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Big data in marketing literature: A bibliometric analysis

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ABSTRACT

The concept of big data is one of the important issues in business decision making in recent years. The expansion of social media platforms, the increase in data production devices and the evaluation and interpretation of the data produced by developing technology become crucial. Previous studies in the big data area have addressed the issue in limited contexts, and there are few studies in the field of marketing with a bibliometric approach. This study, which aims to examine how big data concept is evaluated in marketing literature, examines the publications on big data in indexed marketing journals using bibliometric methodology. This study starts with descriptive statistical information and then includes the top published journals, authors and corresponding author's countries statistics. This study also includes most influential studies for big data concept in marketing literature, employs spectroscopy for detecting historical roots of studies and finally plots growth progress of keywords for predicting, future themes. This study contributes to current literature by providing a summarizing and instructive content for researchers interested in big data in marketing.

Introduction

This Big data simply refers to composition of digital information which derived from interactions between people and machines (Arthur, 2013). Digital environment has increasing data everyday with technological advancements and social media channels. Gantz et al. (2012) estimate that there will be a grow by 300x times for digital universe from 2005 to 2020 which refers to 130 Exabyte to 40.000 Exabyte. Managing data and making sense of it to create value is mandatory for companies which aim competitive advantage.

The studies addressing big data concept in marketing context mostly have micro scopes which focus on specific data sources or platforms. As big data concept is valuable concept for marketing, integrative studies which summarize current knowledge about these two concepts would contribute to future researches. Amado et al. (2018) studies two concepts with text mining and topic modelling approach while they conclude main themes and topics for big data and marketing. The methodology they employ uses keywords mostly for data selection, different from that study, this study uses scientific indexed journals for marketing literature and "big data" for topic-based search. This study aims to examine the concepts with bibliometric approach which examine publications and related information to make sense of scientific knowledge. This approach contributes to evaluation of current literature, examination of roots of concept and prediction of future researches. Therefore, research questions of study can be summarized as;

What is the current state of big data concept in marketing literature?
Which past studies are important for big data concept in marketing literature?
What are most influential studies, authors and publication sources for big data concept in marketing literature?
Which predictions can be made regarding to future studies for big data concept in marketing literature?

The study starts with main concept and its theoretical background and continues with methodological section. Findings section summarizes answers to research questions and conclusion and future research directions sections finalize the study.

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Literature review

Over last decades, business world witnessed various technological and business advancements worldwide which affect consumers, businesses and markets. Social media users increased and internet access through mobile devices become widespread. As produced data increases, new concept "big data" becomes important. Big data simply refers to datasets as larger size which traditional tools cannot capture, store, manage and analyze (Manyika et al., 2011). On the other hand, big data concept has several definitions and De Mauro et al. (2016) include many definitions of Big data concept in their study and conclude a definition.

"Big Data is the Information asset characterised by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value."

The scope of big data includes traditional enterprise data, machine generated / sensor data and social data (Dijcks, 2013). McAfee et al. (2012) imply characteristics of big data concept and concludes three features with 3V's; volume, velocity and variety. Volume refers to size of data individuals and companies produce. According to McAfee et al. (2012), it is estimated that 2.5 petabytes of data produced from customer transactions every hour are collected by by Wallmart. With a macro approach to size of data markets produce, it is a crucial task to collecting, managing and making use of this data for marketing managers. Second feature refers to velocity which is related to speed rate of generated data (Gandomi & Haider, 2015). Third feature (variety) refers to wide scope of data sources and types. Several social media channels, technological devices and platforms produce different types of data for business to process. In conclusion, big data has different characteristics from traditional data and different methodologies could be required due to speed, variety and volume of data.

McKinsey Global Institute May 2011 (Manyika et al., 2011) report includes five domains for potential of big data; health care (United States), public sector administration (European Union), retail (United States), manufacturing (global), personal location data (global). Retail, manufacturing and personal location data have potential for business and marketing management areas. On the other hand, Wamba et al. (2015) examines big data related publications and summarize distribution of industries. They include that technology, service and healthcare industries are main industries for big data publications.

As Erevelles et al. (2016) imply, companies which does not effectively manage big data processes will have challenges related to competitive advantage and survival of big data revolution. According to Dijcks (2013), enterprises which combine big data with traditional enterprise data and use it together could reach to better understanding of business. This better understanding ends up with; i) enhanced productivity, ii) greater innovation and iii) better competitive position. In addition, big data concept includes many opportunities for marketing decision making, as consumers are important actors of market or data environment. Therefore, managing big data and related processes is crucial for new marketing decision making. Next section focuses on big data concept and its relation to marketing management.

Marketing and Big Data

Marketing science is an area where data and data processing have an important function in decision-making. Insights related to market and consumers signal suggestions for marketing decision maker and they must be managed periodically due to dynamism of today's market environment. According to a Global Digital Report by We are Social (2019) 45% of total population (3.484 billion of 7.676 billion) is using social media actively. This population produces data every minute and the produced data from social media is only a small part of big data. The companies and decision makers must consider data produced by consumers and markets as a part of their marketing strategy. Using data as a crucial part of marketing plan is mandatory for marketing decision making. Arthur (2013) defines data-driven marketing as collection, analysis and execution processes of data through companies for customer engagement.

Employing big data as a part of marketing strategy has different options to evaluate. For example, Fan et al. (2015) study big data analytics with marketing mix concept and summarize a marketing mix framework for big data analytics consist of five P's (people, product, promotion, price and place). They also conclude applications of big data analytics for marketing mix, the applications include; customer segmentation and profiling, product ontology and product reputation management, promotional marketing analysis and recommender systems, pricing strategy and competitor analysis, location-based advertising and community dynamic analysis. All these application areas have different specific characteristics regarding to industries, markets and company sizes.

As big data concept in marketing literature has a wide range of research areas, it would be useful to examine how marketing science environment understand and evaluate the concept with publications. Research section of study focuses concept with bibliometric analysis methodology to evaluate current, past and possible future directions of concept consistent to research questions of study.

Research and Methodology

Bibliometric Analysis of Big Data Concept in Marketing Literature

This exploratory study aims to examine how big data concept is evaluated in marketing literature through bibliometric analysis with marketing journals. Context used in this study refers to listed journals in Scimagojr (2019) with only WOS - ISI Web of Knowledge (2019) indexed filter. It is aimed to have a scientific perspective towards big data concept with this approach.

Research data is obtained from WOS - ISI Web of Knowledge (2019) database and publication name and topic parameters are used for filtering. Therefore, specific contexts like text mining, social media, data mining are excluded in this study. Only studies in "big data" topic are included in this study to focus on specific concept, since text mining or social media topics could include other contexts beyond big data concept.

Findings and results of study will be included in four parts;

i) Descriptive statistics for big data concept in marketing literature dataset

ii) Current of marketing literature

iii) Past Influential Studies / History of big data concept in marketing literature

iv) Keyword structures and Future Projections

Bibliometric analysis methodology is selected for this study in line with scientific approach. Bibliometric methods uses quantitative approach on published research for descriptive and evaluative information and they guide researchers about field's structure, social networks and topical interests (Zupic & Čater, 2015).

The methodology is used for different contexts including corporate social responsibility and corporate social performance (De Bakker et al., 2005), performance management (Cuccurullo et al., 2016), consumer-brand relationships (Fetscherin & Heinrich, 2015) and internet advertising research (Kim & McMillan, 2008). As data source for this study, WOS - ISI Web of Knowledge (2019) database is selected for methodology and journal list obtained from Scimagojr (2019) with specific filters. Journals employed in this study are included in Appendix. This study uses "big data" as topic and journals as publication names in WOS database search.

This study uses R Programming Language (R Core Team, 2018) and RStudio software (R Studio Team, 2016) for technical side of methodology. A code package named bibliometrix (Aria & Cuccurullo, 2017) is employed for bibliometric analysis processes. Table 1 shows descriptive information regarding to sample of this study:

Table 1. Descriptive Information

Information 1	N	Information 3	N
Total Publications	197	Publication Range	2012-2019
Total Sources	45	Average Citations per Documents	11.77
Total Authors	510	Keywords (Systems Based)	578
Authors per Document	2.59	Keywords (Author Defined)	672

Source: Authors' search

As table 1 indicates, big data topic is studied as a separate topic since 2012 and total 197 publications are produced. Citation average for documents equal to 11.77 and authors per document equals to 2.59. Figure 1 includes scientific productivity of big data concept in marketing literature by years. As it indicates it starts with 2013 and has maximum publications in 2017. It has an increasing trend from starting while it decreases in 2018. Actual percentage growth rate of publications 50.51%.

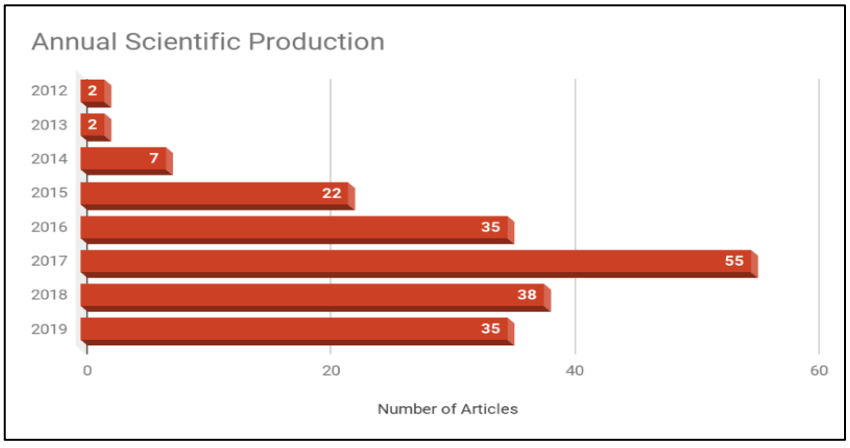

Fig. 1: Annual Scientific Production

Table 2 indicates three descriptive statistics regarding to current situation of big data concept in marketing literature; top sources, top authors and corresponding author's countries. Top sources section shows that Journal of Business Research and Business Horizons

are top two source for publications, which signals that big data concept is mostly studied in journals with business scope. Following journals in list are in marketing area and various contexts like e-commerce, marketing research, retailing, services technology and advertising are included. Top author sections that there is no significant authors in big data studies in marketing literature, since the number of publications for authors are close to each other. Top countries section indicates top three countries of corresponding authors are USA, United Kingdom and China. Germany and Australia follow them. This summative table not only show current situation of big data concept in marketing literature, but also give insights about future researches. For example, new researches could be implemented towards these top journals with authors from top countries. It can be interpreted that China has more probability than Spain in terms of publishing big data concept articles in marketing literature.

Table 2. Top Publication Sources / Authors / Corresponding Authors' Countries

Sources	N	Author	N	Country	N
Journal of Business Research	4	Akter S	32	USA	66
Business Horizons	4	Wamba SF	16	United Kingdom	25
Marketing Science	3	Dubey R	14	China	22
Electronic Commerce Research and Applications	3	Grewal D	13	Germany	13
Electronic Markets	3	Gunesakaran A	13	Australia	11
International Journal of Market Research	3	Kannan P	13	Korea	6
Journal of Marketing Management	3	Liu X	6	India	5
Journal of Retailing and Consumer Services	3	Malthouse EC	6	Portugal	5
International Journal of Services Technology and Management	3	Verhoef PC	5	Netherlands	4
Journal of Adverising	3	Zhang Y	5	Spain	4

Current of marketing literature

Previous figure and tables summarize current situation of marketing literature through statistics and descriptive information. Table 3 summarizes marketing literature of big data (197) studies by ranking studies regarding to citation counts and conclude most influential studies of literature.

Table 3. Most Influential Studies

Title	Author	Source	Citation
Smart tourism: foundations and developments	Gretzel et al. (2015)	Electronic Markets	155
Critical analysis of Big Data challenges and analytical methods	Sivarajah et al. (2017)	Journal of Business Research	111
Big Data consumer analytics and the transformation of marketing	Erevelles et al. (2016)	Journal of Business Research	107
Mining Marketing Meaning from Online Chatter: Strategic Brand Analysis of Big Data Using Latent Dirichlet Allocation	Tirunillai and Tellis (2014)	Journal of Marketing Research	103
Big data analytics and firm performance: Effects of dynamic capabilities	Wamba et al. (2017)	Journal of Business Research	96
Big data and predictive analytics for supply chain and organizational performance	Gunasekaran et al. (2017)	Journal of Business Research	81
The Service Revolution and the Transformation of Marketing Science	Rust and Huang (2014)	Marketing Science	71
Big data analytics in E-commerce: a systematic review and agenda for future research	Akter and Wamba (2016)	Electronic Markets	61
The Future of Retailing	Grewal et al. (2017)	Journal of Retailing	53
Marketing Analytics for Data-Rich Environments	Wedel and Kannan (2016)	Journal of Marketing	52

Time period of most influential studies refers to 2014-2017 period and most influential study is published in 2015. As previously noted, big data in marketing literature starts in 2012 year, so it can be interpreted that first years in studies passed as early studies until 2014. Publication sources have two main segments; marketing specific journals and general business journals. One of 4 studies (Sivarajah et al., 2017) published in business journals examine big data as overall concept, while other studies (Erevelles et al., 2016; Wamba et al., 2017; Gunasekaran et al., 2017) examine big data concept with marketing related topics.

Most influential studies for big data concept in marketing literature show significantly that these studies are mostly review/evaluation studies for big data concepts as they focus on changes and their effects on different contexts. Big data concept is examined in various specific contexts; tourism (Gretzel et al., 2015), online chatter (Tirunillai & Tellis, 2014), firm performance (Wamba et al., 2017), supply chain (Gunasekaran et al., 2017), e-commerce (Akter & Wamba, 2016) and retailing (Grewal et al., 2017). On the other hand,

some studies (Erevelles et al., 2016; Wedel & Kannan, 2016; Sivarajah et al., 2017) have macro perspective for big-data and its elements.

Most influential study by Gretzel et al. (2015) focuses on big data in tourism context by examining smart tourism. They realize changes based upon massive data, evaluate smart tourism concept and include a research agenda for topic. This study has industry-based approach. In another study, Wamba et al. (2017) evaluate big data analytics topic with firm performance concept while they use survey methodology for measurement. Gunasekaran et al. (2017) study big data predictive analytics for supply chain context and uses resource-based view.

On the other hand, some of studies have general approaches for big data concept. Sivarajah et al. (2017)'s study mentions big data and its effect and focuses on implementation and challenges of big data applications by businesses. As the study published in Journal of Business Research, it is not marketing-focused study. Erevelles et al. (2016) examine big data consumer analytics with marketing approach while including theoretical frameworks, propositions and value creation topics.

Apart from general approaches, Tirunillai and Tellis (2014) evaluate topic with empirical approach using latent dirichlet allocation methodology for strategic brand analysis. A framework for extracting latent dimensions of rich user-generated data is provided in this study. Next section examines cited references of big data studies in marketing literature. This approach contributes to understanding related to "past" side of topic as they include historical roots of studies.

Past of marketing literature / Spectroscopy

Bibliometrix (Aria & Cuccurullo, 2017) code package implemented a function for reference publication year spectroscopy which refers to a method for detecting historical roots of research fields. This method was introduced by Marx et al. (2014). Figure 2 indicates a graph (Wickham, 2016) implying reference counts by dates.

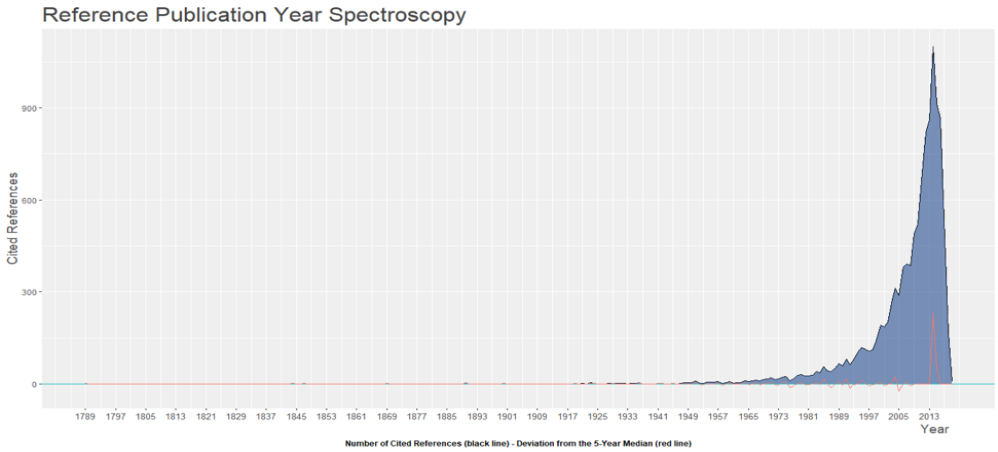

Fig. 2: Reference Publication Year Spectroscoy

As figure indicates, there are significant changes at starting of 90's and after 2005. The historical roots of big data concept studies in marketing literature can be segmented into three different periods. First period refers to years before 1990, while second period refers to 1991-2005 period. Last period which includes a peak point at 2012-2013 years refers to 2005-2019 period.

Second step of past influential studies section focuses on most cited publications from big data concept in marketing literature. Most cited paper in this data set is titled as "Business intelligence and analytics: From big data to big impact.". Chen et al. (2012) examine big data concept in a special issue on Business Intelligence Research of MIS Quarterly and include a framework for elements of Business Intelligence & Analytics 1.0, 2.0 and 3.0. Conceptul structured study also includes a bibliometric study. Second top cited study is titled as "Big data: the management revolution". Mcafee et al. (2012) study on big data with general structure of big data and its attributes. The study is published at Harvard Business Review. Third top cited study is titled as "Big data, analytics and the path from insights to value". LaValle et al. (2011) examine Big data concept with analytics in study published in MITSloan Management Review. Similar to second study, this study has general information about big data.
Spectroscopy analysis and most cited publications together shows that late 90's and 2000's are first roots of big data concept in marketing literature, while 2010's is main root of studies. This result is consistent to rising of social media platforms and e-commerce industry before 2010.

Keyword structures and future prediction

Current and Past dimensions of big data concept in marketing literature summarize overall structure of topic in marketing science. In addition to these dimensions, keyword statistics and collaboration networks of studies can contribute to future projections for next studies.

Table 5: Keyword Plus and Author Keywords

Author Keywords	**Articles**	**Keywords-Plus**	**Articles**
Big Data	84	Big Data	39
Social Media	13	Impact	22
Big Data Analytics	11	Management	22
Internet of Things	11	Model	17
Data Analytics	10	Performance	17
Machine Learning	10	Social Media	15
Text Mining	10	Word of Mouth	15
E-Commerce	6	Information	13
Privacy	6	Sales	13
Retailing	6	Behavior	11

As Table 5 indicates, author keywords are mostly related to platforms or technologies (social media, internet of things), methodologies (machine learning, text mining) and contexts (big data analytics, data analytics, e-commerce, privacy and retailing). Clarivate (2018) states that Keywords-Plus refer to frequent words/phrases which are not directly included in title, but in titles of article's references. Keywords-Plus list includes mostly conceptual (word of mouth, model) and managerial (impact, management, performance, sales) words. Two classification together conclude that keywords defined by authors mostly are mostly related to more certain topics, on the other hand keywords-plus list reflects managerial and conceptual side of studies.

Next figure uses keywordGrowth function from bibliometrix (Aria & Cuccurollo, 2017) package and melt function from reshape2 package (Wickham, 2007) and gglot function from ggplot2 package (Wickham, 2016) to plot growth process of keywords.

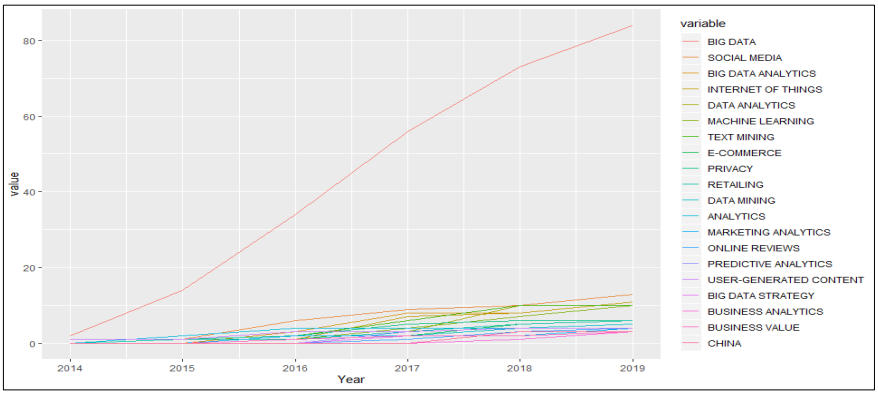

Fig. 3: Keywords Growth Graph

Figure 4 includes keyword-growth graphic for Author-keywords by top 20 words. Top 20 words reflects most popular keywords in recent years, and it signals about future of big data concept in marketing literature. As figure 4 indicates, big data analytics, internet of things, data analytics, machine learning and text mining keywords are popular in recent years. Therefore, it can be evaluated that these trends will follow in future years. On the other hand, e-commerce, privacy, retailing, data mining and analytics are other trend keywords. These could be potential research areas in future.

Conclusions

In this study, big data concept is examined through marketing literature to evaluate the concept with bibliometric approach. Web of Science indexed journals are selected from Scimagojr database for publication scope and Web of Science records are employed for data collection. 197 publications are evaluated, and 45 publication sources and 510 authors are concluded. In addition to main findings, references history analysis (spectroscopy) and collaboration networks are included.

First RQ of study refers to current state of concept, it is found that most productive authors are Akter S. and Wamba SF., while top publication sources are Journal of Business Research, Business Horizons, Marketing Science and Electronic Commerce Research and Applications. Corresponding Author's top countries refer to USA, United Kingdom, China, Germany and Australia. Second RQ focuses on current state and examines influential studies. It is concluded that Gretzel et al. (2015), Sivarajah et al. (2017), Erevelles et al. (2016) and Tirunillai and Tellis (2014)'s studies are most influential studies.

Third RQ is related to past influential studies for big data studies in marketing literature. Years before 1990, 1991-2005 and 2012-2013 periods are found influential for studies, while Chen et al. (2012), Mcafee et al. (2012) and La Valle et al. (2011)'s studies are most influential studies.

Fourth RQ includes interpretation of current studies to make predictions for future researches. It is concluded that social media, big data analytics, internet of things topics have potential for future researches as they are already studies in literature.

Managerial implications of study refer to implementation of big data studies or methodologies for business practices. Variety of industries which big data researches are implemented show that retailing, tourism, e-commerce industries have potential for business practices. Therefore, decision makers from these industries should consider which methodologies can contribute to their decision-making process. Second step refers to decision of data sources/types for researches. Since Big Data concept has "variety" feature, different types of data could be collected for decision making, therefore managers should consider advantages/disadvantages of data types for their decision making.

Future research directions of study consist of two main parts; suggestions from direct conclusion and indirect conclusion. Direct conclusion indicates that most studies research areas of big data concept in marketing literature are big data and its effect on various business operations. Therefore, future researches would focus on these areas for new research questions, as they are already popular research areas.

Second direct conclusion refers to countries and publication sources. USA, United Kingdom, China and Germany are top countries and Journal of Business Research, Business Horizons, Marketing Science are top publication sources for big data concept. Thus, researchers can study with authors from these countries and plan their researches for publishing to these sources.

Future research directions from indirect conclusion refers to platforms, data sources and methodologies for big data studies in marketing literature. Online review websites, social media channels and mobile application reviews can be used for both industrial and academic researches. Ephemeral or static social media content, user reviews and internet of things data could be options as data sources for new researches. Beyond existing studies, researchers should consider trends of social media platforms and big data resources as they guide them on new topics. Methodologies are also crucial for decision making since they complete the "data" part of data mining. New researches and improvements in methodologies will create new research questions in future.

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Appendix:

Journals Used in Bibliographic Analysis; Source Url : https://www.scimagojr.com/journalrank.php?category=1406&area=1400&wos=true

Rank	Title	31	Journal of Destination Marketing and Management	62	Marketing Intelligence and Planning	93	Journal of Nonprofit and Public Sector Marketing
1	Journal of Marketing	32	Business Horizons	63	ACM Transactions on Economics and Computation	94	European Research on Management and Business Economics
2	Journal of Marketing Research	33	Journal of Public Policy and Marketing	64	Journal of Political Marketing	95	International Journal of Market Research
3	Marketing Science	34	Journal of Retailing and Consumer Services	65	Journal of Research in Interactive Marketing	96	Recherche et Applications en Marketing
4	Journal of Consumer Research	35	Marketing Letters	66	Public Relations Inquiry	97	Transformations in Business and Economics
5	Journal of Supply Chain Management	36	Electronic Commerce Research and Applications	67	Journal of Social Marketing	98	Sports, Business and Management
6	Journal of Public Administration Research and Theory	37	Consumption Markets and Culture	68	International Journal of Design	99	Food Science and Technology Research
7	Journal of the Academy of Marketing Science	38	Journal of Services Marketing	69	Qualitative Market Research	100	Journal of Financial Services Marketing
8	Public Administration Review	39	Public Relations Review	70	Journal of Business and Finance Librarianship	101	Journal of Historical Research in Marketing
9	Journal of Retailing	40	Journal of Marketing Management	71	Baltic Journal of Management	102	Journal of Research in Marketing and Entrepreneurship
10	International Journal of Research in Marketing	41	Administration and Society	72	Journal of Business-to-Business Marketing	103	RAE Revista de Administracao de Empresas
11	Quantitative Marketing and Economics	42	Journal of Advertising Research	73	Communication Today	104	Cogent Business and Management
12	Academy of Management Perspectives	43	European Journal of Marketing	74	Publishing Research Quarterly	105	Journal of Global Fashion Marketing
13	Journal of Consumer Psychology	44	Electronic Markets	75	International Journal of Sports Marketing and Sponsorship	106	Sport Marketing Quarterly
14	Journal of International Marketing	45	Journal of Product and Brand Management	76	Journal of Place Management and Development	107	Journal of Marketing Channels
15	Journal of Interactive Marketing	46	Journal of Strategic Marketing	77	International Review of Retail, Distribution and Consumer Research	108	Trziste
16	Journal of World Business	47	Journal of the Operational Research Society	78	Journal of International Consumer Marketing	109	Organizacija
17	Industrial Marketing Management	48	Journal of Business and Industrial Marketing	79	Australasian Marketing Journal	110	International Journal of Pharmaceutical and Healthcare Marketing
18	Governance	49	International Journal of Retail and Distribution Management	80	Journal of Entrepreneurship in Emerging Economies	111	Journal of Electronic Commerce in Organizations
19	Journal of Advertising	50	Journal of Consumer Culture	81	International Journal of Sport Finance	112	International Journal of Services, Technology and Management

Table (Cont'd)

20	American Review of Public Administration	51	International Journal of Bank Marketing	82	International Journal of Applied Ceramic Technology	113	Laser Focus World
21	Sport Management Review	52	Journal of Marketing Education	83	Journal of Islamic Marketing	114	Fashion, Style and Popular Culture
22	Journal of Business Research	53	Journal of Marketing Theory and Practice	84	Canadian Journal of Administrative Sciences		
23	Marketing Theory	54	Foundations and Trends in Marketing	85	Place Branding and Public Diplomacy		
24	Journal of Travel and Tourism Marketing	55	Service Science	86	European Journal of Management and Business Economics		
25	Journal of Purchasing and Supply Management	56	Journal of Macromarketing	87	International Journal of Nonprofit and Voluntary Sector Marketing		
26	International Marketing Review	57	Journal of Brand Management	88	Social Marketing Quarterly		
27	International Journal of Advertising	58	Journal of Consumer Marketing	89	Asia Pacific Journal of Marketing and Logistics		
28	International Business Review	59	Journal of Fashion Marketing and Management	90	Fashion and Textiles		
29	Journal of Hospitality Marketing and Management	60	International Journal of Consumer Studies	91	Journal of Food Products Marketing		
30	Psychology and Marketing	61	Journal of Marketing for Higher Education	92	Journal of Vinyl and Additive Technology		