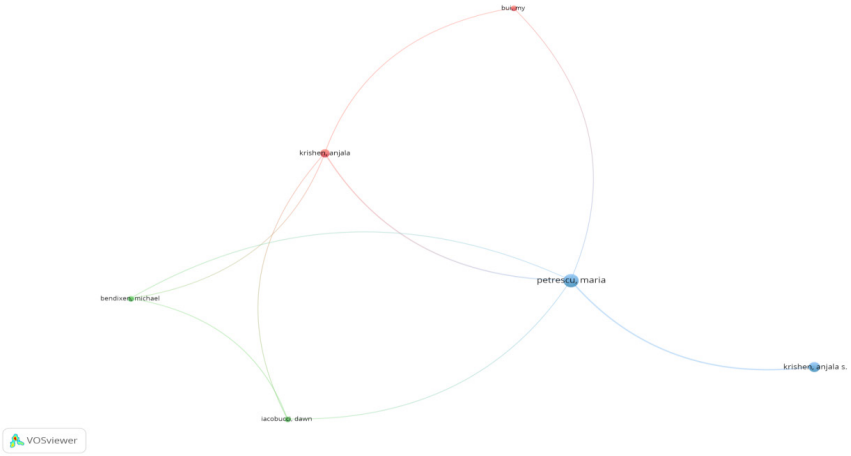

Figure 5. The network of relationships with the highest degree of connection between

Source: Authors' own work based on (Web of Science data, 2021).

The greater the number of co-authored papers, the greater the circumference of the circle with the name on it. Additionally, the links are divided into clusters, each of which has a different colour. The most productive researcher related to co-authorship in the distinguished group is Maria Petrescu, which is consistent with the data presented in Table 4. It is worth noting that authors Dawn Iacobucci, Maria Petrescu, Anjala Krishen, and Michael Bendixen collaborated on the article "The State of Marketing Analytics in Research and Practice" (2019). Hence, the conclusion that of all articles with many authors, this one has the authors with the strongest connections with each other in the field of research.

Figure 6 shows a representation of the network of connections due to citations among the authors. The number of citations of a given author affects the colour of the circle with the surname.

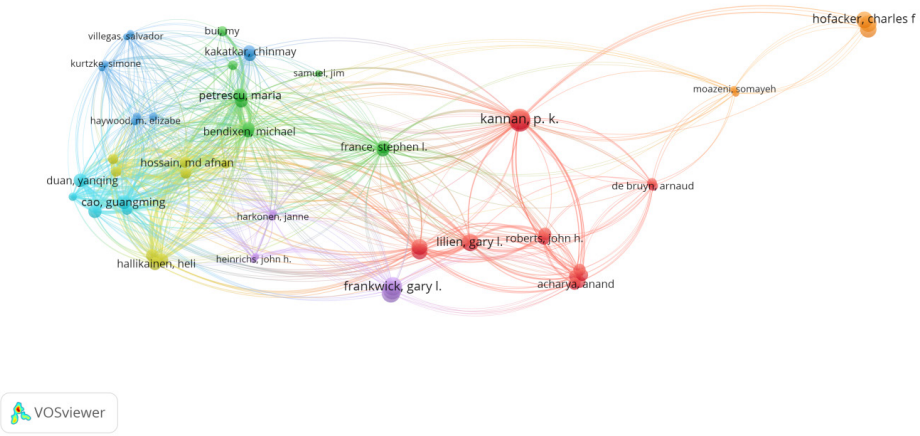

Figure 6. Joint bibliography for the most cited marketing analytics publications

Source: Authors' own study based on (Web of Science data, 2021).

Table 5. Clusters on bibliography for the most cited marketing analytics publications

Cluster 1 (14 items)	Cluster 2 (9 items)	Cluster 3 (9 items)	Cluster 4 (8 items)	Cluster 5 (7 items)	Cluster 6 (5 items)	Cluster 7 (5 items)
Acharya, A.	Bendixen, M.	Haywood, M.E.	Abdel, F.	Frankwick, G.	Blankson, C.	Hofacker, C.F.
De Bruyn, A.	Bui, M.	Kakatkar, C.	Akter, S.	Harkonen, J.	Cao, G.	Malthouse, E.C.
Germann, F.	France, S.J.	Kim, Y.	Fattah, F.	Heinrichs, J.H.	Duan, Y.	Moazeni, S.
Hornbuckle, W.J.	Ghose, S.	Kurtzke, S.	Hallikainen, H.	Lim, J.S.	El Banna, A.	Sultan, F.
Kannan, P.K.	Iacobucci, D.	Mishra, A.	Hossain, M.D.	Nuortimo, K.	Tian, N.	Wilczak, M.J.
Lilien, G.	Krishen, A.	Setkute, J.	Laukkanen, T.	Ramirez, E.		

Cluster 1 (14 items)	Cluster 2 (9 items)	Cluster 3 (9 items)	Cluster 4 (8 items)	Cluster 5 (7 items)	Cluster 6 (5 items)	Cluster 7 (5 items)
Mishra, R.	Krishen, A.S.	Spann, M.	Rahman, M.	Xu, Z.		
Misra, S.	Petrescu, M.	Villegas, S.G.	Savimaki, E.			
Nair, H.S.	Samuel, J.	Vollrath, M.D.				
Rangaswamy, A.						
Roberts, J.H.						
Sarkar, M.						
Shankar, V.						
Wedel, M.						

Source: Authors' own study based on (Web of Science data, 2021).

From the network of authors' mutual citations, 7 clusters marked with numbers and colours were distinguished, each of which indicates strong connections between the authors (Table 5). The most influential authors (Kannan and Wedel) are in the red cluster (1), and the most productive ones (Petrescu and Krishen) are in the green cluster (2).

Hierarchizing the importance of journals that publish analytical marketing research results

The studied articles (207) were published in 68 journals ranked in the WoS database. The concentration level can be described as high with 10 journals publishing 70% of all publications (Table 6). The average citation rate per publication is 21.5, which constitutes 484 citations. The *h*-index averages at 52.

Table 6. Scientific journals with the most publications in the field of analytical marketing

Ranking	Journal	Number of publications in the area of analytical marketing	Percentage of 207	Average number of citations per paper	*h*-index	Total number of citations in the area of analytical marketing	Impact Factor of the Journal in the last 5 years	Quartile in the category
1	*Journal of Marketing Analytics*	113	54.59	2.07	7	234	-	-
2	*Industrial Marketing Management*	6	2.90	16.33	6	98	8.698	Q1
3	*Journal of Business Research*	5	2.42	27.20	3	136	8.488	Q1
4	*Decision Sciences Journal of Innovative Education*	3	1.45	1.00	3	3	-	-
5	*Expert Systems with Applications*	3	1.45	16.33	49	2	6.789	Q1
6	*International Journal of Information Management*	3	1.45	15.67	47	2	13.074	Q1

Ranking	Journal	Number of publications in the area of analytical marketing	Percentage of 207	Average number of citations per paper	*h*-index	Total number of citations in the area of analytical marketing	Impact Factor of the Journal in the last 5 years	Quartile in the category
7	*International Journal of Research in Marketing*	3	1.45	28.00	84	3	6.218	Q2
8	*Management Science*	3	1.45	45.67	137	2	6.619	Q2
9	*Marketing Science*	3	1.45	62.00	186	3	5.293	Q3
10	*Decision Support Systems*	2	0.97	0.50	1	1	6.934	Q1

Source: Authors' own study based on (Web of Science data, 2021).

The largest number of papers (113, which constitutes 55% of the total) was by far published by the *Journal of Marketing Analytics*. The highest average number of citations (62) can be found in the *Marketing Science* journal, which also has the highest level of *h*-index (186), which can be assessed as a very high score. The value of the Impact Factor coefficient is also important, as it allows to select the most important and influential journals from many titles (Osiński, 2012). In the distinguished journals, the *International Journal of Information Management*, which has issued 3 publications in the field of analytical marketing, has by far the highest level of IF (13.074).

Categories in which publications in the field of data marketing appear

The analyzed articles (207) were divided into 28 categories in the WoS database, with some publications being repeated in several categories. Table 7 distinguishes 10 categories with the highest number of papers.

Table 7. The most relevant WoS categories in the area of analytical marketing publications

Ranking	WoS categories	Papers in the area of analytical marketing	Percentage of 207	*h*-index	Average number of citations per paper	Total number of citations	Number of papers cited
1	Business	163	78.74	16	8.31	1,355	1,156
2	Management	25	12.08	11	17	425	408
3	Operations Research Management Science	11	5.31	5	21.64	238	235
4	Information Science Library Science	7	3.38	3	10.57	74	74
5	Computer Science Artificial Intelligence	5	2.42	2	10	50	50

Ranking	WoS categories	Papers in the area of analytical marketing	Percentage of 207	*h*-index	Average number of citations per paper	Total number of citations	Number of papers cited
6	Economics	5	2.42	2	4.2	21	21
7	Education Educational Research	5	2.42	2	1.2	6	5
8	Computer Science Information Systems	4	1.93	2	2	8	8
9	Engineering Electrical Electronic	3	1.45	2	16.33	49	49
10	Business Finance	2	1.00	2	16.5	33	33
11	Immunology	2	1.00	2	412.5	825	788
12	Infectious Diseases	2	1.00	2	412.5	825	788

Source: Authors' own study based on (Web of Science data, 2021).

Most publications on analytical marketing appear in Business (79%) and Management (12%) categories, which by far dominate other categories. Business also has the highest *h*-index (16), the highest number of citations (1,355) and the highest number of references by other papers (1,156) and shows a strong relationship with the area under study. The third category, Operations Research Management Science, which includes 11 publications (5% of the total), has the highest average number of citations per journal.

Main sources of data analysis – institutions

The analyzed papers are related to 327 organizations, of which 14 participated in at least 4 publications in the field of analytical marketing. Table 8 presents the division and role of these institutions in the analyzed area.

Table 8. The main institutional affiliates of the authors of publications in the field of the analytical market

Ranking	Affiliations	Countries	Papers in the area of analytical marketing	Percentage of 207	*h*-index	Average number of citations per paper	Total number of citations	Number of papers cited
1	Nevada System of Higher Education (NSHE)	USA	18	8.70	4	2.56	46	39
2	University of Nevada, Las Vegas	USA	18	8.70	4	2.56	46	39
3	Nova Southeastern Univeristy	USA	8	3.87	3	3.13	25	24

Ranking	Affiliations	Countries	Papers in the area of analytical marketing	Percentage of 207	*h*-index	Average number of citations per paper	Total number of citations	Number of papers cited
4	California State University System	USA	7	3.38	2	1.43	10	10
5	Babson College	USA	6	2.90	1	0.17	1	1
6	State University System of Florida	USA	6	2.90	3	14.33	86	86
7	Colorado State University	USA	5	2.42	2	4.6	23	23
8	University of Quebec	Canada	5	2.42	2	3.2	16	16
9	Embry Riddle Aeronautical University	USA	4	1.93	0	0	0	0
10	University of California System	USA	4	1.93	2	20.75	83	83
11	University of Massachusetts Lowell	USA	4	1.93	1	.25	1	1
12	University of Massachusetts System	USA	4	1.93	1	.25	1	1
13	University of Texas System	USA	4	1.93	2	31.5	126	126
14	University of Wollongong	Australia	4	1.93	3	14	56	54

Source: Authors' own study based on (Web of Science data, 2021).

The results show that 14 institutions out of 327 published almost 50% of all publications. The most important institutions are seemingly in the first two places (Nevada System of Higher Education [NSHE] and the University of Nevada, Las Vegas) because they contain the most publications (18) and the *h*-index is the highest (4). However, the most influential institutions are probably in the 6th, 10th, and 13th places because they contain the highest average number of citations per publication, the highest average number of citations and the highest number of cited papers.

The bibliometric analysis shows a network of connections between institution citations. Eight clusters were specified, each of which contains at least two items (Table 9). The analysis includes 54 institutions that were cited at least once out of the total of 327.

Table 9. Inter-institutional citation clusters

Cluster 1 (12 items)	Cluster 2 (9 items)	Cluster 3 (8 items)	Cluster 4 (8 items)	Cluster 5 (7 items)	Cluster 6 (4 items)	Cluster 7 (4 items)	Cluster 8 (2 items)
Colorado State University	Australian National University	Asharqiyah University	California State University Fullerton	Babson College	Al Ain University	Ajman University	Embry Riddle Aeronautical University
Florida State University	ESS ANAL	North South University	Edinburgh Napier University	California Polytech State University	University of Oulu	Northwestern Polytechnical University	Emory University

Cluster 1 (12 items)	Cluster 2 (9 items)	Cluster 3 (8 items)	Cluster 4 (8 items)	Cluster 5 (7 items)	Cluster 6 (4 items)	Cluster 7 (4 items)	Cluster 8 (2 items)
ICN Business SCH	London Business School	Pace University	Ludwig Maximilians University	Columbia University	University of Texas at El Paso	University of Bedfordshire	
INT Islamic University	MGM Resorts INT	Penn State University	Rider University	Dartmouth Collage	University Utara Malaysia	University of North Texas	
Northeastern University	Mississippi State University	Shaheed Zulfikar Ali Bhutto Institute of Science Technology	Technological University Dublin	Loyola Marymount University			
Northern State University	Stanford University	University of Eastern Finland	Federal University of Paraíba	University of Toledo			
Northwestern University	Texas A&M University	University of Notre Dame	Federal University of Paraíba	Wayne State University			
Nova Southeastern University	University of Chicago	University of Wollongong	University of Maryland				
Ohio Wesleyan University	University of Wisconsin						
University of Nevada							
University of Pretoria							
Vanderbilt University							

Source: Authors' own study based on (Web of Science data, 2021).

Figure 7 shows eight clusters divided into different colours. Due to the size of clusters (connections), the largest of them includes 12 institutions (red), and the most important are the University of Nevada, Las Vegas (18 publications) and Northwestern University (3 publications). In the second cluster, 9 institutions marked in green were designated, and the leading institution is Mississippi State University, despite the fact that it only has its share in two papers. Clusters 3 and 4 include 8 organizations each. Pennsylvania State University (2 publications) is the leader in cluster 3 (blue colour), and the University of Maryland is the leader in cluster 4 (yellow colour).

Taking into account the number of citations, as indicated by the size of the circles, the University of Maryland (446), University of Texas (126) and Florida State University (86) have the highest number. It is worth noting that research in the field of analytical marketing is conducted all over the world, but the most important role is played by institutions from the United States.

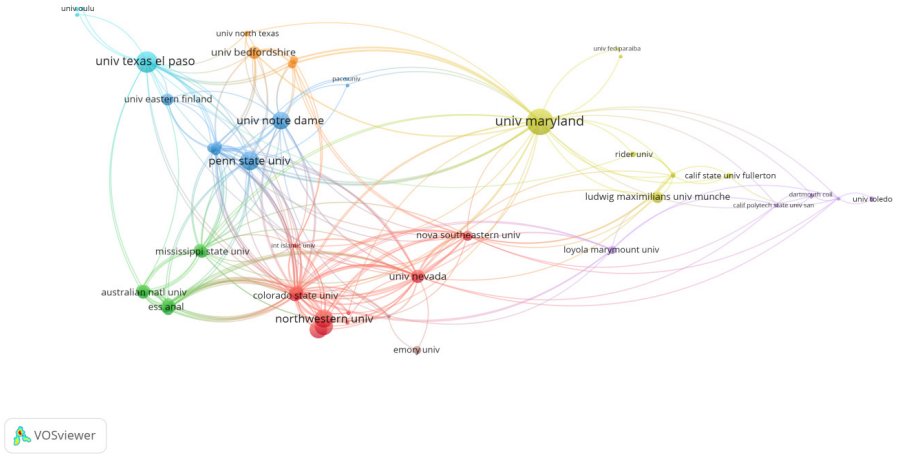

Figure 7. Most cited institutions

Source: Authors' own study based on (Web of Science data, 2021).

Main sources of data analysis – countries

Demographic analysis shows that 56 countries published at least one article related to analytical marketing. Table 10 lists those that had at least 5 publications (there are publications that belong to more than one country, taking into account cooperation between them). The results indicate a high geographical concentration in the specified countries, considering that they account for over 90% of the total. The USA is a clear leader because publications from this country account for over 50% of the total, the *h*-index is equal to 16, which is the highest of those distinguished ones, and the number of citations amounts to 2,076. Additionally, there are 1,901 papers citing the publications of this most influential and productive country in the analyzed area. The highest average of citations per paper is 58.53 and belongs to Canada (15 papers related to data marketing).

Table 10. Countries associated with marketing analytics publications

Rank-ing	Country	Papers in the area of analytical marketing	Percentage of 207	*h*-index	Average number of citations per paper	Total number of marketing analytics citations	Number of papers cited
1	USA	105	50.73	16	19.77	2,076	1,901
2	Canada	15	7.25	6	58.53	878	841
3	England	14	6.76	6	11.43	160	158
4	China	13	6.28	6	17.15	223	222
5	India	10	4.83	4	3.9	39	39
6	France	8	3.87	3	8	64	64

Ranking	Country	Papers in the area of analytical marketing	Percentage of 207	*h*-index	Average number of citations per paper	Total number of marketing analytics citations	Number of papers cited
7	Malaysia	8	3.87	3	11.88	95	95
8	Australia	6	2.90	3	12.33	74	72
9	Germany	6	2.90	6	33.67	202	202
10	Japan	5	2.42	1	.8	4	4
11	UAE	5	2.42	2	1.8	9	8

Source: Authors' own study based on (Web of Science data, 2021).

Figure 8 shows a network of co-authorship between countries. Out of 56 countries, there are 21 countries that relate to each other, but the largest group that forms a network of connections consists of 11 countries. They were divided into three clusters: red (England – the leader among citations, Malaysia, China, UAE), green (USA – the most influential, France, Pakistan, South Africa) and blue (Australia – with the highest number of citations, Bangladesh, Oman).

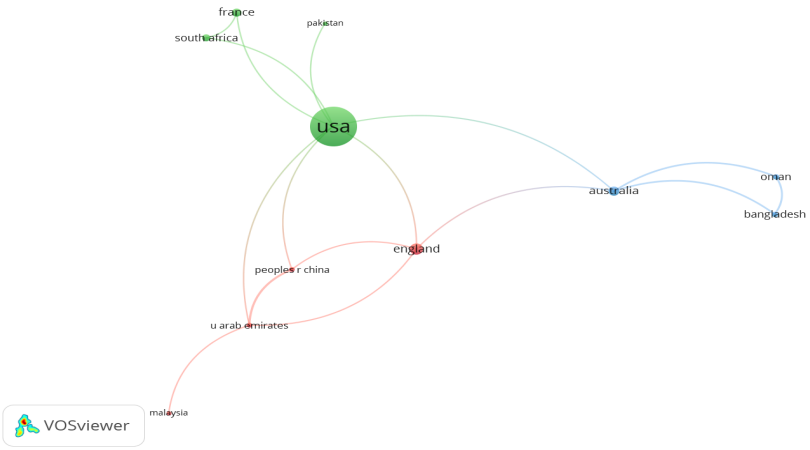

Figure 8. Co-authorship between countries

Source: Authors' own work based on (Web of Science data, 2021).

There is a high potential for the development of research on analytical marketing, as evidenced, in addition to the presented network of connections, by the emergence of many smaller networks that connect neighbouring countries, for example, Ireland-Scotland, Serbia-Bosnia and Herzegovina or Spain-Portugal, which have a chance to expand.

Bibliometric analysis of keywords

The results of the bibliometric analysis show that out of 288 keywords appearing in 207 publications of the WoS database, 55 occur more than twice (Figure 9).

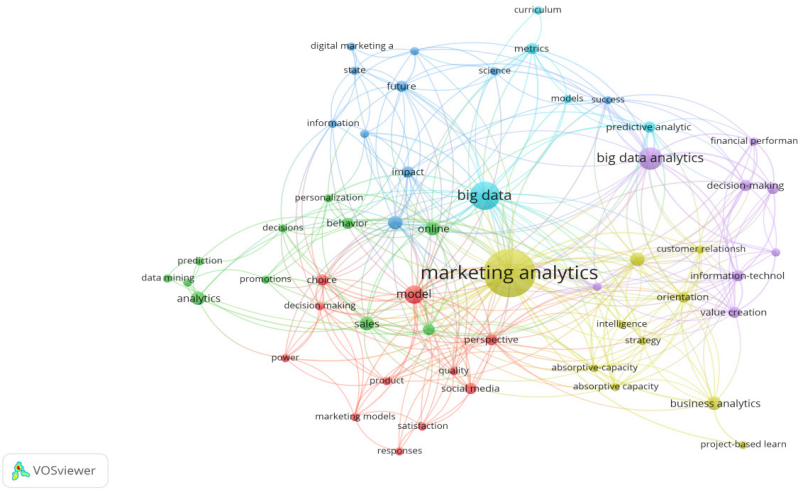

Figure 9. Bibliometric map on the research in the area of analytical marketing

Source: Authors' own study based on (Web of Science data, 2021).

Table 11. Co-occurrence clusters in the use of keywords

Cluster 1 (11 items)	Cluster 2 (11 items)	Cluster 3 (10 items)	Cluster 4 (10 items)	Cluster 5 (8 items)	Cluster 6 (5 items)
choice	analytics	digital marketing analytic	absorptive capacity	informa-tion-technology	big data
decision making	behavior	future	absorptive capacity	decision-making	curriculum
marketing models	data mining	impact	business ana-lytics	dynamic ca-pablities	metrics
model	decisions	information	customer relationship marketing	financial perfor-mance	models
perspective	marketing	Internet of things	firm perfor-mance	big data ana-lytics	predictive ana-lytics
power	online	knowledge	intelligence	resource-based view	
product	personalization	performance	marketing analytics	systems	
quality	prediction	science	orentation	value creation	
responses	promotions	state	project-based learning		
satisfaction	sales	successs	strategy		
social media	word-of-mouth				

Source: Authors' own study based on (Web of Science data, 2021).

On this basis, 6 clusters were generated, with a minimum number of 5 items in each of them (Table 11). The term "analytical marketing" is located in cluster 4 (yellow) and is the most common (23), the second most used concept is "big data" (11 repetitions) assigned to cluster 6 (blue), and the third is "big data analytics" (cluster 5, purple) occurring 8 times. This indicates a very strong interpenetration of these terms.

Discussions

The scientific influence on the studied concept and the network of relations make it possible, among other things, to determine future directions of research, especially since interest in this field has been growing rapidly in recent years (more than 200 publications have been published, and the total number of citations is over 2,500). Moreover, the literature contains research results confirming that companies using analytical marketing in their operation achieve better results and even exceed their goals (Rubin & Chang, 2013; Miles, 2014; Venkatesan et al., 2021).

It should also be noted that this study was based on the data contained in the WoS database, which contains most publications on analytical marketing, but there are also some that are not there. Additionally, the searched articles in the field of analytical marketing were not thoroughly analyzed in terms of compliance with the search term (the concept of analytical marketing was sometimes only mentioned in some publications). These comments can be the basis for deepening knowledge and starting work on new methods of analytical marketing. For future studies, consider a thorough analysis of the content of each selected WoS article in the context of analytical marketing. A further priority would be to extend the research to other databases where access is possible (e.g. EBSCO, SCOPUS). The authors chose the WoS because it is the best available base due to the capabilities of the home university. In addition, it will probably be possible to update the data in two-year panels.

Conclusions

In the literature, there has been an increase in interest in the subject of analytical marketing over the last fifty years and it is becoming a global phenomenon. The study presents a bibliometric and scientometric analysis of analytical marketing, which allowed to show the degree of development and evolution of the literature in this area. This is the first comprehensive data-driven marketing study that has answered many key questions.

Data is no longer available only in leading countries (e.g. the US – the most significant country with over 50% of all publications and 8 out of the 10 most influential institutions are located there), but almost all have access. It turned out that the most influential authors of publications on the studied subject matter were Michel Wedel

and P.K. Kannan, whose work was referred to by Maria Petrescu (the most productive author according to the conducted analysis) in "The State of Marketing Analytics in Research and Practice" (2019). The network of relationships between researchers is not yet well developed (the largest consists of 5 authors), but there are many smaller ones that have a chance to develop and create relationships with each other through joint research and improvement of knowledge in the field of analytical marketing. Most publications appeared in the *Journal of Marketing Analytics* and the areas with which the concept of analytical marketing is most closely related are "big data" and "big data analytics". The two categories with the most publications are Business and Management – already mentioned in earlier literature as an important element in data marketing (Sivarajah et al., 2020), but without such a deep explanation.

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