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# Technological and Innovative Transformation in Marketing: Examination of Social Media Text Stream Visualization Concept with Bibliometric Analysis: Future Agenda

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**Abstract**: Changes in technology and innovation processes affect many areas. The impact of technology and innovative applications lead to radical changes in marketing strategies. Social media text stream visualization stands out as one of the most important tools of these changes. Social media text stream visualization allows the analysis of text data coming from social media platforms through graphics and infographics. In this way, social media text stream visualization allows the development of more effective and efficient strategies by combining technology and innovation in marketing. In this study, the Web of Science database is used to reveal in which areas the concept of social media text stream visualization has been used in the last 10 years through bibliometric analysis. After the inclusion and exclusion criteria are applied, the final sample consists of 12 refereed articles. Five separate analyses were conducted to test the sample. Performance analysis determined the publication years of the articles, their contributions by country, the outputs of relevant journals, and the sectors where this concept is used most intensively. The findings of the study provide a broad perspective on the research conducted to date and identify potential research gaps. Accordingly, it is seen that the studies within the scope of social media text stream visualization are mostly conducted in the fields of social media, advertising, e-commerce and market research. It was concluded that machine learning, big data, text analysis and time series methods were used in the studies. It is recommended that studies be conducted in the retail, tourism and accommodation and technology sectors for future research. This research aims to contribute to the field of marketing by revealing the gaps in the literature. The study also offers suggestions for future research to be conducted by academics and sectoral researchers.

**Keywords:** Technology and inovation, Digital transformation, Social media text stream visualization

## Introduction

In today's world of rapid digitalisation, social media has become one of the most important platforms that reshape the interaction between individuals and businesses. Social media text flow refers to the dynamic presentation of user interactions, shares and content on these platforms. Visualisation refers to the graphical representation of complex data and information. The combination of these two concepts plays an important role in increasing the impact of content while making social media text flow more understandable.

Visualisation is a critical tool in demonstrating the impact of social media text streams on marketing strategies. Through text streams supported by visual content, brands can reach their target audiences more effectively and attract the attention of users. In this context, the digitalisation of marketing strategies and the visualisation of campaigns carried out on social media shape consumer behaviour and increase brand loyalty.

Technological advancements offer innovations in the management and analysis of social media text streams, enabling brands to make data-driven decisions. Tools such as data analytics and artificial intelligence provide a better understanding of visualised text streams and optimise marketing processes. The digital transformation

process helps businesses strengthen their presence on social media and respond quickly to changing consumer expectations. For a thorough grasp of the subject, a number of factors were examined, including academic journal publications, performance by decade, contributions by nation, and keyword co-occurrence.

**Social Media Text Stream Visualization**

Social media offers a multitude of data that can be mined to support a variety of business intelligence applications and better inform marketing campaigns, in addition to providing companies with new avenues for customer engagement through online advertising (Royle & Laing, 2014; Osatuyi, 2013; Rud, 2009). The idea of Visualization gives viewers a compiled picture of a dataset that is accessible. It provides a visual interface that allows people to comprehend and examine the dataset. Visualization technology helps people view, browse, distinguish, and comprehend information. It was inspired by scientific computational Visualization, which first emerged in the 1980s (Qi et al., 2015). Creating pictures or other visual representations from massive datasets is the art and science of Visualization.

As a social network that draws people together to share interests and activities, social media platforms like Facebook, Instagram, and Twitter are becoming more and more significant. Numerous photographs with intriguing information are available for information extraction from social networks like Instagram (Miguéns et al., 2008; Nebhi, 2012). Instagram is a relatively new type of social network that allows users to take photographs or videos and share them with others while also giving them a fast option to do so with friends (Hu et al., 2014).

Geolocation-based social media Visualizations were introduced by a few studies. Hochman and Schwartz (2012) used Instagram photo analysis to present a technique for tracking cultural visual patterns. A system architecture for extracting situation awareness information from Twitter posts created during various crises and disasters was given by Yin et al., (2012). Systems for text extraction analysis of social media content were created by several researchers (Zhao et al., 2011; Yin et al., 2012).

**Social Media Text Stream Visualization Phases**

**1. *Data Collection and Preparation*:** Gathering and preparing the pertinent data sources is essential before visualising social media data. This could entail using third-party technologies, scraping webpages, or gathering data from APIs. After being collected, the data must be filtered, cleaned, and formatted so that it may be visualised.

**2. *Visualization Approaches*:** Data from social media can be represented using a variety of Visualization techniques. Bar charts, line graphs, scatter plots, and treemaps are a few popular methods. Every technique has advantages and disadvantages and can be applied to various data types and analytical objectives. For instance, a treemap can represent the distribution of content categories, and a line graph can efficiently show the rise of followers over time.

**3. *Interactive Visualizations*:** By enabling users to examine and engage with the data, interactive Visualizations offer a more customised and captivating experience. Users can concentrate on particular areas of the data and obtain deeper insights by using features like zooming, filtering, and sorting. Users can examine geolocation data and examine regional trends, for example, using an interactive map.

**4. *Sentiment Analysis:*** Sentiment analysis is a useful component of social media Visualization since it provides insight into the feelings and viewpoints of users. Sentiment analysis algorithms can categorise social media messages as neutral, negative, or positive by examining text data. Results from sentiment analysis can be visualised to reveal important information about public opinion on particular subjects, brand impression, and customer satisfaction.

**5. *Real-time Monitoring***: Real-time monitoring of social media activity is another application for social media Visualization. Businesses may monitor brand mentions, stay up to date on the newest trends, and quickly address customer feedback by consistently gathering and visualising data. Businesses can quickly make data-driven choices thanks to real-time visualizations like live dashboards.

### Social Media Text Stream Visualization Tools and Techniques

**1.** ***Application Programming Interfaces (API):*** The foundation of social media data harvesting is APIs. They enable programmatic interaction between developers and social media sites such as Facebook, Instagram, LinkedIn, and Twitter. Access to information like posts, comments, likes, and user profiles is made possible by each platform's own API. As an illustration, Twitter's API offers endpoints for retrieving tweets based on user handles, hashtags, or particular phrases. This data can be used by researchers to observe trends, examine user behaviour during events like elections or product debuts, or investigate sentiment analysis.

**2.** ***Web scraping:*** Data extraction from websites, especially social media platforms, is known as web scraping. Web scraping enables you to gather unstructured content, including comments, photos, and videos, while APIs offer structured data. For instance, user-generated material, captions, and hashtags linked to a specific brand can be scraped while evaluating Instagram posts about that brand.

**3.** ***Social listening tools:*** These tools keep an eye on discussions about particular companies, keywords, or subjects on social media. They compile engagement metrics, sentiment, and mentions. For instance, social listening services are available through Hootsuite, Brandwatch, and Sprout Social. Marketers are able to measure campaign performance, find influencers, and monitor brand perception.

**4.** ***Analysis of Hashtags:*** Hashtags categorise information across platforms by acting as metadata labels. Understanding user preferences and trends can be gained by examining trending hashtags.

**5.** ***Analysis of Networks:*** Social media platforms are networks that are connected to one another. Understanding influence, community structures, and information flow can be gained by examining relationships (friends, followers, and retweets).

**6.** ***Data based on location:*** Location tags are frequently used in social media posts. By gathering geotagged data, you can investigate regional patterns and habits.

**7.** ***Content Created by Users (UGC):*** User-generated content (UGC) consists of user-generated reviews, photos, videos, and posts. Collecting user-generated content yields genuine insights.

## Method

A bibliometric analysis of the studies conducted so far in the field of marketing on the concept of social media text stream visualization is carried out. One useful statistical method for examining publishing trends in a topic is bibliometric analysis. Researchers may effectively pinpoint existing trends and research gaps by using this strategy, which will help guide future investigations (Guo et al., 2019). This method provides a quick understanding of the discipline, which is very helpful for scholars who are eager to investigate a certain field. Science mapping and performance analysis are the two primary bibliometric analytic methodologies. By examining publications, authors, and citations, performance analysis evaluates the impact of science. In the meantime, science mapping uses co-word and co-citation analyses to produce a visual depiction of the organization and development of scientific research (Feng et al., 2017).

### Bibliometric Database Selection

Initially, a thorough search was conducted in the chosen Web of Science database. Articles from a greater variety of nations and sources could be analyzed thanks to this approach. One of the most popular and well-known research databases in the world is Web of Science. This made it easier to do a thorough analysis of the material that was available, which enhanced knowledge of the subject.

### Identifying the Main Results and Defining the Keywords

In the first search, the keywords ‘social media text stream’, ‘visualization’ and ‘marketing’ in the research questions were used. These keywords were entered into the Web of Science database using the ‘all fields’ search function. As can be seen in Table 1, 51 articles were collected from all these possible combinations. After the inclusion and exclusion criteria, a total of 12 articles related to the field were reached.

Table 1. Keyword results

| **Database** | **Web of Science** |
|---|---|
| **Keywords** | ‘’Social media text stream’’ and ‘’Visualization’’ and ‘’Marketing’’ |
| **Inclusion criteria** | Research field: Business/ Marketing<br>Language: English<br>Source type: Article |
| **Exclusion criteria** | Research field: Engineering<br>Language: Articles written outside English<br>Source type: Book, book chapter and paper |
| **Number of studies** | 12 |

Although a comprehensive search was conducted, the results were filtered according to two main criteria relevant to the topic of the study. Firstly, publications had to be in English. Secondly, studies conducted outside the field - particularly in engineering - were not included. However, the research findings included reviews conducted in the field of business. As a result, 12 peer-reviewed articles on the visualization of social media text streams in marketing were found to be relevant to the field.

**Bibliometric Analysis Process**

The data were examined after the final sample was determined. VOSviewer software was used in the study to organize the sample in a cluster-oriented manner and to show the visual connections between terms (Van Eck & Waltman, 2010). By producing a cloud map based on numerous pertinent characteristics, such as authors, journals, and keywords, VOSviewer is a tool that builds and presents bibliometric networks (Srivastava & Sivaramakrishnan, 2021).

**Analyzing the Most Contributing Author**

The information about the authors who contributed the most studies on the concept of social media text stream visualization is as shown in the figure below.

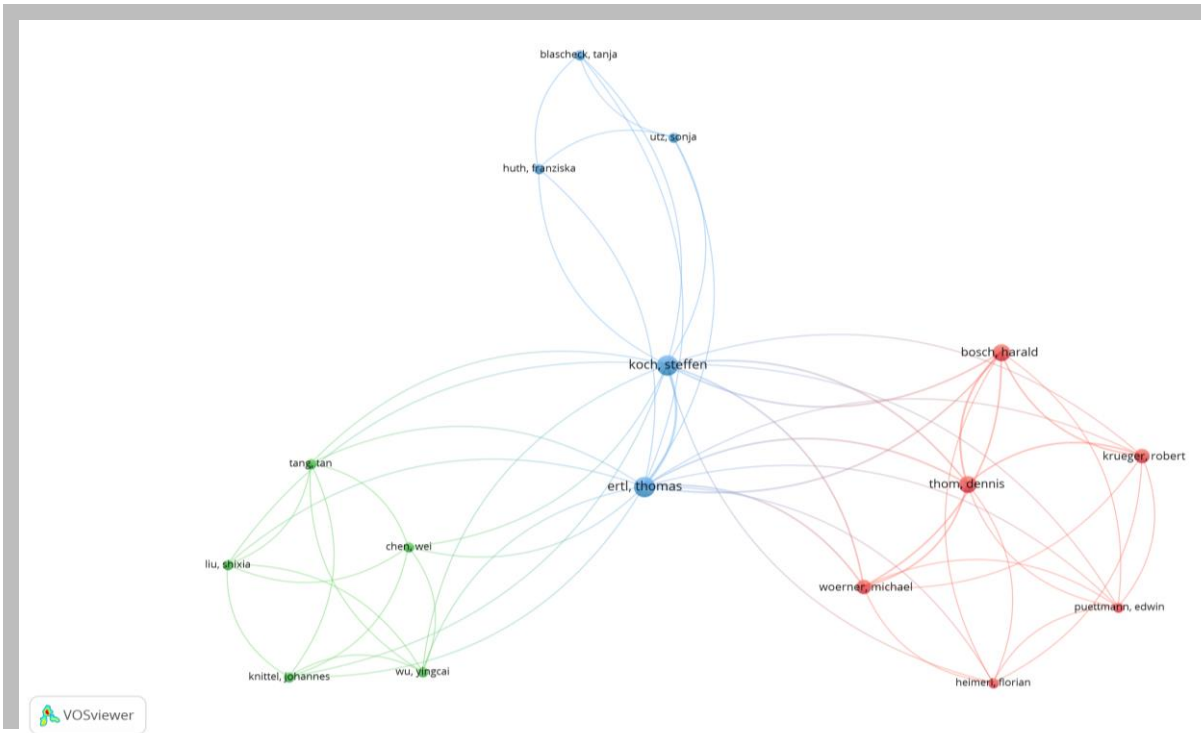


Figure 1. Authors who contributed the most

The top 5 authors with the most publications on social media text stream visualization are shown in Table 2.

Table 2. The most prolific authors

| Number | The Author |
|---|---|
| **1)** | Steffen Koch |
| **2)** | Thomas Ertl |
| **3)** | Harald Bosch |
| **4)** | Dennis Thom |
| **5)** | Robert Krueger |

As a result of the analysis, it is seen that Steffen Koch, Thomas Ertl, Harald Bosch, Dennis Thom and Robert Krueger are the authors who contributed the most to the field.

**The Most Contributing Institutions Analysis**

The figure and table showing the most contributing authors and their institutions in the field subject to the research are given below.

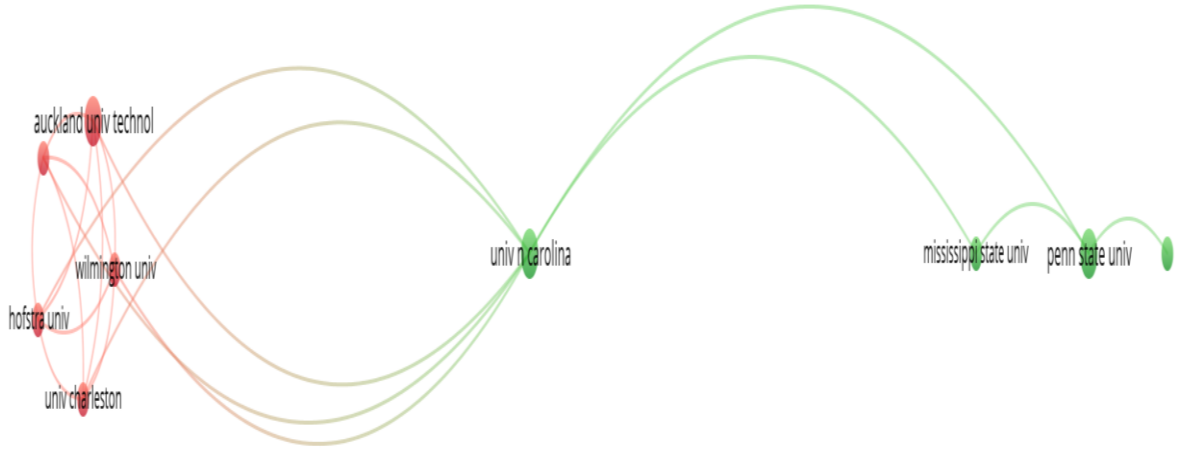


Figure 2. The most contributing institutions

The top 5 institutions contributing the most to the field of social media text stream visualization are given in the table below.

Table 3. The most productive institutions

| Number | Institution |
|---|---|
| **1)** | The University of Auckland |
| **2)** | University of North Carolina |
| **3)** | Pennsylvania State University |
| **4)** | Wilmington University |
| **5)** | Mississippi State University |

The top 5 universities producing the most publications are the University of Auckland, University of North Carolina, Pennsylvania State University, Wilmington University and Mississippi State University.

**Countries Contributing the Most to the Field Analysis**

The countries where the most articles are produced within the scope of social media text stream visualization are shown in the Figure 3. The list of the top 5 countries contributing the most to the field of social media text stream visualization is shown in Table 4. The top 5 countries that contribute the most to social media text stream visualization are USA, China, India, Australia and England, respectively.

Table 4. The most contributing countries

| Number | Country |
|---|---|
| **1)** | USA |
| **2)** | China |
| **3)** | India |
| **4)** | Australia |
| **5)** | England |

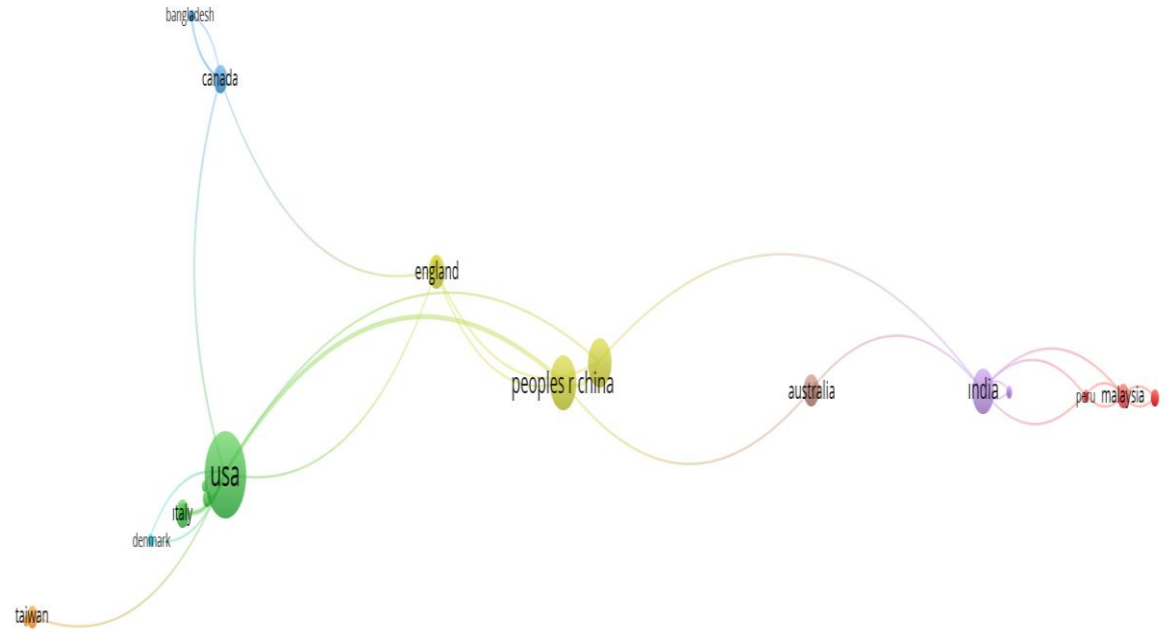


Figure 3. The most contributing countries

**The Most Used Keywords Analysis**

The result of the analysis of the most commonly used words related to the field within the scope of social media text stream visualization is shown in the Figure 4 below.

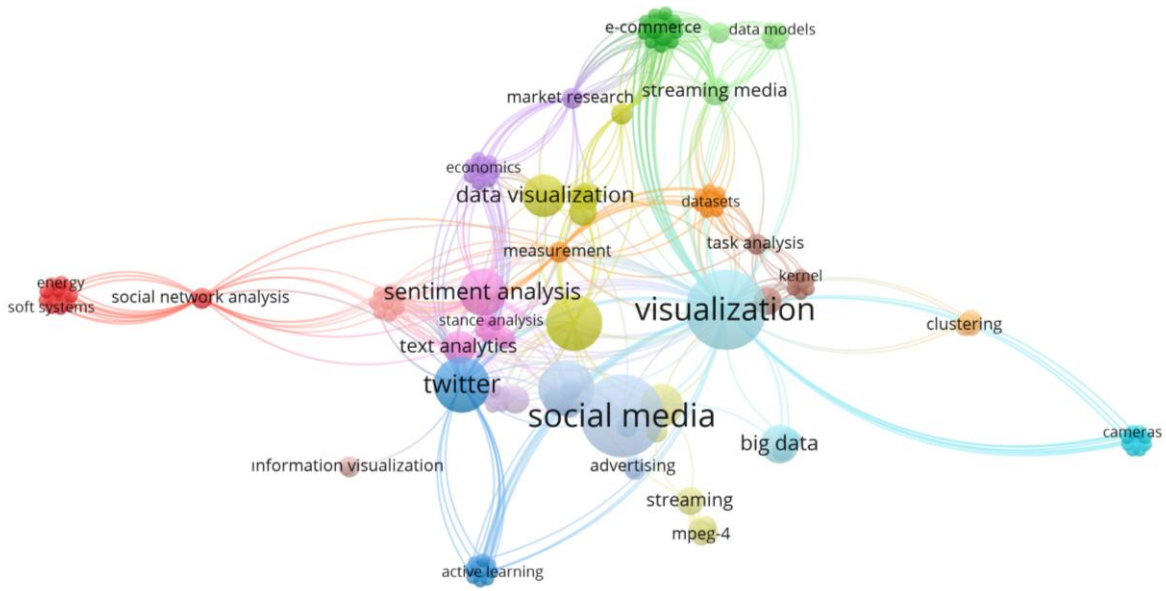


Figure 4. The most used words

The top 10 most used words together within the scope of social media text stream visualization are given in the table below.

Table 5. The most used words

| Number | Word |
|---|---|
| **1** | Social media |
| **2** | Visualization |
| **3** | Twitter |
| **4** | Sentiment analysis |
| **5** | Text Analysis |
| **6** | E-commerce |
| **7** | Big data |
| **8** | Streaming |
| **9** | Advertising |
| **10** | Market research |

When the studies conducted in the field are analyzed, the words that are most frequently used together and subject to studies are shown through figures and tables. Accordingly, while it is seen that the concept of social media text stream visualization has an intensive use on Twitter as a social media tool, it is concluded that the most commonly used areas are e-commerce, advertising and market research.

### Number of Publications by Years

In this part of the bibliometric analysis, the distribution of studies on social media text stream visualization according to years is presented. The number of publications by years is shown in Figure 5.

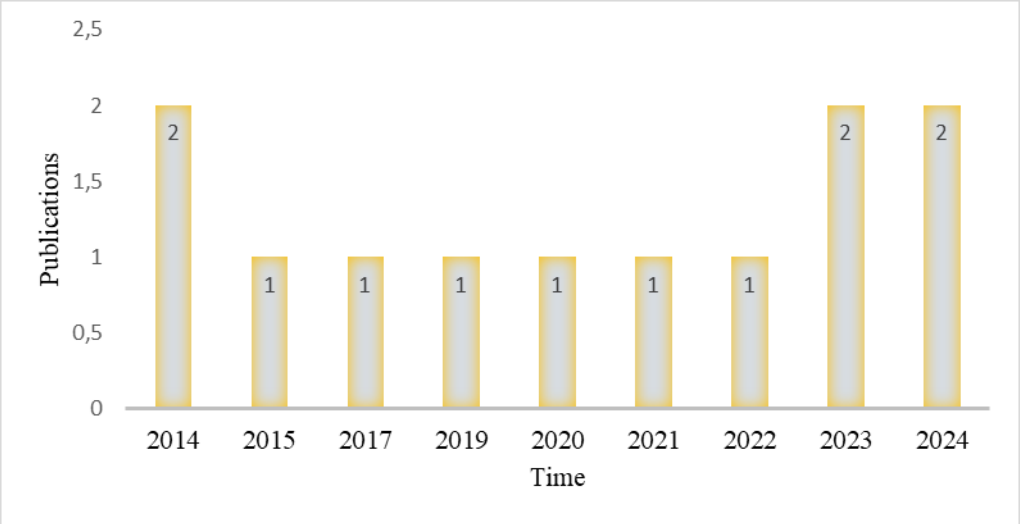


Figure 5. Number of publications by years

It is seen that studies on the concept of social media text stream visualization have increased especially in the last 10 years. As a result of the literature analysis, it has been determined that the number of studies in which the studies on the field are handled together with marketing is very few. It can be stated that the most publications were carried out between 2023 and 2024. Accordingly, it is seen that there are relatively fewer studies in the field within the scope of marketing and that there are studies that can be written about the field. It is seen that there were two studies on the field in 2014, 2023 and 2024, and one study on the field between 2015 and 2022.

### Analysis According to Publication Sources

The figure below shows the journals in which the studies carried out within the scope of social media text stream visualization was published. The journals of the 12 articles that were bibliometric analyzed in the study are also indicated in the Figure 6.

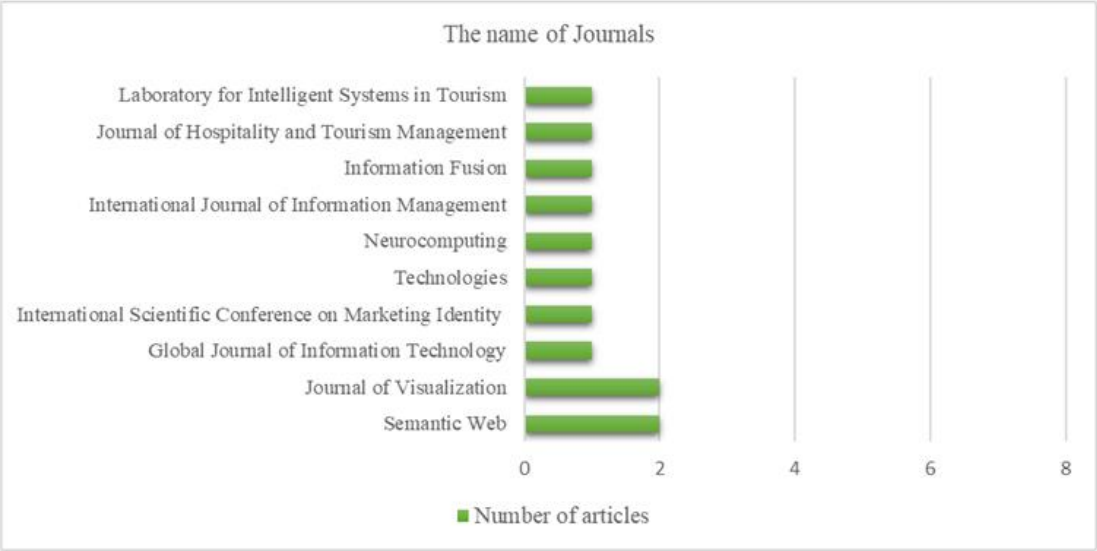


Figure 6. The ten most prominent academic journals

As a result of the analysis, it is seen that there are a total of 12 articles on social media text stream visualization in the field of marketing. In this context, in Table 7, which includes 10 journals with 12 articles, it is seen that the most studies are in Semantic Web and Journal of Visualization. It is seen that the studies on the field are mostly published in journals focusing on information systems, technology and tourism. Accordingly, Laboratory for Intelligent Systems in Tourism, Journal of Hospitality and Tourism Management, Information Fusion, International Journal of Information Management, Neurocomputing, Technologies, International Scientific on Marketing Identity and Global Journal of Information Technology.

## Results and Discussion

One of the methods performed within the scope of bibliometric analysis was the analysis of words. Accordingly, the most commonly used words within the scope of social media text stream visualization were brought together and cluster analysis was performed. Accordingly, it is seen that there are five different clusters related to the field. After the word analysis shown in Figure 4, the grouping of the clusters is shown in Figure 7.

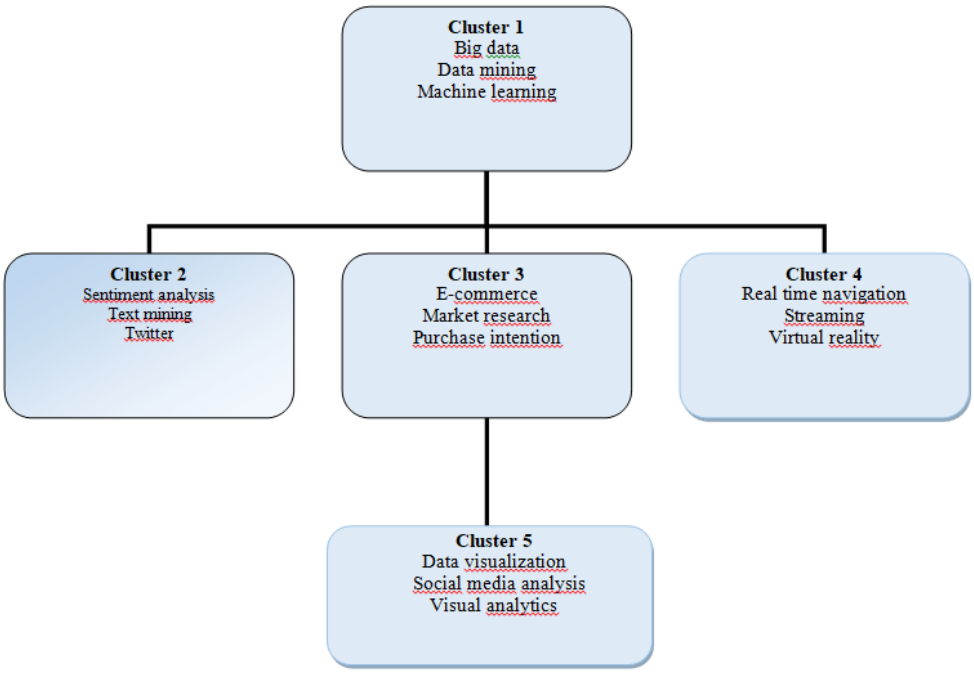


Figure 7. Cluster analysis

After the analysis, the most intensively used words were grouped together and five cluster structures emerged as a result. Accordingly, the structure of each cluster group was analyzed as follows.

**Cluster 1:** In the first cluster group, it is seen that data processing within the scope of social media text stream visualization is mostly addressed. Accordingly, it can be stated that a visualization analysis focused on technology and digitalization was carried out and tools such as big data, data mining and machine learning were used extensively in the studies. It can be stated as another result obtained that the use of technological tools is more intense within this cluster. After the process of transforming big data into more useful data, the findings obtained from social media through machine learning are used for the purposes of businesses and brands with the visualization technique.

**Cluster 2:** In the second cluster group, it is seen that sentiment analysis, text mining and twitter elements are more prominent. In this context, it can be stated that emotions are analyzed and texts are examined through text mining during social media text stream visualization. Another result obtained is that Twitter, one of the social media tools, is used more intensively in the studies carried out within the scope of sentiment analysis and text mining. Although there are a wide variety of social media tools, it is seen that the studies carried out in this field are mostly carried out on Twitter. Based on the posts made by Twitter users, emotions are analyzed through text mining and as a result, visualization can be performed.

**Cluster 3:** In the third cluster group, it is seen that the concepts of e-commerce, market research and purchase intention are used together in social media text flow visualization studies. Accordingly, especially in studies conducted through e-commerce, visualization and analysis processes for market research are carried out by analyzing the behavior of consumers. Through market research, consumers' purchase intentions can also be evaluated. In this context, it can be stated that the third cluster group mostly consists of visualization studies on consumers' online purchasing behaviors.

**Cluster 4:** In the fourth cluster, it is seen that the studies carried out are on real-time navigation and virtual reality. Real-time navigation provides users with access to dynamic data and in this way, the text stream showing the location of users on a map can be improved with instant updates. This helps users to understand the changes more easily. Virtual reality offers users a completely different and interactive environment. Text streaming can be an effective method for presenting information in these environments. For example, as users navigate through a virtual city, historical and cultural information about that region can be visualized virtually. Text stream, combined with data visualization, helps make complex information more understandable. In a virtual reality environment, users can see text and graphics together, allowing them to process information in a more intuitive way.

**Cluster 5:** In the fifth cluster, it is seen that the studies carried out are mostly in the context of data visualization, social media analysis and sana analysis. Carrying out studies by bringing these three concepts together is very important within the scope of feature digitalization and innovation processes. Data visualization makes complex data understandable through graphs, tables or other visual formats. For social media analytics, visualising data such as consumer behaviour, engagement rates and trends allows for quick analysis of this data.

Virtual analytics refers to the study of data sets, often using simulations and virtual environments. Social media analytics can use such methods to understand users' behaviour in virtual environments. Data visualisation also comes into play here; by visualising the results of virtual analytics, it is possible to better understand user behaviour and develop strategies Social media analysis is a process of analyzing users' interactions, content sharing and general trends. Data visualization presents the results of this analysis more effectively.

Data visualization enables brands and organizations to be more effective in decision-making processes by presenting the results of social media analysis clearly. Virtual analytics helps to predict possible outcomes by simulating scenarios in these processes. Working together, these three components can enhance consumer experience and engagement.

## Conclusion

As a result of the bibliometric analysis, studies related to the field of marketing within the scope of social media text stream visualization were examined and 12 studies conducted between 2014 and 2024 were examined in detail. Accordingly, five different cluster structures have emerged and the relationship of each cluster with social media text stream visualization is explained.

As social media becomes a powerful marketing tool for brands, visualisation of text flow enables data to be presented in an understandable and effective way. This visualization allows brands to better interact with their target audience, follow trends and make strategic decisions. Especially in today's age of digitalisation and innovation, it is of great importance for businesses and brands to examine and analyse the behaviour of consumers. In the digitalisation process, social media text stream visualisation plays a critical role in optimising marketing strategies and improving user experience. In this context, it is important for brands to adopt data-driven approaches in order to gain competitive advantage.

As a result of the analyses, it is seen that the studies conducted are mostly on e-commerce, market research, advertising and consumer purchase intention. Understanding the studies carried out by consumers through social channels is of critical importance for both academic and business world. Another result obtained is that the use of marketing and digital tools and technology together is quite intense. Accordingly, when we consider both academic and business world, studies are carried out through the use of machine learning and big data.

## Recommendations

Social media text stream visualization is of great importance for marketing, innovation and strategic decision-making processes of businesses in today's age of digitalization. This process not only makes data more understandable, but also enables businesses to interact more effectively with their target audience. From a marketing perspective, visualising social media text stream is a critical tool to increase the impact of brand messages and campaigns. Understanding users' behaviour on social media platforms helps brands create more personalised and effective content for their target audience. Visualization enables data to be analysed instantly, allowing marketing strategies to be updated quickly. This improves campaign performance and provides the opportunity to increase customer satisfaction.

In the field of innovation, social media data can be used as an important resource in new product development processes. Customer feedback and interactions help to understand which features are requested or which problems need to be solved. Visualised data speeds up this process, allowing businesses to create more innovative solutions.

In the context of digitalisation, social media text stream visualization helps businesses strengthen their digital presence. Data analysis and visualization allow organisations to optimise their digital strategies. Especially when developing multi-channel marketing strategies, presenting data on social media in an integrated way contributes to businesses making more effective decisions.

As a result of the analysis, it is seen that the studies are concentrated especially in the fields of e-commerce, advertising and market research. In this context, it is recommended to increase sectoral diversity in future studies. Another suggestion is that it is also possible to make a different evaluation by comparing the results of these studies on a sectoral basis.

It is important to deepen the research on social media text flow visualization, marketing, digitalisation and innovation on a sectoral basis in order to increase the effectiveness of applications in different fields. In this context, suggestions for studies that can be carried out in different sectors can be listed as follows:

- *In the retail sector,* examining the relationship between social media data and consumer behaviour can increase customer satisfaction. Analysing consumer comments and feedback should be integrated into product development processes. In addition, the effects of social media campaigns on customer loyalty can be investigated.
- *In the finance sector,* firms providing financial services can increase customer trust and brand perception through social media analysis. In this field, research should be conducted to measure the impact of financial advice given through social media. The reflections of crisis management practices on social media should also be considered as an important area of investigation.
- *In the health sector*, health organisations can increase patient interaction by actively using social media platforms. Information sharing and visualisation of educational materials can be effective in increasing health awareness in the community. In addition, the effects of social media campaigns on health can be analysed in detail.
- *In the tourism sector*, integration of visualization techniques to enhance consumer experiences through social media is recommended. Analysing customer comments and experiences is important to understand their impact on travel choices.

- *In the technology sector*, firms can improve user experience by incorporating social media data into product development processes. Research on the effectiveness of social media strategies in the promotion of innovative products can be encouraged.
- *In the automotive sector*, social media interactions should be integrated into product development processes by collecting and analysing customer feedback. Studies examining the impact of social media campaigns on sales can help brands optimise their strategies.

These recommendations will contribute to the deepening of research in the field of social media text stream visualisation, digitalisation and innovation and the development of more effective marketing strategies by strengthening cross-industry collaboration.

In conclusion, social media text stream visualization offers great opportunities to businesses in terms of marketing, innovation and digitalisation. By using these tools effectively, businesses can gain competitive advantage, increase customer loyalty and achieve sustainable growth. Therefore, the implementation of social media text stream visualization has become an inevitable necessity in today's business world.

## Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPSTEM Journal belongs to the author.

## Acknowledgements or Notes

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