SEARCH TRENDS: CLASSIFICATION AND RESEARCH AGENDA

SEARCH TRENDS: CLASSIFICAÇÃO E AGENDA DE PESQUISA

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A B S T R A C T

This study aims to provide an analysis of the role and potential of search trends as a data source. Using bibliometric analysis, we identify three main clusters where Search Trends data have shown efficacy: forecasting tourism demand, analyzing public behavior during crises such as the COVID-19 pandemic, and market analytics. The data source's real-time nature and ability to capture mass sentiment have made it indispensable in these clusters. However, limitations such as data reliability and potential biases necessitate cautious interpretation. The study also charts a future research agenda, highlighting promising avenues in behavioral analysis, forecasting evaluation, market analytics, and word-of-mouth research.

K E Y W O R D S

Search Trends. Google Trends, bibliometrics, forecasting, nowcasting.

R E S U M O

Este estudo tem como objetivo fornecer uma análise do papel e do potencial do Search Trends como fonte de dados. Usando uma análise bibliométrica identificamos três clusters principais onde os dados das Search Trends demonstraram eficácia: previsão da procura turística, análise do comportamento público durante crises como a pandemia da COVID-19 e análise de mercado. A natureza em tempo real da fonte de dados e a capacidade de capturar o sentimento das massas tornaram-na indispensável nesses clusters. No entanto, limitações como a fiabilidade dos dados e potenciais vieses exigem uma interpretação cautelosa. O estudo também traça uma agenda de pesquisa futura, destacando caminhos promissores em análise comportamental, avaliação de previsões, análise de mercado e pesquisa boca a boca.

P A L A V R A S - C H A V E

Tendências de pesquisa. Google Trends, bibliometria, forecasting, nowcasting

INTRODUCTION

Through more rich information and storage systems developed in recent years, the concept of Big Data emerged as a new digital paradigm (Urbinati et al., 2018), with data sources as protagonists in this process. The use of search engines in our daily lives has become increasingly widespread. Currently, searches are not limited to search websites. Video streams, virtual assistants, and content portals also use these mechanisms and are indexed (Google, 2019). This phenomenon provided researchers with a non-traditional data source of economic and social data that allows the analysis of data of interest closer to reality, managing to cover a large part of the universe to be analyzed (Blazquez & Domenech, 2018).

Among the search engines used, Google is the most used, accounting for more than 86% of searches worldwide (Statista, 2020). In 2006 it presented Google Trends (GT) to analyze the search interest of any term, considering the geographic region and period analyzed. This platform was updated in 2012 and merged with Google Insights for Search, introducing us to the current format (Jun et al., 2018).

The use of data from search engines, known as "Search Trends", has become increasingly prevalent in several areas of research and practice (Choi & Varian, 2012; Jun et al., 2018). This data not only provides a real-time snapshot of public behavior and interests, but also offers a rich repository for predictive analytics in fields such as car sales, unemployment, travel planning, consumer confidence (Choi & Varian, 2012), financial market research (Perlin et al., 2016), rates of unemployment (Nikos Askitas & Zimmermann, 2011), and consumer behavior (Wu & Lee, 2016). However, using this data is not without challenges, including issues of reliability and bias. This article aims to provide a comprehensive review of the characteristics, uses, limitations, and future research directions associated with Search Trends data.

With the increase in competitiveness between companies, information plays an essential role in this context, and trend data play an indispensable role in society and the economy. Despite the importance of Search Trends, scholars have paid little attention to reviewing the literature on Search Trends. One of the few articles that analyzed the use of Search trends was by Seung-Pyo Jun, Hyoung Sun Yoo, and San Choi (Jun et al., 2018). After completing ten years of using Google trends, they carried out an extensive review of its use and applications, focusing on Google Search, the most used search engine. Bring fruitful insights into the management field, including a gap of studies that broadly analyze the Search trends with these other tools. Despite this, the study focuses only on Google Trends, leaving aside other search trends tools that provide this type of information and are more used in other countries, such as China (Baidu), Korea (Naver) and Russia (Yandex).

Even with more than ten years of use, there is little unification of methods and forms of analysis beyond understanding how companies, governments, and researchers create and capture value (Urbinati et al., 2018). From this gap, this article aims to analyze and classify the body of knowledge on Search Trends in the Management field, aiming at an agenda for future research.

The present study aims to fill the gap by reviewing the search trends literature using the bibliometric method of 85 articles published between 2011 and 2021 in the Web of Science database. The bibliometric analysis allows us to identify the main lines of current research and trends on a given topic. This line presents a descriptive statistical analysis of the influential publications, authors, and journals. This study also suggests a factorial map of the main articles of the field and a thematic map with the main topics. Thus, the study's main contribution should be to provide the main lines of research that use Search Trends and directions for future research.

Thus, this article makes three main contributions to the field: First, we present a descriptive analysis of the characteristics of the use of Search Trend in Management. Second, through the factorial map, we identify the main articles in the field and their relationship with other research, and we present the main lines of research in the area. Third, through the thematic map, we suggest the main research topics and classify them to highlight the main lines, presenting a Research Agenda in the management field.

This study will adopt the scientific mapping criteria using bibliometric methods as proposed by Zupic & Čater (2015). The research design will be presented, followed by the compilation and analysis of bibliometric data, as well as visualization. The results and discussion session will present the main findings and interpretations.

In conclusion, this study addresses a gap in the literature by providing a comprehensive review of the use of Search Trends in the field of Management over the past decade. By utilizing bibliometric methods, this study offers a systematic approach to reviewing Search Trends, enabling the identification of key research areas and trends in the field. By presenting the current state of research and future research directions, this study contributes to advancing knowledge in the field and lays the groundwork for further research on Search Trends.

RESEARCH DESIGN AND METHODS

This research uses bibliometrics to analyze the Seach Trend as a data source, following the workflow for scientific mapping proposed by Zupic & Čater (2015). Bibliometrics is an established field that describes a set of stable methods over time (Bales et al., 2020). Scientific mapping presents itself as one of them, which employs a quantitative approach to describing and evaluating a given topic, aiming to present the body and dynamics of scientific research (Cobo et al., 2011).

The present work aims to analyze the body of knowledge about Search Trends in the Management area. For this purpose, we used the five-step methodology for collecting and evaluating the field of the study indicated by Fahimnia (2015) step one (Defining the appropriate search terms), two (Initial search results), and three (Refining the results of the research) will be presented in this section. In item 3.1 (Characteristics of using Search Trend in the Management field), we will show step four; in item 3.2 (Current lines of research using Search Trends), we will present the last step.

To make methodological decisions more transparent, the process proposed by Fahimnia (2015) aims to make data collection more comprehensive and straightforward to replicate for analysis of the most influential studies, research topics, and directions for future studies.

Following this process, we initially developed a search query for the Web of Science (WoS) core collection database. For this, we use the combination of TITLE-ABS-KEY (Google AND Trends) OR (Search AND Trends) OR (Naver AND Datalab) OR (Yandex AND Keyword statistics) OR (Baidu AND Top). In this query, we searched for the generic term Search Trends in addition to the trend pages of the leading search engines: Google Trends (Google, 2022), Baidu Top (Baidu, 2022), Yandex keyword statistics (Yandex, 2022), and Naver Database (Naver, 2022). We adopted this strategy to get the most articles on this particular topic with the least amount of further data manipulation.

The initial research process resulted in 89 articles using the search for "title", "abstract," and "keyword". Within the Web of Science system, we restricted the search to English articles from 2011 to 2021. In determining the timeframe for our study, we based the data on the tenth anniversary of the first article published in the area. We selected this criterion to assess comprehensively the field's evolution over a meaningful period. Ten years not only allows for a substantive analysis of trends and citation impact but also offers a natural juncture for reflecting on a decade of scholarly contributions. This approach ensures that our study captures both the breadth and depth essential for a robust bibliometric analysis and literature review. We decided to make this combination generate a single output containing all articles with these combinations so that we do not have to manipulate data from the generated BibTex file (.bib). Despite the manipulation of extraction, the software used (bibliometrix) suggests that joining bases can bring critical problems because they have different approaches to coding bibliographic metadata (Aria & Cuccurullo, 2016). This process generated a total of 85 articles.

BIBLIOMETRIC ANALYSIS AND RESULTS

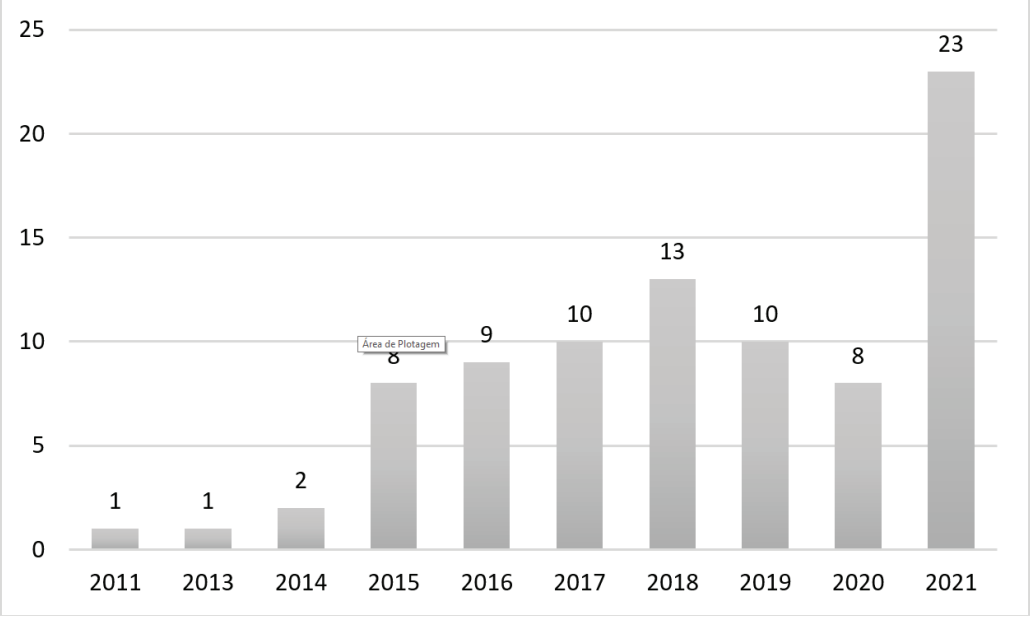
Characteristics of using Search Trends in the Management field

The methodology used in this study involves a comprehensive analysis of the characteristics of using Search Trends in the field of Management. The first step was to gather articles published between 2011 and 2021 from 45 different journals, representing a diverse set of sources. To perform the analysis, we employed the bibliometrix R library for bibliometrics (Aria & Cuccurullo, 2017), which is a powerful tool for analyzing large datasets and identifying trends in research.

One of the primary objectives of this study was to understand the evolution of the use of Search Trends in Management research. Therefore, we analyzed the year of publication of the articles in our dataset to create a graphical representation of the trend over time. As shown in Figure 1, we observed a steady increase in the number of articles using Search Trends in Management, with a growth rate of 41.68%. This trend indicates a growing interest in the use of Search Trends as a valuable tool for conducting research in the Management field.

It is worth noting that 2018 was a pivotal year for the use of Search Trends in Management research. This year marked the tenth anniversary of the public release of Google Trends data, which has been a significant driver of research in this area (Jun et al., 2018). As a result, we saw a marked increase in the number of articles published in 2018, as researchers sought to leverage this valuable resource.

Figure 1. Annual production of scientific publications using Search Trends in the management field



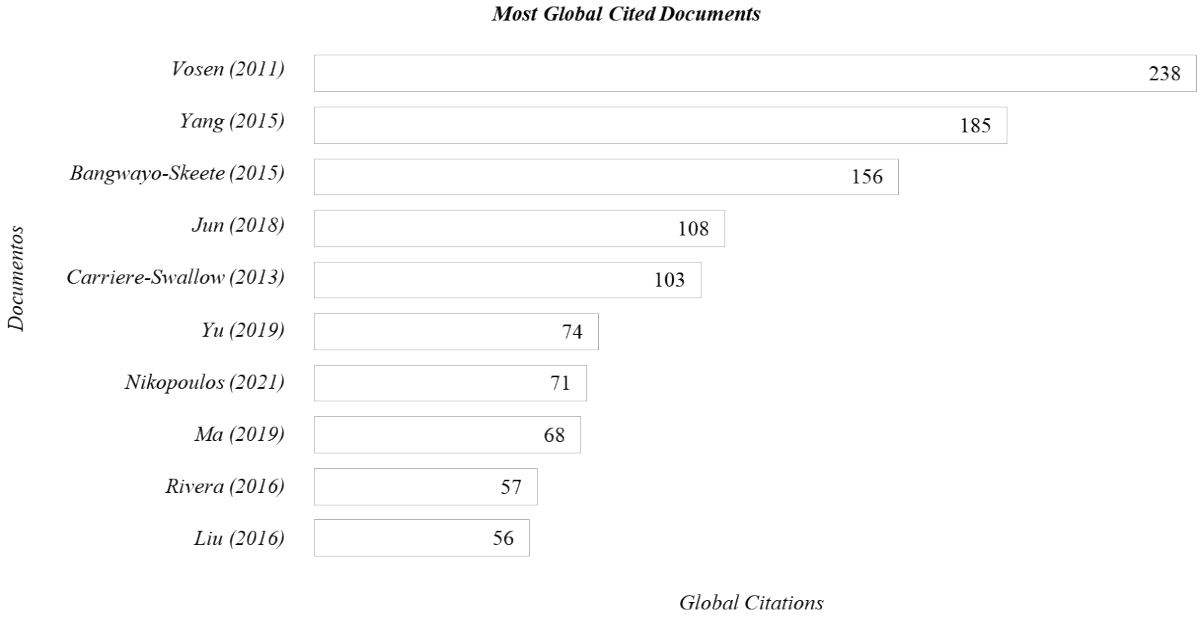
SOURCE: AUTHORS

Most cited publications and authors with more productions

Figure 2 displays the Search Trends articles with over 50 citations, providing insight into the most influential publications and authors in the field. Citation count is often used to evaluate the relevance and impact of an article within a particular research area. At the top of the list is the article by Vosen and Schmidt (2011) with 238 citations, indicating its significant influence on subsequent research in the field. This study introduces a new indicator for private consumption based on Google Trends search query time series. The indicator, which is derived from consumption-related search categories, outperforms two commonly used survey-based indicators in forecasting experiments. These findings suggest that incorporating data from Google Trends can provide significant benefits to private consumption forecasters.

Similarly, the article by Yang et al. (2015) with 185 citations, and Bangwayo-Skeete and Skeete's (2015) paper with 156 citations, have both made substantial contributions to the field of Search Trends. The Yang et al. (2015) work analyzes the use of web search query volume to predict tourist numbers in a popular Chinese destination. It compares the effectiveness of Google and Baidu search data in reducing forecasting errors, finding that both search engines' data is useful for this purpose. However, Baidu's larger market share in China made its data more effective. The Bangwayo-Skeete and Skeete's (2015) article proposes a new tourism demand forecasting indicator that is based on Google Trends search query time series data. The study focuses on five popular Caribbean tourist destinations and uses a composite search for "hotels and flights" from three source countries. The results show that the new indicator outperforms traditional forecasting methods, indicating the potential value of Google Trends data for tourism forecasting.

Figure 2. Analysis of articles with more citations



SOURCE: AUTHORS

This study also analyzed the citations referenced in all 85 articles, and Table 1 presents the papers with more than seven citations. Since this is a form of data source, it is expected to see a wide dispersion in the references. Nonetheless, the analysis reveals that 29 out of 73 (39.73%) publications cite Choi and Varian's seminal paper (2011), which is considered the pioneer work on using Search Trends for topics related to Social Sciences. Interestingly, some articles outside the Management field also received a significant number of citations, such as Ginsberg et al. (2009) in Nature with 21 citations (28.77%). The Natures´s article highlights the impact of seasonal influenza epidemics and the potential for a pandemic with millions of fatalities. Monitoring health-seeking behavior by analyzing large numbers of Google search queries can accurately estimate the current level of weekly influenza activity in each region of the United States, with a reporting lag of about one day.

This analysis indicates that research using Search Trends in the Management field is gradually becoming established, and recent articles are no longer exclusively citing the first papers that used Search Trends as a data source. Instead, there is a growing body of literature that uses Search Trends in various ways to address research questions related to Management. This trend suggests that the application of Search Trends has gained popularity among scholars as a useful tool for exploring and understanding different Management phenomena.

Table 1. References with more than ten citations

Cited References	Citations
Choi, H., Varian, H., (2012)	38
Ginsberg, J., Mohebbi, M., Patel, R., Brammer, L., Smolinski, M., Brilliant, L., (2009)	32
Vosen, S., Schmidt, T., (2011)	30
Da, Z., Engelberg, J., Gao, P., (2011)	20
Lazer, D., Kennedy, R., King, G., & Vespignani, A. (2014).	17
Askitas, N., Zimmermann, K., (2009)	15
Carrire-Swallow, Y., Labb, F., (2011)	15
Preis, T., Moat, H.S., Stanley, E., (2013)	15
Bangwayo-Skeete, P.F., Skeete, R.W., (2015)	13
Yang, X., Pan, B., Evans, J.A., Lv, B., (2015)	13
Goel, S., Hofman, J. M., Lahaie, S., Pennock, D. M., & Watts, D. J. (2010)	11
Pan, B., Wu, D. C., & Song, H. (2012).	11

SOURCE: AUTHORS

Journals with more publications

Several studies using Search Trends as a data source have been published in various academic journals, allowing for their integration with different theories and methodologies. Table 2 displays the journals that have published three or more studies using Search Trends as a data source.

Additionally, we have included the classification of each journal according to the Academic Journal Guide (AJG) 2021, which is compiled by the Chartered Association of Business Schools (Chartered Association of Business Schools, 2021).

The Journal with the most publications using Search Trends is 'Technological Forecasting and Social Change' with twelve publications. It is followed by 'Journal of Forecasting' with eleven articles, 'Tourism Management' with six publications, 'International Journal of Forecasting' with five, and the journals 'International Journal of Contemporary Hospitality Management', 'International Journal of Manpower', and 'Tourism Management Perspectives' with three publications; the rest of the journals accumulated two or fewer publications using Search Trends.

The diversity of journals in which studies using Search Trends are published is noteworthy. The use of Search Trends as a data source allows for its application across various research fields and methods, which is reflected in the wide range of journals with publications using this source. The most frequent journal, 'Technological Forecasting and Social Change,' has a classification of 3 in the AJG, which means it is considered an internationally excellent journal. 'Journal of Forecasting,' which comes in second with eleven articles, also has a classification of 3 in the AJG. Other journals with a 3 classification in the AJG that had publications using Search Trends include 'International Journal of Forecasting,' 'International Journal of Contemporary Hospitality Management,' and 'Tourism Management Perspectives.'

It is interesting to note that some journals, such as 'Tourism Management' and 'International Journal of Manpower,' have a lower classification of 2 in the AJG, indicating that they are recognized as internationally recognized journals. Nevertheless, they had a significant number of publications using Search Trends. This fact may suggest that the use of Search Trends is becoming more widespread in diverse research fields and is not restricted to only the most prestigious journals.

Overall, the diverse range of journals and classifications of the journals with publications using Search Trends indicates the broad applicability of this data source across various research fields and methods. The growing use of Search Trends in different journals and classifications emphasizes the importance of this data source in the current research scenario.

Table 2. Journals with more publications

#	Sources	AJG rating	Articles
1	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	3	12
2	JOURNAL OF FORECASTING	2	11
3	TOURISM MANAGEMENT	4	6
4	INTERNATIONAL JOURNAL OF FORECASTING	3	5
5	INTERNATIONAL JOURNAL OF CONTEMPORARY HOSPITALITY MANAGEMENT	3	3
6	INTERNATIONAL JOURNAL OF MANPOWER	2	3
7	TOURISM MANAGEMENT PERSPECTIVES	2	3

SOURCE: AUTHORS

Current lines of research using Search Trends

We followed the methodological process proposed by Zupic & Čater (2015) and used the emerging visual representation of the data through factorial maps. Our goal was to identify the main current strands, thematic maps, and the main groupings of keywords to answer the question about the direction of recent research and facilitate understanding of the body of literature in the management field that uses Search Trends.

In all fields, some articles with more significant impact stimulate the advancement of research and thus contribute to the area's progress (Berry & Parasuraman, 1993). Therefore, this article analyzed the research using Search Trends with more significant contributions to understanding the main lines of research and their seminal papers. It addresses the research question that aims to group and catalog the articles with more relevance in Search Trends.

To construct the factorial map of the documents with the most significant contributions, we used the Abstracts as a source of origin for the analysis. As Journals accept a limited number of Keywords per article, and we selected the terms related to Search Trends in the initial process of the database, few terms would be left to generate relationships. As a result, we used the Abstract that expanded the possibility of analysis. In this way, additional data preparation was necessary to present a factorial map of the documents with the most significant contributions classified by clusters and a thematic map with the central thematic lines.

Initially, we selected the main words of the Abstracts and analyzed them manually. As Search Trends tend to be a data source for all research, we had to exclude terms that had reference to Search Trends, not to fit all articles into a single cluster. We also removed common Abstract words like 'method' and 'model' as they do not contribute to the analysis of thematic lines. Table 3 summarizes the terms taken from the study. As the authors' keywords do not follow a standard for a correct grouping, we also inserted a table with the keywords that are synonyms.

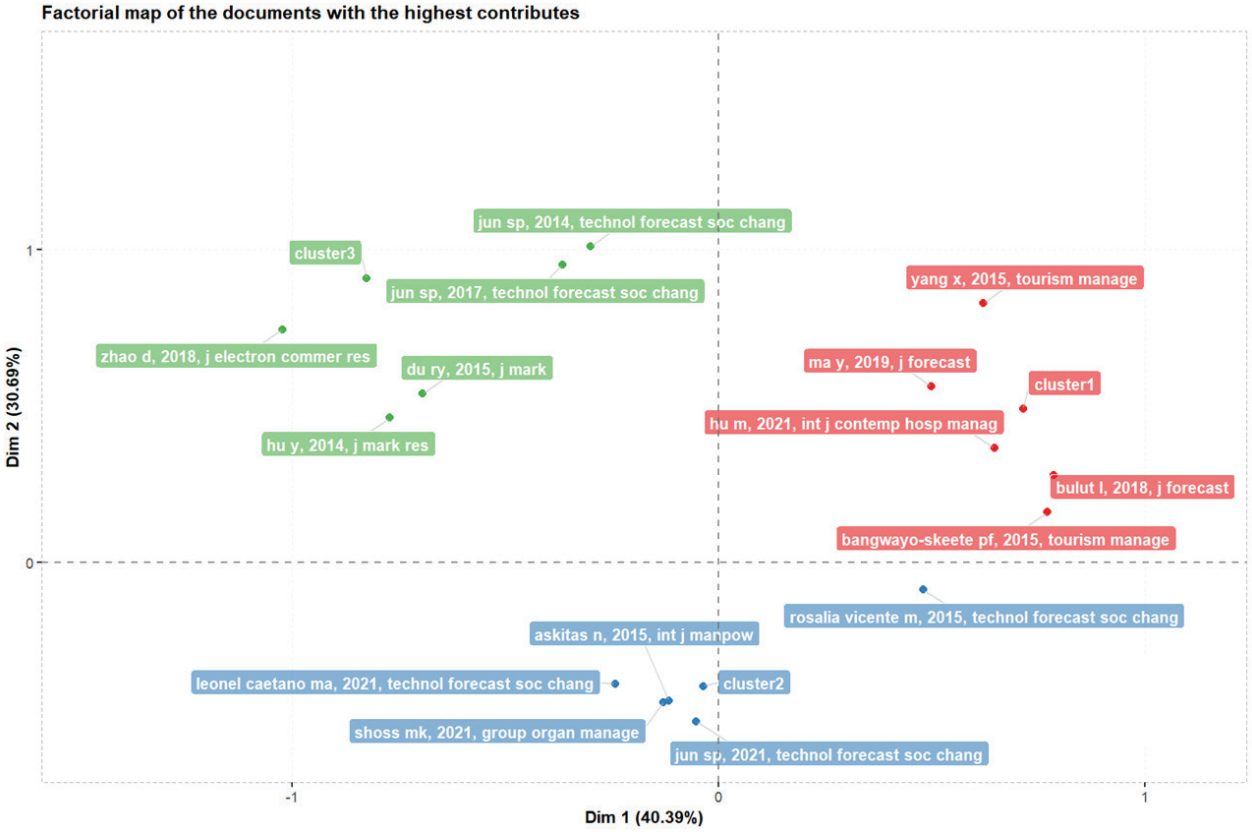
Table 3. Keywords excluded from the analysis

	List of excluded words
Words related to the theme "Search Trends"	Search, Trends, Google, Google Trends, Search Data, Google Search Volume, Search Traffic, Search Trends, Search Engine, Search Engine Data, Google Trends Search Volume Index, Web Search Traffic, Google Data, Google Trends Query Share, Google Indicators
Common words linked to Abstract	word, addition, analysis, analyze, approach, authors, based, behavior, context, data, decisions, design, methodology, approach, economic, effect, effects, empirical, evidence, examine, findings, identify, implications, improve, including, index, information, insights, internet, investigate, level, literature, method, model, online, originality value, paper, period, potential, practical, previous, process, proposed, provide, published, purpose, queries, rate, related, relationship, relative, research, researchers, reserved, results, rights, sample, searches, series, significant, studies, study, suggest, terms, test, time, variables, volume

SOURCE: AUTHORS

To ensure the methodological rigor of this study, we employed multiple correspondence analyses to examine the connection between articles using the abstract, as recommended by Cuccurullo et al. (2016). This approach allowed us to group the articles into specific themes and to gain a better understanding of the current research lines. Furthermore, this type of analysis is useful for exploring data without preconceived restrictions, as highlighted by Abdi, Hervé, and Valentin (2007). In order to generate the most informative map possible, we set the number of terms to 150 and the N-Grams to 'Unigrams'. The results of this analysis are presented in Figure 3, which displays a factorial map of the documents with the highest contributions. This map provides a clear visualization of the different clusters of research and their relationships, which will be discussed in detail in the following section. By using this approach, we were able to objectively and systematically examine the literature on Search Trends and provide a comprehensive analysis of the current state of the field, as well as to identify potential avenues for future research.

Figure 3. Factorial map with the documents with the highest contributions



SOURCE: AUTHORS

Cluster 1 – Red cluster- Demand forecast

The first cluster obtained from the factorial map analysis focuses on predicting the behavior of a given population. This cluster encompasses studies that use Search Trends data to predict the volume of tourists in a particular region and those that analyze market volatility. Articles within this cluster also use different search trend platforms, such as Google Trends and Baidu, to develop more accurate predictions, particularly concerning Chinese travelers.

The papers in this cluster adopt a range of methodologies and technologies to improve predictive accuracy. These methodologies range from straightforward linear regressions to more complex neural networks and machine learning algorithms. The choice of technology is shown to influence the reliability of predictions, adding a layer of complexity to the decision-making process for both academics and practitioners.

Another avenue explored within this cluster is the variation in data sources. Yang, Pan, Evan, and Lv (2015), for example, collate data from both Google Trends and Baidu, thereby offering a cross-platform analysis. This suggests that the diversity of search platforms can lead to more robust and reliable forecasts, especially for topics with regional-specific interests such as tourism in China.

The articles that made the most significant contributions within this cluster, as indicated by the factorial map, include the work by Yang, Pan, Evan, and Lv (2015), which utilizes data from Google Trends and Baidu to predict the volume of Chinese tourists. Bulut's (2018) article utilizes Google Trends data to forecast exchange rates, while Bangwayo-Skeete and Skeete (2015) use Google Trends data to predict tourist demand in Caribbean cities. Hu, Xiao, and Li´s (2021) study finds that search queries generated from PCs result in improved prediction performance compared to those generated from mobile devices. Finally, Ma, Ji, and Pan's (2019) article uses Google Trends data as an event trigger to predict oil price volatility.

The studies within this cluster do not only apply to tourism and market volatility but also have broad ramifications for other sectors like healthcare, real estate, and even political science. This opens new avenues for interdisciplinary research and applications, offering a versatile tool for analysts and decision-makers across fields.

Overall, this cluster reflects the usefulness of Search Trends data in predicting market trends and behaviors, which can help stakeholders make more informed decisions. The studies within this cluster highlight the importance of using multiple search trend platforms, considering different variables, and developing more accurate and robust forecasting models.

Cluster 2 – Blue clusters- Behavior during a crisis

The second cluster in the factorial map of the main contributions is characterized by articles that analyze the behavior of a population during a crisis, with a particular emphasis on recent crises such as the COVID-19 pandemic, the Great Recession, and environmental crises. The studies in this cluster aim to understand the public's response to such events and provide insights for policymakers and organizations.

It's important to recognize that not all crises are created equal. The papers in this cluster often subdivide crises into different categories such as health crises, financial crises, and environmental crises. Understanding the nuances between these types of crises allows for more targeted and effective interventions. Many articles within this cluster also delve into the role that social media plays in disseminating information during a crisis. Platforms like Twitter and Facebook are frequently cited as important tools for gauging public sentiment and understanding the effectiveness of crisis communication strategies.

Jun, Yoo, and Lee's (2021) article is an example of such research, which found that the pandemic declaration increased public awareness. Shoss, Horan, DiStaso, LeNoble, and Naranjo (2021) focused on analyzing helping behaviors during the COVID-19 pandemic, considering both economic and health aspects.

Askitas and Zimmermann (2015) also examined the impact of the 2008 Economic Crisis on well-being using Search Trends data. In the same vein, Vicente, López-Menéndez, and Pérez (2015) used Google Trends data to improve the unemployment forecast in Spain by analyzing search and job offer data. Finally, the work by Caetano (2021) used Google Trends data to predict fires in the Amazon in 2019.

These studies underscore the immense potential for Search Trends data to be leveraged across various sectors, including public health, economics, and environmental science. By understanding the factors that influence behavior during a crisis, authorities and organizations can better prepare and implement more effective interventions.

What is striking about the Blue Cluster is its inherently interdisciplinary nature. Researchers from fields as diverse as economics, psychology, public health, and even environmental science are converging around this shared focal point. This multi-disciplinary approach broadens the applicability of the findings and sets the stage for collaborative research in the future.

Cluster 3 - Green Cluster – Use of Search Trends for Products

Cluster 3 in the factorial map of the main contributions presents articles that analyze products and their adoption. In this group, we have the research by Jun, Yeom, and Son (2014) that used Search Trends data of a product brand to explain its sale. Sung and Park (2017) also used Search Trends data from Google Trends and Naver, Korea's most popular browser, to compare various products and forecast the market for hybrid vehicles in Korea. Du, Hu, and Damangir (2015) analyzed the use of Search Trends as trend indicators of the relative importance of vehicle resources, while in another study, the same authors (2014) used Search Trends as intermediate data to understand the widespread impact of advertising on vehicle sales. As the use of Search Trends to sell products has advanced, Zhao, Fang, Li, and Ye (2018) published an article in 2018 that traces the relationship between Google search volumes and product sales.

One of the emerging themes in this cluster is the role of Search Trends data in e-commerce. As online shopping gains momentum, particularly post-pandemic, understanding what potential

customers are searching for becomes critical for retailers. Articles in this cluster increasingly touch upon how data can be used for real-time analytics to adapt marketing strategies quickly.

Another important aspect this cluster touches on is the 'Innovation Adoption Cycle.' Search Trends can not only predict the sales but also give insights into where in the adoption cycle a product might be—whether it is in the introduction, growth, maturity, or decline stage. This information is invaluable for product lifecycle management.

The Green cluster's contributions show that the use of Search Trends in the management field is relevant in the analysis of products and the adoption of new technologies. The factorial map allows the identification of key articles in this area and their relationships with other relevant works.

Search Trends Thematic Map

We employed the thematic map to establish a research agenda. Following the approach of Cobo et al. (2011), we used the keyword plus method to group the authors' keywords and generate the map from 2011 to 2021. The resulting thematic map consists of four quadrants (niche themes, motor themes, essential themes, and emerging or declining themes) according to Callon et al. (1991) on centrality and density. Centrality in the network refers to the interaction of this network with others, while density is the internal strength of the network or the intensity of its internal ties, forming the abscissa and ordinate of the plan.

For the analysis, we excluded the standard terms of Search Trends (as listed in Table 4). The parameters used for the formation of the thematic map included 250 words with a minimum frequency of twenty per thousand documents for cluster formation. By using the thematic map, we were able to identify the main topics of research in the field of management that use Search Trends. These topics include the (i) behavior, (ii) forecast evaluation, (iii) market, (iv) machine learning, (v) corporate social media, and (vi)word of mouth. This map can serve as a useful tool for researchers and practitioners to understand the current state of research and to identify potential areas for future investigation.

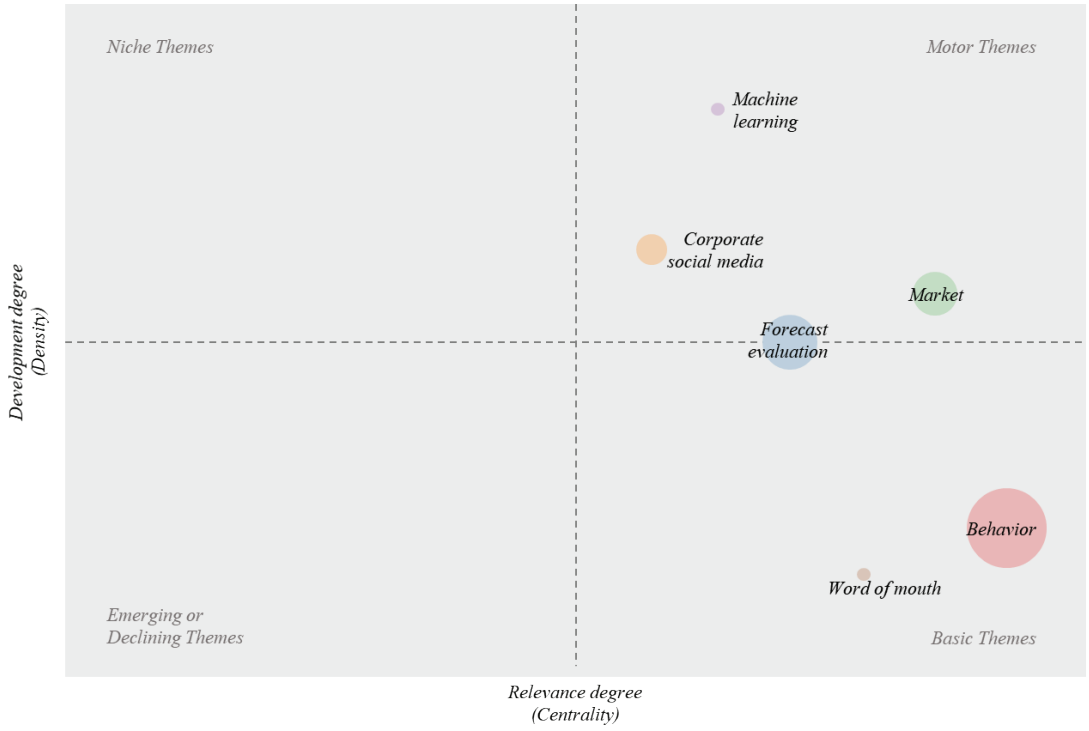
Table 4. Keywords excluded from the analysis

	List of excluded words
Words related to the theme "Search Trends."	Search, Trends, Google, Google Trends, Search Data, Google Search Volume, Search Traffic, Search Trends, Search Engine, Search Engine Data, Google Trends Search Volume Index, Web Search Traffic, Google Data, Google Trends Query Share, Google Indicators

SOURCE: AUTHORS

As shown in Figure 4, six clusters emerged through the thematic map. Their keywords had their definition of cluster presented in Table 5, explicitly presenting the six clusters, namely: (i) behavior, (ii) forecast evaluation, (iii) market, (iv) machine learning, (v) corporate social media, and (vi)word of mouth.

Figure 4. Thematic map from 2011 to 2021 using Keyword Plus



SOURCE: AUTHORS

Table 5. Frequency of Keywords and Clusters

Cases	Keyword	Cluster	Cases	Keyword	Cluster
7	covid-19	1	5	market	3
8	big data	1	5	investor	3
4	big data	1	4	trending search terms	3
5	nowcasting	1	4	machine learning	4
4	advertising	1	4	corporate social media	5
16	forecast evaluation	2	4	consumer sentiment indicators	5
8	inbound tourism	2	4	word of mouth	6

SOURCE: AUTHORS

As it is a recent theme, we can see that all the niches formed are present in the quadrants of greater relevance, in the quadrants of Motor and Basic themes.

In the motor themes quadrant, we find (iv) machine learning, (v) corporate social media, and (iii) market. The machine learning cluster gathers more technical research that uses machine learning modeling to solve research questions such as occupancy prediction (Ampountolas & Legg, 2021) or social knowledge in the health sector (De Luca, 2021). The corporate social media survey cluster comprises surveys that focus on the behavior of a population captured through Search Trends

and social media. This cluster includes research on the influence of corporate social responsibility on consumer behavior (Allen et al., 2020) and consumption prediction through Google Trends data (Woo & Owen, 2019). Finally, this quadrant is also the cluster of (iii) market. This quadrant brings together research that relates Search Trends data with the capital market, such as Nguyen & Pham (2018) and Perlin, Caldeira, Santos, and Pontuschka (2017).

At the intersection of the Motor and Basic quadrants is the (ii) forecast evaluation cluster. This cluster mainly deals with forecasts for a given population. It contains the primary studies that relate Search Trends to tourism (Bangwayo-Skeete & Skeete, 2015; M. Hu et al., 2021; Vyas, 2019; Xu & Reed, 2019; Yang et al., 2015).

Finally, we have the clusters located in the quadrant of Basic themes, such as (i) 'Behavior', which deals with nowcasting research (Carrière-Swallow & Labbé, 2013; Smith, 2016), and the more recent ones that relate to the impact of covid-19 (Jun et al., 2021; Nikolopoulos et al., 2021; Shoss et al., 2021). Another cluster formed in this quadrant is the (vi) word-of-mouth cluster, which combines research that analyzes the prediction from the diffusion perspective (Chumnumpan & Shi, 2019; Ruohonen & Hyrynsalmi, 2017; Schaer et al., 2019).

DISCUSSION AND CONCLUSION

This study investigated the use of Search Trend for forecasting in a variety of ways. Understanding the characteristics associated with the use of Search Trends, the main publication outlets, the frequency of these publications, and the leading authors in the field is critical to guiding the future direction of research and practice. This awareness helps researchers identify knowledge gaps and set the context for future investigations (Sugimoto et al., 2013). For professionals, this knowledge allows the optimization of resource allocation, directing attention to the publication sites and authors that most impact the field (Waltman & van Eck, 2013).

The growth of the number of publications in relevant journals indicates that there is interest from the academic and business communities in the use of this type of data. The unique characteristics of Search Trends data, particularly its real-time nature and its ability to capture mass sentiment, have made it indispensable for research in the management field. Furthermore, the results obtained from the thematic and factor maps show that there are different and distinct lines of research using Search Trends.

It is important to recognize that the utilization of Search Trends for forecasting has evolved considerably over the past decade. The shift from merely predictive models to more nuanced behavioral analysis demonstrates a maturation in the application of this data (Jun et al., 2018). This mirrors broader trends in data science and analytics, where big data is increasingly used for complex problem-solving and to generate actionable insights (Blazquez & Domenech, 2018).

While demand forecasting remains a robust area of study, the expansion into behavioral analysis during crises indicates an alignment with socio-political realities, particularly post-2020 (Jun et al., 2021). The data has begun to reflect more complex human phenomena, highlighting both the challenges and opportunities for decision-makers (Petropoulos et al., 2022). Such an evolution in

research focus also points towards a heightened responsibility for scholars and practitioners to consider ethical dimensions, including privacy concerns and data integrity.

Our study identified the journals with the most publications using Search Trends, as well as the articles with the most citations. This information is critical for scholars and researchers who wish to stay up-to-date on the latest research in the field. In this sense, 'Technological Forecasting and Social Change' and 'Journal of Forecasting' are the top journals with the most publications using Search Trends. Vosen and Schmidt (2011), Yang et al. (2015), and Bangwayo-Skeete and Skeete (2015) are the articles with the most citations.

The results of the factor map indicate that there are three main clusters of research on Search Trends in management. The first cluster focuses on demand forecasting, particularly related to the tourism sector. This research has included the use of Search Trends data to predict the behavior of Chinese travelers (Yang et al., 2015) and to forecast the exchange rate (Bulut, 2018). This line of research has been around for some time and has received significant attention from researchers, with a high number of publications and citations. The emergence of articles focused on the use of Search Trends to forecast tourism demand highlights the potential of this data source in this area.

The second cluster focuses on behavior during crises, including the COVID-19 pandemic and other economic crises. The use of Search Trends data in this context can provide valuable information for decision-making. For instance, Shoss et al. (2021) analyzed helping behaviors during the COVID-19 pandemic, while Jun et al. (2021) investigated the impact of the pandemic declaration on public awareness. The analysis of behavior during a crisis can provide insights into the effects of crises on society and how people respond to them, which can help organizations and governments to plan and respond appropriately.

The third cluster focuses on using Search Trends to forecast products. This line of research is concerned with analyzing the sales forecast of products, including the projections of the most relevant features for developing a product or advertising campaign. The research in this area includes studies by Du et al. (2015) and Sung and Park (2017), which use Search Trends data to analyze the adoption of new products and predict market demand.

When we compare the results of the factor map with those of the thematic map, we can see that the surveys with the most significant contributions to the factor map are mainly present in the 'behavior' cluster. This cluster brings together research on behavior during a crisis, the use of Search Trends for product development, and forecast analysis related to tourism. This finding highlights the relevance of research on behavior during a crisis and the use of Search Trends for product development. Although these areas have not received as much attention as demand forecasting, they show significant potential for future research and development.

Looking ahead, the evolution of Search Trends in scholarly research suggests a trajectory toward more complex models and applications (Petropoulos et al., 2022). We can anticipate a broadening of research clusters that may include more granular social and behavioral components, driven by advancements in machine learning and data analytics. The next decade in Search Trends research will likely be defined by the balance researchers strike between technological capability and ethical responsibility.

Research Agenda for future research

This article utilized two forms of analysis to identify the current state and potential for future research using Search Trends. The analysis of the most significant documents showed the main aspects of the theme, while the thematic maps identified the most promising research areas still at a relatively low level of development.

Based on the intersection of this information, four promising lines of research can be identified. Firstly, the (1) Behavior cluster, which reflects population behavior through changes in the current scenario, such as the impact of COVID-19. The use of Search Trends data to generate more accurate models with more reliable data is essential to equip public agents and companies for decision-making.

Another line of future research can be found in the (2) Forecasting Evaluation cluster, which focuses on analyzing tourism forecasts. Future research in this area could include improving communication to address tourists' concerns (Xu & Reed, 2019), utilizing Search Trends data from different devices to improve forecasts (M. Hu et al., 2021), and improving tourism demand forecasts themselves (Bangwayo-Skeete & Skeete, 2015).

The (3) Market cluster is also a promising area for future research, especially given the increasing role of algorithms in automated trading. This line is compatible with publications that use Search Trends data to increase accuracy, and research is still needed on the impact and forecast of periods of financial crises (Perlin et al., 2016) and on developing markets considering other Search Trends in addition to Google Trends (Nguyen & Pham, 2018).

Finally, the (4) Word-to-Mouth cluster explores research that uses the theory of diffusion of innovation to achieve predictions or leverage the power of social networks to improve prediction. This line of study includes intriguing strands, such as alternative methods for incorporating Google Trends data into diffusion models and assessing their effectiveness (Chumnumpan & Shi, 2019) and applying Search Trends data to various time series models for various markets and industries (Ruohonen & Hyrynsalmi, 2017).

The lines of research identified in the article provide a comprehensive overview of the possibilities for using Search Trends data in the management area. The studies presented demonstrate that this type of data can be used to generate insights into a wide range of phenomena, from population behavior during crises to forecasting demand for products and services.

Despite the significant contributions of our study, it is essential to acknowledge its limitations. First, we used the Web of Science database, which may not cover all the relevant publications in this area. Therefore, future studies could use other databases or combine several databases to obtain more comprehensive results. Additionally, our research focused on the management area, and future studies could approach this topic from different areas of knowledge, such as social sciences, computer science, and engineering.

Our study provides a comprehensive overview of the literature on Search Trends in the management field, identifying the main characteristics of this area, and highlighting the potential for future research. We believe that the use of Search Trends offers a valuable opportunity for academic research and business applications, and we hope that our study provides a useful resource

for researchers in this area. As the field of big data and predictive analytics continues to evolve, we believe that the use of Search Trends will continue to be a relevant and promising direction for research in the management field.

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