Review Article

VERITAS

A Review of Usage and Applications of Social Media Analytics

Shadrack Stephen Madila [1]*, Mussa Ally Dida [1], Shubi Kaijage [1]

[1] School of Computational & Communication Science and Engineering (CoCSE) Nelson Mandela African Institution of Science and Technology (NM-AIST), TANZANIA
*Corresponding Author: email@affiliation.com

| ARTICLE INFO	ABSTRACT
	This paper presents the report of a social media analytics (SMA) review. The review conducted to find out the methods and tools used in social media analytics, types of social media platforms which the SMA are performed and the field which SMA has been performed. Social media contains a lot of user uploaded data in different formats like text, images, photos, video etc. These large volumes of data are converted in meaningful information which can be understood using different methods and tools which are called social media analytics. A literature review of articles published between 2010-2020 has been conducted using articles obtained from reputable databases IEEE Xplore, ACM digital, Emerald insight, Springer Link and Science direct. A number of 44 articles have been selected for review from 110 retrieved papers. The paper has been reviewed according to the study objectives. The study found that SMA tools and techniques which have been used are sentiment analysis, youtube analytics, visible intelligence, IBM Watson tool and predictive models. The social media platforms which were mostly used are twitter, facebook, youtube, trip advisor and blogs. SMA has been observed in different fields like agriculture, politics, health, social and business sector. **Keywords:** social media, social media analysis, sentiment analysis

INTRODUCTION

Social media are web-based services which allows users to post through a profile as well as allows connections to other profiles. The increasing use of social media creates web online communities which enable people to be connected, allow communication and collaboration with each other (Das, 2015). Social media has been used as a communication tool in business, politics and other fields. (Stieglitz et al., 2014). There is an increase in the number of people who are using social media, the number of social media users was expected to be 2.77 billion in 2019 (Drus, 2019). These users of social media create a big amount of data structured and unstructured through different social media platforms. As there is a large amount of social media generated data. Organization needs automated tools to extract social media data and perform sentiment analysis to this huge amount of data so that to gain knowledge and insights (He et al., 2017).

Zeng et al. (2010), defined social media analytics as, "social media analytics is concerned with developing and evaluating informatics tools and frameworks to collect, monitor, analyze, summarize, and visualize social media data, usually driven by specific requirements from a target application." Stieglitz et al. (2014), pinpoint that "In a business setting, SMA might be considered a subset of business intelligence (BI) that is concerned with methodologies, processes, architectures, and

technologies that transform raw data from social media into meaningful and useful information for business purposes." Social media analytics can be conducted in different fields of study, Social media analytics can be used in various fields to get insight from social media platforms; it can be used in business (Xiang et al., 2016), agriculture (Saravanan and Perepu, 2019), politics (Stieglitz and Dang-Xuan, 2012), disaster management (Khaleq and Ra, 2018) and other fields. It is conducted to assist in analyzing and understand Social media data which are obtained as structured as well as unstructured big data using different techniques such as web crawling computational of linguistics data, machine learning models and different statistics methods to analyze and get insight such as finding trending topics, finding sentiments opinions or on geographical information. (Xiang et al., 2017). The famous applications of SMA are on business activities, politics, and disaster management, journalism as well as in sports activities.

Scholars have conducted several researches about social media analytics in various fields. This paper targeted to conduct review of various articles which explains social media analytics in various fields. With the intention to determine the methods used, which platform have been used and the area which the social media analytics has been performed or explained.
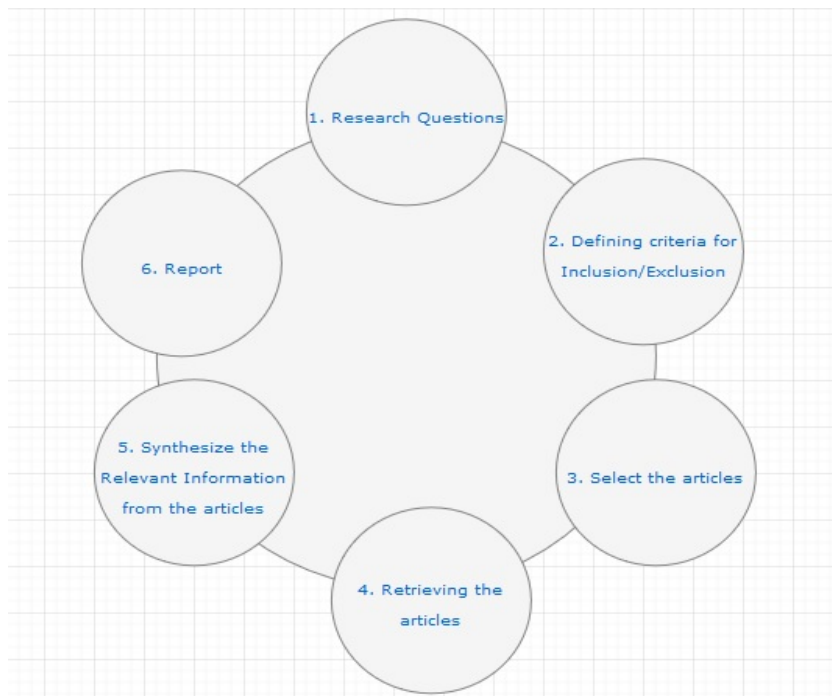
Figure 1. Review stages

Study Methodology

The study conducted the review process based on the six stages of Palmatier et al. (2018) methods. The stages include, identifying the research objectives and defining research questions. Defining criteria of inclusion and exclusion of the articles, sampling the study articles which involve identification of the relevant studies to be selected for the review process, retrieving the relevant articles which have been identified and check if the retrieved article meets the selection criteria, Synthesizing the relevant information from the retrieved articles and lastly reporting the obtained results of the articles reviews have been performed.

Selecting Articles for Review

The study uses 44 papers/articles selected from those which passed the inclusion criteria and meets the study objectives. The study selected articles which were published from 2010-2019. The articles were obtained from four reputable databases IEEE Xplore, ACM digital, Emerald insight, Springer link and Science Direct. The search keyword was "social media", "social media analytics" and "social media insight". 110 Articles have been retrieved and then screened; the screening involves reading the full paper to check if they meet the objectives of the study. After screening the selected articles were distributed as follows, 9 articles selected from IEEE Xplore, 8 articles from Emerald insight 1 from science Direct, 13 from ACM digital library and 12 articles from springer link. The selected articles were analyzed and the found data were extracted and presented below. The articles were selected based on the study objectives which were, to determine the field where SMA has been conducted, to determine the Social media platform(s) which SMA has been performed and the technology, tool and techniques which have been performed to find the insight on social media contents.

Summary of Reviewed Articles

From the reviewed articles, the applications of social media analytics have been seen in different applications these includes industrial sector, sports and games, local governments services, tourism and hospitality services, politics, social issues, disaster management, community development issues, commerce and business applications, fashion industry, agricultural activities, online media, medical and health related services as well as supplier chain services. The summary of the reviewed articles is shown below.

Su and Chen in their study "Social media analytics based product improvement framework" in 2016 obtained in IEEE database. The study explores the uses of twitter data analysis to demonstrate how companies can use social media data to get insight and improve their products. The study uses sentiment analysis techniques to get insight of those twitter comments.

Another study shows the applications of social media analytics in sports was conducted by Vorvoreanu et al. (2013). The study aims to use social media analytics to identify issues and specific topics in real time to enable marketers to adapt and improve sports events campaigns. The study applied sentiments analysis to get insight on the comments and contents in twitter, facebook and blogs social media platforms. Bukhari et al. (2012) explores the usage of SMA in local government services, the study generates social media insight from the public regarding the Indianapolis services like hospitality and accommodation within the city during the super Bowl XLVI sports events. Radian6 and Visible intelligence SMA tools were used to gather data from the social media platforms facebook, twitter and blogs and get the insight about managing these sports events and the information about hospitality and accommodation services.

Chang et al. (2017), and Xiang et al. (2016) shows the applications and usage of social media analytics in the tourism

and hospitality sector. Chang et al. (2017) proposed the framework on conducting the sentiment analysis using the hotel reviews from the trip advisor. The social media analytics technique used was sentiment analysis and visual analytics from the comments posted in trip advisor. Xiang et al. (2016) performed social media analytics to find market intelligence for the hotel. Sentiment analysis technique was applied to find insight of the market intelligence from the twitter comments. Park et al. (2016) applied the social media analytics to examine thoughts and emotions of Asian restaurant customers by conducting sentiment analysis on twitter comments. He et al. (2017) introduced the study which analyzing the customers review to various hotel which was used as a study case by doing sentiment analysis in trip advisor. Navarro and Rodriguez (2019) show the application of SMA in tourism sector the study collected data from facebook and Instagram which provide insight about budget accommodation in tourism regions. The data were analyzed by inbuilt tools for analysis from facebook and Instagram. The study explains well how social media data can help tourist to find budgeted accommodation. Von Hoffen et al. (2019) uses sentiment analysis to review the tweets about the services provided by online marketplace for accommodation known as Airbnb. The study introduces the software as their tool kit to perform the sentiment analysis on the reviews and tweets. The software provides negative and positive sentiments which provide the insight on how customers perceived the services offered by Airbnb.

Some studies also show how social media analytics can be applied in politics, Stieglitz (2012) proposed the framework for analyzing politics topics in twitter social media platform. The SMA techniques which were applied are trend analysis and sentiments analysis to find the meanings of those twitter comments. Udanor et al. (2016) uses social media data from tweets regarding Nigeria election of 2015 to gain insight on how social media data can make impact on the political administration in developing countries. The results demonstrate how social media analytics has influence and major contributions on predicting different trends which influence economy of developing countries. However, the study uses SNA alone which didn't strong conclude on the predictions of the outcomes of political events. Another current study Santander et al. (2020) uses social media data from twitter to predict the Chile president's election of 2017. The study uses different models to predict the election including decision tree, random forest, Adaboost and linear support vector machine. The results of the models were compared to the original results; the predicted results of the models were almost the same to the original results.

Social media analytics also can be used to get insight of the community and social issues from the social media comments and posts. Dias et al. (2018) uses the social media analytics techniques to classify racism words from Sinhala language for the facebook comments and posts. The study uses text analytics models and machine learning techniques to find racism words. Jang and Myaeng (2016) conducted a study by collecting tweets from different regions and clustering the regions based on their topics of interest from the tweets collected. The study uses graph representation and clustering techniques was Markov chains. Another social issue application of SMA was road safety as it was studied by Jain et

al. (2015) they developed the system which provides real time updates of traffic trends using social media analytics performed in facebook and twitter. Machine learning models and trend analysis tools were used. Weiler (2013) developed the method for identifying events using social media data. The event detection tool was made by analyzing social media data from twitter and Flickr. Another recent study in social issues was conducted by Udanor and Anyanwu (2019) to identify the hate speech and the who use hate speech in twitter social media platform the study uses sentiment analysis to find the opinion and feelings.

Shang et al. (2018) gives the application of SMA in community development activities, the study analyses the activities and describes the structure of local communities using data collected from twitter by applying sentiment analysis and network analysis.

Social media analytics applications have been appreciated in other areas like disaster management, climate change, supply chain, online media and agriculture. Dong et al. (2013) introduced the application of SMA in disaster management. The twitter comments sentiment analysis was performed to give evacuation information from the occurrence of hurricane sandy.

Another disaster management study was conducted by Xu et al. (2019) the study defines the public opinions on twitter comments to identify the stages of the disaster, the case of Hurricane Irma in USA occurred in the year 2017 the techniques used was sentiment analysis and topic modeling. Other study in natural disaster was performed by Sachdeva and Mc Caffrey (2018), they use the comments from social media especially tweeter to predict the occurrence of air pollution in the events of wildfires. The predictive tools and topic modeling techniques were used on the prediction. The study demonstrates how this technique can be used in wildfire events with good performance; however, the study didn't map the area with air pollution during wildfire events geographically. Ghosh et al. (2017) introduces the study which used to classify tweets during disaster based on their insight they contain. The study performs clustering algorithm to create different clusters based on different classes. The algorithm used includes Adaboost, decision tree, gradient boosting, Random forest, and SVM. The study compares the results of different methods used, SVM perform better than other methods.

The study of SMA application in climate change was introduced by Dahal et al. (2019) the study aims to analyse the climate changes on twitter comments using sentiment analysis to perform topic modeling. Singh et al. (2018) presented the study which uses twitter text analysis using a support vector machine to give the insight from consumer's tweets on the supply chain of meat and beef. The study gathers tweets from consumers and performs sentiment analysis to identify the issues regarding customer satisfaction.

Online media SMA has been performed by Jansen et al. (2018) by using online Youtube data to group customers into different segments (age, geographical locations) Youtube analytics platform has been used to create customer segments from online news media. SMA application in media industry also includes the study conducted by Hu et al. (2011), in this

study the authors analyse the response of the twitter users on the public events. The analytical method has been applied to the comments from the public speech to provide deeper understanding of the individual feedback regarding public events on twitter. The study demonstrates the best application of clustering algorithms on topic modeling and the usage of semantic analytics on the tweets. Araya et al. (2017) studied about using tweets collected to visualize news and events within a certain geographical area. The study uses a visualization tool named Galean to explore news events and their locations. The Galean tool was well represented and performs well in mining historical events based on locations.

Social media analytics applications have potential in several health services, according to literature there are some studies explaining this well, Kannan et al. (2018) introduced the study using topic discovery and contents analysis in twitter platform to determine the information about Dengue fever shared in twitter. Culotta (2010) introduces the study which uses predictive analysis to predict the rate of influenza in a population using twitter messages. The study conducted by Martinez et al. (2019) uses sentiment analysis techniques to get insight on social media e-cigarettes belief and risk perceptions using twitter comments. Another study conducted by Al Kubaizi et al. (2015) analyse the comments on people's experience about the use of herbs which was advised by the prophet Mohammed (PBUH) the study uses sentiment analysis, natural language processing and other tool like IBM Watson natural understand language to the twitter comments.

In the agriculture sector SMA application has been revealed by Saravan and Perepu (2019). In this study the best plant diseases solution was proposed among the posted one on the social media platforms. The best diseases solution was proposed using deep learning, natural language processing and predictive models using twitter and facebook comments.

Several studies pinpoint the usage of social media analytics in business activities, such studies include Indrawati and Alamsyah (2017) creates customer segments based on customer conversation on twitter. Social network analysis was used to form groups based on customer conservation. The study uses opinion mining, social network analysis and quantitative analysis techniques. Barrelet et al. (2016) applied the natural language processing and sentiment analysis to investigate the indicators in the stock market using the twitter comments.

Another study in SMA application in business was conducted by Babu et al. (2017) the study showed the usage of sentiment analysis on twitter comments to extract opinion mining on the products reviews and produce different clusters based on the sentiment analysis. Sijtsma and Chen (2016) presented the use of Tweetriz social media analytics tool to help businesses to acquire valuable information from the twitter comments. The study uses sentiment analysis technique and Tweetriz social media analytics tool. Chumwatana and Wongkolkitsilp (2019) introduces the study which uses social media analytics techniques sentiment analysis and classification tools like support vector machine and Naïve Bayes to social media platform twitter, facebook and Youtube to classify customers based on social media comments. Tian et al. (2019) studied the application of twitter data to predict the services quality in the airline industry. The

study conducted the sentiment analysis on the collected tweets. On business customer loyalty He et al. (2019) develop the customer loyalty program based on social media data. Sentiment analysis was performed on tweets sent by customers. The study conducted by Cvijikj and Michaheliles (2011) uses sentiment analysis to understand how products of a certain brand is perceived by the users using the contents shared in facebook page of the brand. The study explains well how the sentiment analysis performed gives the insight from the posts given by the customers. However, the study uses small dataset as the use of large datasets provides clear insight. Other study in business was conducted by Wu et al. (2018) in this study the framework to find insight from twitter use on the new product development particular iPhone was developed and used. The study uses text mining and sentiment analysis. It was clearly indicated that SMA can help industries and researchers on getting insight on new product development from social media data. Rahmani et al. (2013) conducted the study to perform network analysis to the tweets. The study identifies the similarities of different posts in tweets with business topics. Through similarities in their post different communities were created. The study presented two analysis methods for summarizing high volumes of data on social media with specific subjects. The methods performed well on dealing with those high volumes of social media data.

RESULTS

SMA Methods and Tools Used

The study reviewed different articles which met the study research questions criteria and obtained the results. The results from the reviewed papers and articles show different SMA methods and tools. Most of the reviewed articles demonstrate the usage of sentiment analysis in different areas 54.54% of the articles reviewed uses sentiment analysis Su and Chen (2016), Vorvoreanu et al. (2013), Chang et al. (2017), Xiang et al. (2016), Park et al. (2016), He et al. (2017), Stieglitz (2012), Udanor and Anyanwu (2019), Shang et al. (2018), Dong et al. (2013,), Xu et al. (2019), Dahal et al. (2019), Kannan et al. (2018), Martinez et al.(2019), Alamsyah (2017), Barrelet et al. (2016), Chen (2016), Chumwatana and Wongkolkitsilp (2019), Tian et al. (2019), He et al. (2019), Cvijikij and Michaheliles (2011), Hu et al. (2011), Wu et al. (2018), Santander et al. (2020) and Von Hoffen et al. (2019).

Other SMA methods obtained are trend analysis; Jain et al. (2015) comprise 2.27%, spatial analysis takes 2.27%; Araya et al. (2017), comparative analysis contribute 2.27% Quijada et al. (2020), predictive analysis 9.09% Culotta (2010), and Saravan and Perepu (2019), Sachdeva and Mc Caffrey (2018) and Santander et al. (2020), topics discovery 9.09% Xu et al. (2019), Kannan et al. (2018), Hu et al. (2011), and Sachdeva and Mc Caffrey (2018), clustering technique 6.81% Jansen et al. (2018), Myaeng et al. (2016), and Ghosh et al. (2017), natural language processing 6.81% Barrelet et al. (2016), Al Kubaizi et al. (2015), and Saravan and Perepu (2019), text analysis 4.54% Dias et al. (2018), and Singh et al. (2018), event detection tool 2.27% Weiler (2013) and social network analysis 6.81% Alamsyah (2017), Udanor et al. (2016), and Rahmani et al. (2013).
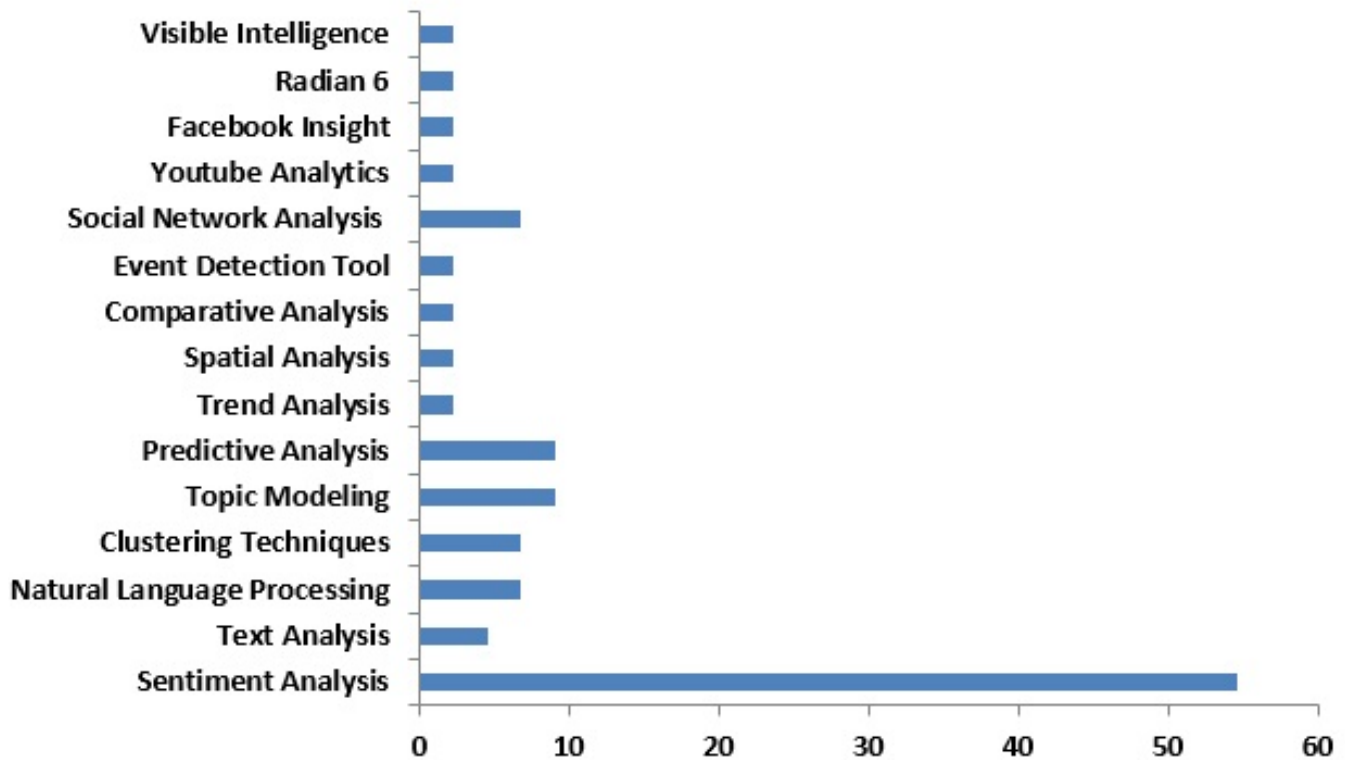
Figure 2. Social media analytics methods, Technique and Tools used

Different tools for performing SMA also have been obtained in the reviewed studies, the tools like Youtube analytics 2.27% Jansen et al. (2018), Facebook insight 2.27% Navarro and Rodriguez (2019), Radian6 2.27 % Bukhari et al. (2012), and visible Intelligence 2.27% % Bukhari et al. (2012). Also, different SMA sentiment analytics techniques have been found these include machine learning techniques, Support vector machine (SVM), Natural understanding language, Natural Language processing and text analysis models.

Sentiment analysis according to Beigi, 2016 is defined as "multidisciplinary field of study that deals with analyzing people's sentiments, attitudes, emotions and opinions about different entities such as products, services, individuals, companies, organizations, events and topics and includes multiple fields such as natural language processing (NLP), computational linguistics, information retrieval, machine learn-ing and artificial intelligence."

Predictive models are powerful tools for numerical forecast and perform assessment of uncertainty using quantitative statements which are used to provide better decision in organization (Lassen, 2015).

Types of SM Platforms Used for SMA

The study found several social media platforms in the reviewed articles, these platforms including twitter, Facebook, Youtube, Tripadvisor and blogs. The most usable platform for social media analytics was twitter. 77.27% of the reviewed articles use twitter as the social media platform and the study found that most of the analytics performed in twitter platform was sentiment analysis; Su and Chen (2016), Vorvoreanu et al. (2013), Bukhari et al. (2012), Xiang et al. (2016), Park et al.

(2016), Stieglitz (2012), Myaeng (2016), Weiler (2013), Udanor and Anyanwu (2019), Shang et al. (2018), Dong et al. (2019), Xu et al. (2019), Dahal et al. (2019), Singh et al. (2018), Kannan et al. (2018), Culotta (2010), Martinez et al. (2019), Al Kubaizi et al. (2015), Saravan and Perepu (2019), Alamsyah (2017), Barrelet et al. (2016), Chen (2016), Chumwatana and Wongkolkitsilp (2019), Tian et al. (2019), He et al. (2019), Hu et al. (2011), Sachdeva and Mc Caffrey (2018), Udanor et al. (2016), Wu et al. (2018), Santander et al. (2020), Ghosh et al. (2017), Araya et al. (2017), Rahmani et al. (2013), and Von Hoffen et al. (2019). 18.18% of the reviewed articles used Facebook; Vorvoreanu et al. (2013), Bukhari et al. (2012), Dias et al. (2018), Jain et al. (2015), Saravan and Perepu (2019), Chumwatana and Wongkolkitsilp (2019), Cvijikj and Michaheliles (2011), and Navarro and Rodriguez (2019). Apart from twitter and facebook other platforms used were Youtube (Jansen et al., 2018), and Chumwatana and Wongkolkitsilp (2019) comprise 4.54%, 4.54% from Instagram Navarro and Rodriguez (2019) and Quijada et al. (2020), Flickr 2.27% (Weiler et al., 2013) and Tripadvisor 4.54% (Chang et al., 2017).

Twitter is a micro blogging site which allows users to post updates as a review or messages to their followers. The uniqueness of twitter compared to other social media platforms is limitation of the number of characters in a single post also having the hash tags, URL, emotions and mentions in the content this provide easiest for social media analytics (Kursuncu et al., 2018).
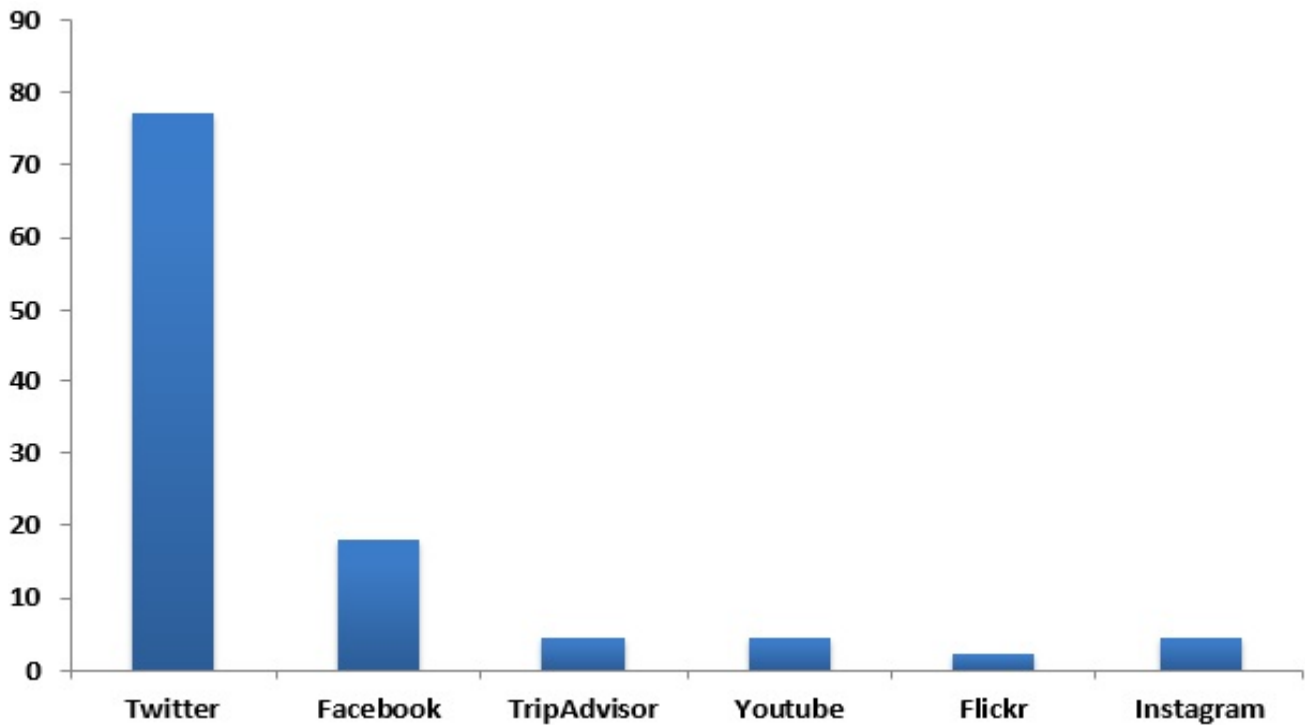
Figure 3. Distribution of articles based on Social Media Platforms used

THE AREAS WHICH SMA HAS BEEN DONE

The study reveals that SMA has been used in various fields (areas) to provide insights from the social media data which will help in making decisions. The applications of social media analytics have been seen in areas like health, local government, tourism, supply chain, industry, social issues, disaster management, business, media, sports, politics, agriculture, stock market, community development and road safety.

SMA in health can be applied to find insight on different matter several studies have been reviewed in health sector which comprise about 9.09%; Culotta (2010), Martinez et al. (2019), Al Kubaizi et al. (2015), and Saravan and Perepu (2019). The study also finds the usage of SMA in local government issues, Bukhari et al. (2012) equal to 2.27% shows the generations of insight from social media in big events like super Bowl XLVI.

Social media analytics also is applied in tourism and hospitality this takes 13.63% of the reviewed articles; Chang et al. (2017), Xiang et al. (2016), Park et al. (2016), He et al. (2017), Navarro and Rodriguez (2019), and Von Hoffen et al. (2019).

SMA also has been applied in social issues like racism and social topics discover equal 11.36% Weiler (2013), Jain et al. (2015), Myaeng et al. (2016), Dias et al. (2018), and Udanor and Anyanwu (2019).

2.27% of the articles, Quijada et al. (2020) exhibit the uses of Instagram data in fashion industry to find the interaction between the fashion retailers and their customers, the comparative analysis was conducted using bivariate and multivariate modeling on interactions of the brands and their customers. The results show that there is interaction between retailer and their customers but still the interaction is low.

9.09% of the reviewed articles shows the use of SMA in disaster management; Dong et al. (2013), Xu et al. (2019), Sachdeva and Mc Caffrey (2018), and Ghosh et al. (2017). The studies show how SMA can be used to analyze social media data to get insight of different matters during disaster.

Business also is among the fields which apply SMA 20.45% of the reviewed articles; Alamsyah (2017), Barrelet et al. (2016), Chen (2016), Chumwatana and Wongkolkitsilp (2019), Tian et al. (2019), He et al. (2019), Cvijikj and Michaheliles (2011), Wu et al. (2018), and Rahmani et al. (2013) studies demonstrate the usage of social media analytics tool to generate valuable information from the social media data.

SMA application in online media comprise 6.81%; Jansen et al. (2018), Hu et al. (2011), Araya et al. (2017). In politics 6.81% articles has been reviewed; Stieglitz (2012), Udanor et al. (2016), and Santander et al. (2020). Other applications of social media data are on agriculture, Saravanan and Perepu (2019) 2.27% propose the best plant disease solution from the social media data. Barrelet et al. (2016) demonstrates the use of social media analytics in the stock market. Vorvoreanu et al. (2013) explain the SMA application in Sports equal to 2.27%. Other application of SMA in industry Su and Chen (2016); 2.27%, Community development Shang et al. (2018); 2.27%, Dahal et al. (2019); 2.27%, climate change and Singh et al. (2018) in supply chain.
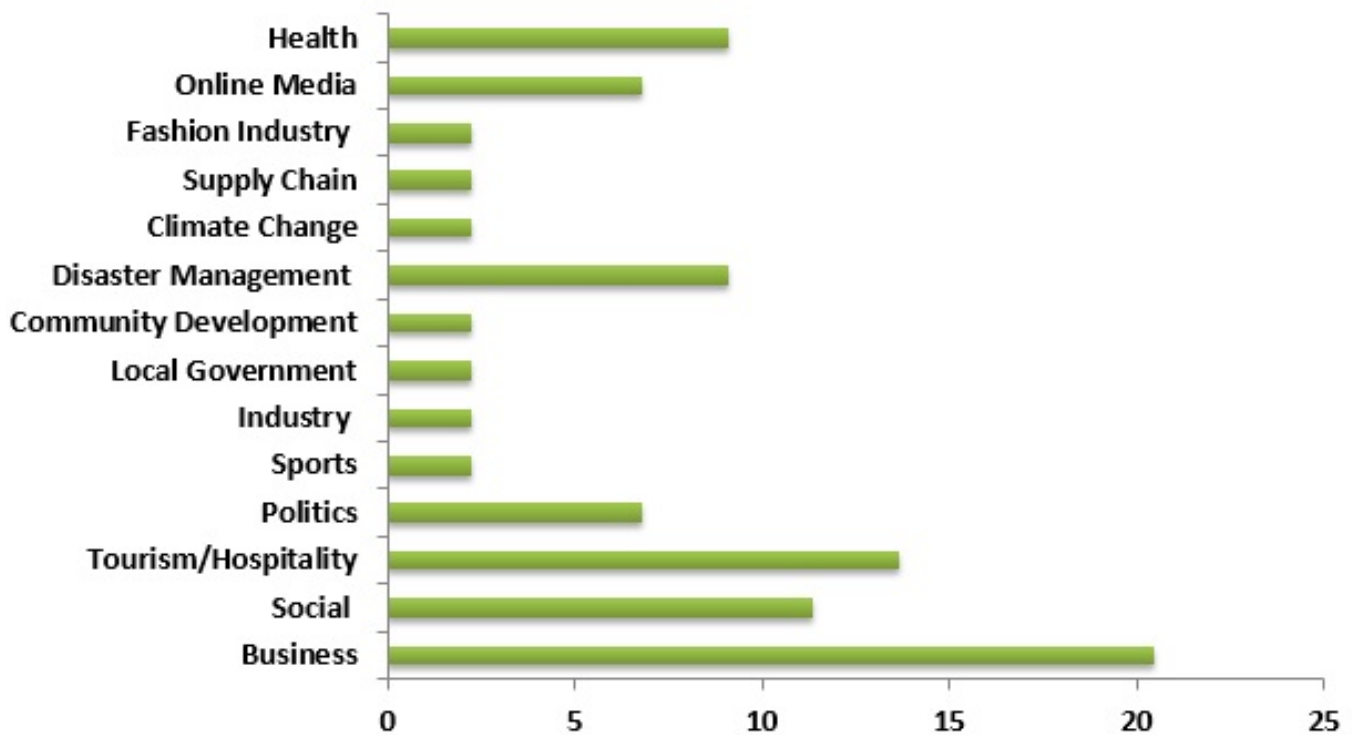
Figure 4. Distribution of paper based on Area/Field

CONCLUSION

The study aims to give information about social media analytics usage from the reviewed articles. Based on the surveyed papers and the objectives of the study the paper contributes to three main areas. First the study identifies different methods and tools used in social media analytics. Different analytics has been demonstrated like sentiment analysis, trend analysis, visual analytics, contents analysis and social network analysis. Reviewed articles show that Sentiment analysis has been more used than other types of analytics. Based on different kinds of analytics also there are different tools, reviewed articles show different tools like Youtube analytics, facebook insight, radian 6, Tweetriz, visible intelligence and IBM Watson. Choosing the tools and analytics method depends on the type of analytics you want to perform and the available data from the social media platform.

The study also contributes to providing types of social media platforms which are used for SMA. Most of the analytics were performed on Twitter. Other platforms were facebook, Youtube, Instagram, Tripadvisor and Flickr. The reviewed analysis shows the usage of SMA from different fields like health, local government, tourism, supply chain, industry, social issues, disaster management, business, media, fashion industry, sports, politics, agriculture, stock market, community development and road safety. SMA has been performed in the business area to analyze data in different business processes like marketing, product review, providing customer segments and gathering other intelligence information. This shows that SMA provides more importance to business organizations and other fields to understand the data from the social media platforms. In general, the applications of SMA in those reviewed articles demonstrate the advantages and necessity of these social media data in giving insight in several aspects. Due to its advantages this SMA has to be performed in a good and manageable way so that the results can be of high advantages. For future uses further recommendations are for studies to be conducted which will give the frameworks for implementation and management of SMA process in different applications eg, business, politics, health etc.

REFERENCES

Al Kubaizi, R., Al-Otaibi, S., Al Washigry, B., Al Suhaim, E., Al Sughayer, J. and Al Jumaiah, R. (2018). Mining Expertise Using Social Media Analytics. *2018 1st International Conference on Computer Applications & Information Security (ICCAIS), Riyadh.* https://doi.org/10.1109/CAIS.2018. 8442014

Babu, A. G., Kumari, S. S. and Kamakshaiah, K. (2017). An Experimental Analysis of Clustering Sentiments for Opinion Mining. *Proceedings of the 2017 International Conference on Machine Learning and Soft Computing - ICMLSC '17.* https://doi.org/10.1145/3036290.3036318

Barrelet, C. J., Kuzulugil, S. S. and Bener, A. B. (2016). The Twitter Bullishness Index. *Proceedings of the 20th International Database Engineering & Applications Symposium on - IDEAS '16.* https://doi.org/10.1145/2938503.2938508

Beigi, G., Hu, X., Maciejewski, R. and Liu, H. (2016). An Overview of Sentiment Analysis in Social Media and Its Applications in Disaster Relief. *Studies in Computational Intelligence*, 313-340. https://doi.org/10.1007/978-3-319-30319-2_13

Bukhari, I., Wojtalewicz, C., Vorvoreanu M. and Dietz, J. E. (2012). Social media use for large event management: The application of social media analytic tools for the Super Bowl XLVI. 2012 IEEE Conference on Technologies for Homeland Security (HST), Waltham, MA, pp. 24-29. https://doi.org/10.1109/THS.2012.6459821

Buus Lassen, N., la Cour, L. and Vatrapu, R. (2017). Predictive Analytics with Social Media Data. In L. Sloan & A. Quan-Haase (Eds.), *The SAGE Handbook of Social Media Research Methods* (pp. 328-341). London: SAGE Publications. https://doi.org/10.4135/9781473983847.n20

Chang, Y.-C., Ku, C.-H. and Chen, C.-H. (2017). Social media analytics: Extracting and visualizing Hilton hotel ratings and reviews from TripAdvisor. *International Journal of Information Management, 48,* 263-279. https://doi.org/10.1016/j.ijinfomgt.2017.11.001

Chumwatana, T. and Wongkolkitsilp, T. (2019). Using Classification Technique for Customer Relationship Management based on Thai Social Media Data. In *Proceedings of the 2019 11th International Conference on Computer and Automation Engineering (ICCAE 2019). Association for Computing Machinery*, New York, NY, USA, pp. 7-11. https://doi.org/10.1145/3313991.3314010

Culotta, A. (2010). Towards detecting influenza epidemics by analyzing Twitter messages. *Proceedings of the First Workshop on Social Media Analytics - SOMA '10.* https://doi.org/10.1145/1964858.1964874

Cvijikj, I. P. and Michahelles, F. (2011). Understanding social media marketing. *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments - MindTrek '11.* https://doi.org/10.1145/2181037.2181066

Dahal, B., Kumar, S. A. P. and Li, Z. (2019). Topic modeling and sentiment analysis of global climate change tweets. *Social Network Analysis and Mining, 9,* 24. https://doi.org/10.1007/s13278-019-0568-8

Das, M. and Das, G. (2015). Structured analytics in social media. *Proceedings of the VLDB Endowment, 8*(12), 2046-2047. https://doi.org/10.14778/2824032.2824135

del Rocío Bonilla Quijada, M., Arriaga, J. L. D. O. and Domingo, D. A. (2020). Insights into user engagement on social media. Findings from two fashion retailers. *Electron Markets*. https://doi.org/10.1007/s12525-020-00429-0

Dias, D. S., Welikala M. D. and Dias, N. G. J. (2018). Identifying Racist Social Media Comments in Sinhala Language Using Text Analytics Models with Machine Learning. *2018 18th International Conference on Advances in ICT for Emerging Regions (ICTer), Colombo, Sri Lanka.* https://doi.org/10.1109/ICTER.2018.8615492

Domínguez-Navarro, S. and González-Rodríguez, M. (2020). Social Media managerial implications for budget accommodation venues: use of Social Media platforms more effectively and efficiently. *Quality & Quantity, 54,* 1671-1689. https://doi.org/10.1007/s11135-019-00932-3

Dong, H., Halem M. and Zhou, S. (2013).Social Media Data Analytics Applied to Hurricane Sandy. 2013 International Conference on Social Computing, Alexandria, VA. https://doi.org/10.1109/SocialCom.2013.152

Drus, D. and Khalid, H. (2019). Sentiment analysis in social media and its application: Systematic literature review. *Procedia Computer Science, 161,* 707-714, https://doi.org/10.1016/j.procs.2019.11.174

Ghosh, S., Srijith, P. K. and Desarkar, M. S. (2017). Using social media for classifying actionable insights in disaster scenario. *International Journal of Advances in Engineering Sciences and Applied Mathematics, 9*(4), 224-237. https://doi.org/10.1007/s12572-017-0197-2

Ghriga, M., Shang, R. and Shurriah, R. (2016). Discovering community development information from social media: a social media analytics project using IBM BlueMix: faculty poster abstract. Journal of Computing Sciences in Colleges, 31(6), 52-54.

He, W., Tian, X. and Wang, F.-K. (2019). Innovating the customer loyalty program with social media: A case study of best practices using analytics tools. *Journal of Enterprise Information Management, 32*(5), 807-823. https://doi.org/10.1108/JEIM-10-2018-0224

He, W., Tian, X., Tao, R., Zhang, W., Yan, G. and Akula, V. (2017). Application of social media analytics: a case of analyzing online hotel reviews. Online Information Review, 41(7), 921-935. https://doi.org/10.1108/OIR-07-2016-0201

Hong Y. and Sinnott R. O. (2018) A Social Media Platform for Infectious Disease Analytics. In: O. Gervasi et al. (Eds.), *Computational Science and Its Applications – ICCSA 2018. ICCSA 2018. Lecture Notes in Computer Science* (vol. 10960). Springer, Cham. https://doi.org/10.1007/978-3-319-95162-1_36

Indrawati and Alamsyah, A. (2017). Social network data analytics for market segmentation in Indonesian telecommunications industry. 2017 5th International Conference on Information and Communication Technology (ICoIC7), Malacca City, pp. 1-5. https://doi.org/10.1109/ICoICT.2017.8074677

Jain, A. K., Kumar, A., Garg, J., Patange, U. and Jalan, P. (2015). TraffTrend. *Proceedings of the 2nd IKDD Conference on Data Sciences - CODS-IKDD '15.* https://doi.org/10.1145/2778865.2778875

Jansen, B. J., Jung, S., Salminen, J., An J. and Kwa, H. (2017). Leveraging Social Analytics Data for Identifying Customer Segments for Online News Media. *2017 IEEE/ACS 14th International Conference on Computer Systems and Applications (AICCSA), Hammamet*, pp. 463-468. https://doi.org/10.1109/AICCSA.2017.64

Kannan, R., Govindasamy, M. A., Soon, L. and Ramakrishnan, K. (2018). Social Media Analytics for Dengue Monitoring in Malaysia. 2018 8th IEEE International Conference on Control System, Computing and Engineering (ICCSCE), Penang, Malaysia. https://doi.org/10.1109/ICCSCE.2018.8685028

Khaleq, A. A. and Ra, I. (2018). Twitter Analytics for Disaster Relevance and Disaster Phase Discovery. Advances in Intelligent Systems and Computing, pp. 401-417. https://doi.org/10.1007/978-3-030-02686-8_31

Kursuncu, U., Gaur, M., Lokala, U., Thirunarayan, K., Sheth, A. and Arpinar, I. B. (2018). Predictive Analysis on Twitter: Techniques and Applications. *Emerging Research Challenges and Opportunities in Computational Social Network Analysis and Mining*, pp. 67-104. https://doi.org/10.1007/978-3-319-94105-9_4

Martinez, L. S., Tsou, M.-H. and Spitzberg, B. H. (2019). A case study in belief surveillance, sentiment analysis, and identification of informational targets for e-cigarettes interventions. *Proceedings of the 10th International Conference on Social Media and Society - SMSociety '19*. https://doi.org/10.1145/3328529.3328540

Palmatier, R. W., Houston, M. B. and Hulland, J. (2018). Review articles: purpose, process, and structure. *Journal of the Academy of Marketing Science, 46*, 1-5. https://doi.org/10.1007/s11747-017-0563-4

Park, S. B., Jang, J. and Ok, C. M. (2016). Analyzing Twitter to explore perceptions of Asian restaurants. *Journal of Hospitality and Tourism Technology, 7*(4), 405-422. https://doi.org/10.1108/JHTT-08-2016-0042

Peña-Araya, V., Quezada, M., Poblete, B. and Parra, D. (2017). Gaining historical and international relations insights from social media: spatio-temporal real-world news analysis using Twitter. *EPJ Data Science, 6*(1), 25. https://doi.org/10.1140/epjds/s13688-017-0122-8

Rahmani, A., Chen, A., Sarhan, A., Jida, J., Rifaie, M. and Alhajj, R. (2014). Social media analysis and summarization for opinion mining: a business case study. *Social Network Analysis and Mining, 4*(1), 171. https://doi.org/10.1007/s13278-014-0171-y

Sachdeva, S. and McCaffrey, S. (2018). Using Social Media to Predict Air Pollution during California Wildfires. *Proceedings of the 9th International Conference on Social Media and Society - SMSociety '18*. https://doi.org/10.1145/3217804.3217946

Santander, P., Alfaro, R., Allende-Cid, H., Elortegui, C. and González Arias, C. (2020). Analyzing social media, analyzing the social? A methodological discussion about the demoscopic and predictive potential of social media. *Quality & Quantity, 54*, 903-923. https://doi.org/10.1007/s11135-020-00965-z

Saravanan, M. and Perepu, S. K. (2019). Realizing Social-Media-Based Analytics for Smart Agriculture. *Review of Socionetwork Strategies, 13*, 33-53. https://doi.org/10.1007/s12626-019-00035-3

Sijtsma, B., Qvarfordt, P. and Chen, F. (2016). Tweetviz. Visualizing tweets for business intelligence. *Proceedings of the 39th International ACM SIGIR Conference on Research and Development in Information Retrieval - SIGIR '16*. https://doi.org/10.1145/2911451.2911470

Singh, A., Shukla, N. and Mishra, N. (2018). Social media data analytics to improve supply chain management in food industries. *Transportation Research Part E: Logistics and Transportation Review, 114*, 398-415. https://doi.org/10.1016/j.tre.2017.05.008

Stieglitz, S. and Dang-Xuan, L. (2012). Social media and political communication: a social media analytics framework. *Social Network Analysis and Mining, 3*(4), 1277-1291. https://doi.org/10.1007/s13278-012-0079-3

Stieglitz, S., Dang-Xuan, L., Bruns, A. and Neuberger, C. (2014). Social Media Analytics. Business & Information Systems Engineering, 6(2), 89-96. https://doi.org/10.1007/s12599-014-0315-7

Su, C. and Chen, Y. (2016). Social Media Analytics Based Product Improvement Framework. *2016 International Symposium on Computer, Consumer and Control (IS3C), Xi'an*, pp. 393-396. https://doi.org/10.1109/IS3C.2016.107

Tian, X., He, W., Tang, C., Li, L., Xu, H. and Selover, D. (2019). A new approach of social media analytics to predict service quality: evidence from the airline industry. *Journal of Enterprise Information Management, 33*(1), 51-70. https://doi.org/10.1108/JEIM-03-2019-0086

Udanor, C. and Anyanwu, C. C. (2019). Combating the challenges of social media hate speech in a polarized society: A Twitter ego lexalytics approach. *Data Technologies and Applications, 53*(4), 501-527. https://doi.org/10.1108/DTA-01-2019-0007

Udanor, C., Aneke, S. and Ogbuokiri, B.O. (2016). Determining social media impact on the politics of developing countries using social network analytics. *Program: electronic library and information systems, 50*(4), 481-507. https://doi.org/10.1108/PROG-02-2016-0011

Von Hoffen, M., Hagge, M., Betzing, J. H. and Chasin, F. (2017). Leveraging social media to gain insights into service delivery: a study on Airbnb. *Information Systems and e-Business Management, 16*(2), 247-269. https://doi.org/10.1007/s10257-017-0358-7

Vorvoreanu, M., Boisvenue, G. A., Wojtalewicz, C. J. and Dietz, E. J. (2013). Social media marketing analytics: A case study of the public's perception of Indianapolis as Super Bowl XLVI host city. *Journal of Direct, Data and Digital Marketing Practice, 14*(4), 321-328. https://doi.org/10.1057/dddmp.2013.18

Weiler, A., Scholl, M. H., Wanner, F. and Rohrdantz, C. (2013). Event identification for local areas using social media streaming data. *Proceedings of the ACM SIGMOD Workshop on Databases and Social Networks - DBSocial '13*. https://doi.org/10.1145/2484702.2484703

Wu He, Xin Tian, Ran Tao, Weidong Zhang, Gongjun Yan, Vasudeva Akula, (2017). Application of social media analytics: a case of analyzing online hotel reviews. *Online Information Review, 41*(7), 921-935. https://doi.org/10.1108/OIR-07-2016-0201

Wu, G. J., Xu, Z., Tajdini, S., Zhang, J. and Song, L. (2019). Unlocking value through an extended social media analytics framework: Insights for new product adoption. *Qualitative Market Research, 22*(2), 161-179. https://doi.org/10.1108/QMR-01-2017-0044

Xiang, Z., Du, Q., Ma, Y. and Fan, W. (2017). A comparative analysis of major online review platforms: implications for social media analytics in hospitality and tourism. *Tourism Management, 58*, 51-65. https://doi.org/10.1016/j.tourman.2016.10.001

Xiang, Z., Schwartz, Z. and Uysal, M. (2016). Market Intelligence: Social Media Analytics and Hotel Online Reviews. *Tourism on the Verge*, 281-295. https://doi.org/10.1007/978-3-319-44263-1_16

Xu, Z., Lachlan, K., Ellis, L. and Rainear, A. M. (2019). Understanding public opinion in different disaster stages: a case study of Hurricane Irma. Internet Research. 30(2), 695-709. https://doi.org/10.1108/INTR-12-2018-0517

Yuheng Hu, Ajita John, and Doree Duncan Seligmann. 2011. Event analytics via social media. In *Proceedings of the 2011 ACM workshop on Social and behavioural networked media access (SBNMA '11). Association for Computing Machinery*, New York, NY, USA, 39-44. https://doi.org/10.1145/2072627.2072638

Zeng, D., Chen, H., Lusch, R. and Li, S.-H. (2010). Social Media Analytics and Intelligence. *Intelligent Systems, 26*(6), 13-16. https://doi.org/10.1109/MIS.2010.151