EXPLORING SENTIMENT ANALYSIS RESEARCH: A SOCIAL MEDIA DATA PERSPECTIVE

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ABSTRACT

Sentiment analysis has been rapidly employed for business decision support. New data mining researchers are yet to have an adequate understanding of the various applications of sentiment analysis while utilising social media data. As a result, it is critical to define the data mining and text analytics research trend holistically using existing literature. The study explores sentiment analysis research for its application in transforming social media data and identifies relevant research aspects through a comprehensive bibliometric review of 523 research articles published in the Scopus database (between 2018 and 2022) to discern the content and thematic analysis. Findings suggested that key purposes of the sentiment analysis are mainly related to innovation, transparency, and efficiency. Our review also highlights the distinctiveness of sentiment analysis for synthesising social media information to investigate various features, including the knowledge-domain map that detects author collaboration networks in the past.

KEYWORDS

Social Media, Sentiment Analysis, Bibliometric Analysis, Systematic literature review

1. INTRODUCTION

Sentiment analysis (SA) is a type of computational qualitative analysis that has proliferated over the past decades for various business applications. The application is to learn how people feel about things like users, groups, organisations, problems, and themes (Kumar et al., 2021; Mehraliyev et al., 2022; Mejova et al., 2009). Researchers use sentiment analysis to systematically categorise and extract customers' feelings about products from their discussions or posts on social media in order to study consumer emotions in order to discover new insights into their point of view. Questions have been raised about the accuracy and applicability of sentiment analysis, despite the potential of the techniques for interpreting massive amounts of data gathered in a real-world business setting (Mehraliyev et al., 2022; Prager, 2006; Ravi & Ravi, 2015).

A systematic literature review is a well-accepted research method for synthesising scientific evidence to answer research questions or explore research issues in a transparent and rigors manner, including all available evidence from the topic areas for assessing its rationale and quality (Gray, 2019).The primary goal of the traditional review approach is to reduce the risk for bias in studies and to increase transparency at every stage of the review process by relying on explicit and systematic methods to operate appropriate selection and inclusion of studies, by appraising quality of the included studies, and to objectively summarise the outcomes from them (Liberati et al., 2009; Petticrew, 2001). There are many types of SLR studies. For example, theory-based, content-analysis based, theme-based, framework-based, theory development,

bibliometric, theory-context-characteristics-methodology (TCCM), and meta-analysis reviews (Aromataris & Pearson, 2014). In this study, we used a bibliometric review, which allows researchers to collect hundreds to thousands of relevant papers on a research topic for analysis and the generation of new results. Visualization tools like CiteSpace, Perish, and VOSviewer are used to identify trends in literature and journal performance, collaboration patterns, and research elements, as well as the intellectual structure of a certain subject in the literature (Donthu et al., 2021a).

Scopus, an online research database, comprises nearly all key research journals; therefore, relevant publications exist. It also has built-in analysis features to provide representative representations for new generalised understanding. For further analysis, Scopus search results can be exported using various tools, such as R-tool-biblioshiny. There is no global or comprehensive review of social media studies or pertinent research that is directly oriented to SA, despite a rise in humanistic and social science publications. As a result, this paper makes an important contribution to the target body of knowledge areas because it presents in-depth bibiomatric findings using the R-biblioshiny tool for analysing SA bibliographic data in social media studies. In this paper, we discuss how the R-tool biblioshiny can be used to create, explore, and visualise maps of bibliometric networks.

Consequently, the following research questions (RQs) guide our analysis:
RQ1: What are the publication and citation trends of SA in social media research?
RQ2: What are the most influential agents (documents, sources, authors, institutions, and countries) in SA in social media research?

2. STUDY BACKGROUND- SENTIMENT ANALYSIS

SA is often referred to as "opinion mining" in the data mining research field because it is the computing study sub-field of capturing how people feel about various things, such as entities, persons, situations, events, topics, and their characteristics (Devika et al., 2016; Medhat et al., 2014; Ravi & Ravi, 2015). SA is a method that uses Natural Language Processing (NLP) to extract, transform, and understand text-based opinions before categorising them as positive, negative, or neutral (Devika et al., 2016; Joshi & Itkat, 2014; Mathew & R, 2020). Sentiment analysis is a crucial scientific approach for businesses to ascertain consumer sentiment insights transforming specific views, such as on brands or products.

Since it is impossible to manually keep up with the huge flow of new information appearing on the Internet, this sub-field (directly related to automatically extracting opinions) has significantly evolved in the last decade (Dhana Laxmi et al., 2020; Zhang et al., 2020). SA takes into account not only for investigating the positive or negative polarity of words and concepts, but also the syntactical tree of the sentence (Obaidi et al., 2022; Prager, 2006). The software makes an effort to analyse idiomatic and colloquial expressions, to provide meaning for negations, to change the polarity of words based on their proximity to other words (such as adverbs, adjectives, and conjunctions), and to account for certain functional-logic complements (Calefato et al., 2018; Hausmann et al., 2020).

Sentiment analysis in social media analytics provides many opportunities, since it helps capture emotions including denial, irony, joy, sadness, and wrath. The rapid transmission of beliefs and ideas on social media generates a "neuralgic" reaction. Shared neurobiological pathways generate close ties among members of a network. Our neurochemistry benefits from strong social connections in a network. Leaders can identify issues and create solutions by analysing social media sentiment. Assessing customers' opinions has been a vital element of corporate success. Product and service reviews are also abundant online. Thus, companies regularly hire researchers

to analyse their web material for opinions. Table 1 contains some recent academic studies that investigate novel findings from web text for opinion mining and sentiment analysis.

Table 1: Related existing studies of SA

Central topics	*Authors*	*Purposes of the studies*
Understanding public opinions	(Qian et al., 2022)	Provided a thorough analysis of public sentiments about NFTs as expressed on Twitter and used sentiment and emotion analysis to further investigate the secondary market and uncover the factors contributing to NFTs' rising popularity.
Sentiment analysis-based expert weight determination method	(Wan et al., 2021)	Determined the best way to utilise such data to facilitate LSGDM at scale is, therefore, an area worthy of research. This paper is the first to use social media sentiment analysis to assess LSGDM's quality
An evaluation of eleven SA tools	(He et al., 2022)	SA is used to examine the efficacy of current sentiment analysis tools on social media datasets, with a focus on health-related and healthcare-related topics. To fill that void is the purpose of this research.
Topic-level SA of social media	(Pathak et al., 2021)	Proposed a topic-level sentiment analysis model based on deep learning.
Time series SA of relief operations	(Bhullar et al., 2022)	SA based on time series analysis for relief operations utilising social media data with situational information gathered using Twitter

2.1. Bibliometric Studies

We present bibliometric research in a similar vein to that which has appeared in prominent academic journals. Bibliometrics is important tool in evaluating the scientific outputs of different nations, regions, journals, and institutions (Tang et al., 2018). In almost every field of information systems, there are many high-impact studies that use the bibliometric tool for reviewing existing literature. Table 2 contains a list of relevant articles focusing on bibliometric studies from various fields.

Table 2: Relevant studies conducting SLR with the Bibliometric analysis.

Studies	*Purposes of the studies*
Vrontis et al., (2022)	Conducted SLR for bibliometric meta-analysis on societal effects of social media applications in organizations, adopting practices of the VOSviewer software.
Donthu et al.,(2021b)	Providing detailed instructions for bibliometric analysis to provide context for the use of comparison to other methods, such as meta-analysis and systematic literature reviews.
Z. Xu, Wang, et al., (2021)	Developing deeper insights into the realm of consumers by utilising bibliometric analysis and visualisation techniques.
Aria & Cuccurullo, (2017)	Using bibliometrix to conduct in-depth science mapping analysis.

3. SYSTEMATIC REVIEW PROCESS

The ultimate goal of a systematic review is to identify relevant research and synthesise its findings. Annotated bibliographies that provide a scientific synthesis of the source literature are examples of independent literature reviews. This article discusses the SLR (systematic literature review), which is a more comprehensive literature review than solo reviews. (Lin et al., 2022; Okoli & Schabram, 2010). SLR is an appropriate research method for the current study because of the nature of the research questions (RQs), which aim to understand the trends and investigate prevailing gaps in the pertinent scientific literature (Whittemore et al., 2014).

Bibliometrics is an interdisciplinary scientific approach that employs statistical and mathematical methods to quantitatively analyse bibliographic data (Zanjirchi et al., 2019). However, one of the most common ways to disseminate research results is through articles published in scientific journals, which provide a representative cross-section of international scientific activity.

Finding the documents to analyse is the initial stage of a systematic review. To do this, we created a three-step search and filtration technique for our review, which included a database search, filtration of the database results, and the exclusion of irrelevant documents (Kumar et al., 2021). Comparing with the PRISMA flow diagram for different phases of SLR activities, our simplified stage one is related to the database search. We selected the databases in which to search for documents. Multiple databases exist, including PubMed, ISI, Web of Science, Scopus, and Dimensions. Scopus was selected because it indexes scholarly and scientifically relevant publications. It provides extensive bibliometric data for each publication it indexes. Scopus is a great tool for projects that compile a large body of literature for scholarly analysis (Paul et al., 2021), It is an academic database that is highly recommended for bibliometric analysis (Donthu et al., 2021a).

Importantly, Scopus is a more complete and high-quality data source for review, since it is a high-quality source for bibliometric data (Baas et al., 2020) and its metrics have a "very high" correlation with those in other scientific databases like Web of Science (Liu, 2013). Stage two involved a comprehensive key-word search of SA in social media literature. We used the term "sentimental AND analysis AND social AND media" as the keywords for our search because it is a key concept in our review. Results from the database search included 5,031 document results. Stage three is related to database filtration. A series of inclusion and exclusion filters were applied to the initial search.

First, we searched only "articles," "conference papers," and "reviews" because these works are peer-reviewed and graded based on novelty (Kumar et al., 2021). We excluded the research areas of "Engineering", "Mathematics", "toxicology and pharmaceutics" and "medicine" and keep the remaining areas, since we realised that many of the published documents on social media were outside the expected areas, i.e., those related to "business, management," and "computer science." We chose to include documents published between 2018 and 2022 to eliminate publications that were not related to the subject matter of the study. This database, after the filtering process, has 523 articles that survived the filtration process and are progressed for bibliometric review, which we explain in the next section.

4. RESULTS

Table 3 presents the collected information from the Scopus database for 523 publications published between 2018 and 2022. These articles appeared in 325 scientific journals. Descriptive statistics and performance analysis of scientific actors (authors, sources, papers) are used for

trend analysis. Social media sentiment analysis study is supported by bibliometric data. The total number of keywords that commonly appear in the article title is 2224, four times the number of articles. it's noted that 5 years of scientific output were studied and in 2021 we found a huge surge in publications.

Table 3: Descriptive statistics

Description	Results
Timespan	2018:2022
Sources (Journals, Books, etc)	325
Documents	523
Average years from publication	1.76
Average citations per documents	8.189
Average citations per year per doc	2.571
References	25510
DOCUMENT TYPES	
article	254
conference paper	252
review	17
DOCUMENT CONTENTS	
Keywords Plus (ID)	2224
Author's Keywords (DE)	1499
Authors	1550
Author Appearances	1721
Authors of single-authored documents	44
Authors of multi-authored documents	1506
AUTHORS COLLABORATION	
Single-authored documents	45
Documents per Author	0.337
Authors per Document	2.96
Co-Authors per Documents	3.29
Collaboration Index	3.15

4.1. Publication Trend

The distribution of articles by year of publication indicates that sentiment analysis in social media has gained increasing scholarly interest over the last 20 years (see Fig. 1 below). Most sentiment analysis in social media research were published in 2021 (n = 789).

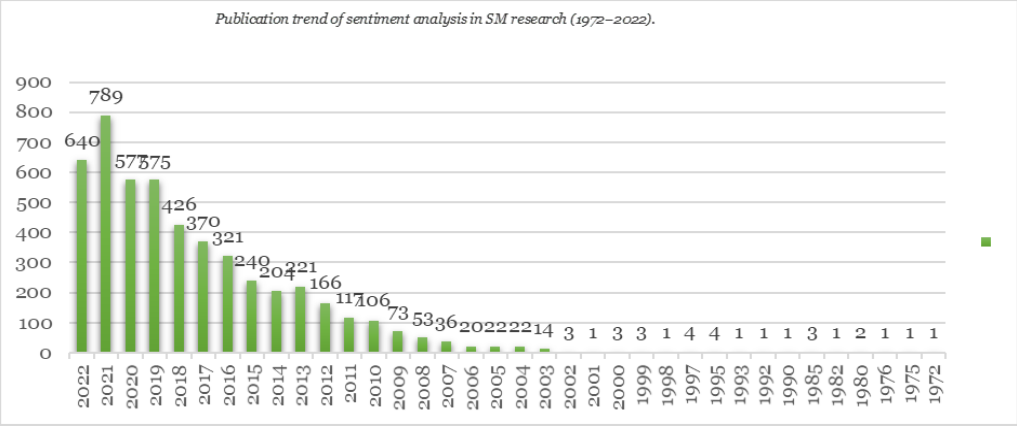

Figure 1: Publication trend (1972–2022).

The trend topics (see table 4) in this analysis is “sentiment analysis” it appeared (n = 292) followed by “social networking (online)” (n = 158), while the figure 2 illustrated trend topic areas of previous studies.

Table 4: The trend topics

Topics	freq	year_q1	year_med	year_q3
sentiment analysis	292	2020	2021	2022
social networking (online)	158	2019	2020	2021
social media	90	2020	2021	2021
classification (of information)	68	2019	2021	2021
deep learning	64	2020	2021	2021
data mining	60	2018	2019	2021
learning systems	57	2019	2020	2021
machine learning	52	2019	2021	2021
learning algorithms	48	2019	2020	2021
natural language processing systems	34	2018	2020	2021

4.2. Other Important Trends and Insights of the Topic Areas

The distribution of scientific production by country in the subject of sentimental analysis and social media reveals that India has the most scientific production, with 224 documents. Figure 3 shows the number of articles produced by the authors of different countries (SCP) and the rate of cooperation of each country’s authors with other countries' authors (MCP). For example, Chinese authors have written 18 articles, and China has co-written 42 articles with other countries. Subsequently, the authors from India ranked second with 2 articles, and the author’s co-authorship with other countries is at 30 articles.

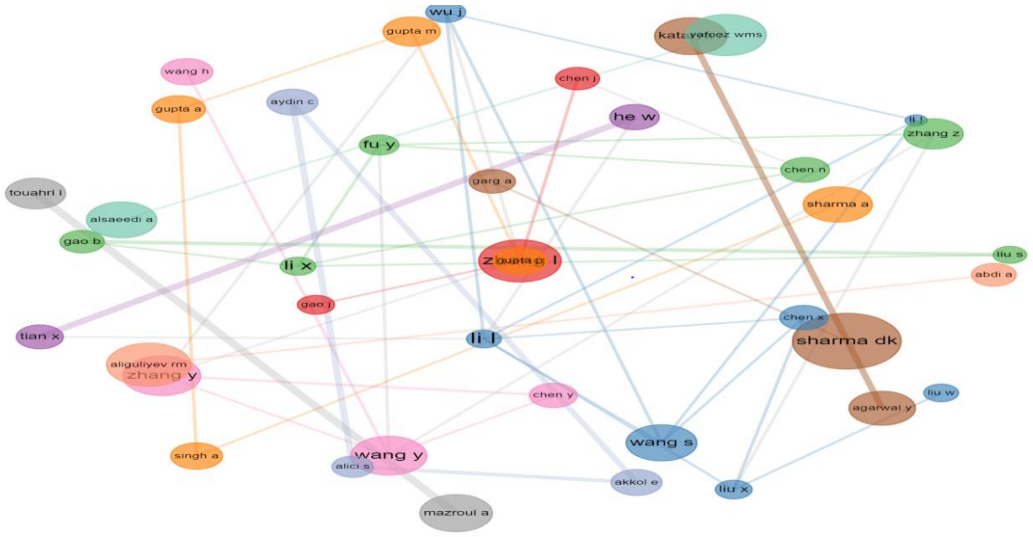

Figure 2: Author’s Collaboration Network

We used document analysis to identify emerging trends. The trend topics for abstracts are as shown in Figure 4. To reveal the conceptual structure of the documents, we present the thematic map of author keywords as shown in Figure 4. In Figure, the research themes obtained from the conceptual structure of documents are characterised by two parameters: ‘density’ and ‘centrality’. The clusters represent the themes of the research, and the size of the clusters is proportional to the

number of keywords. The factorial analysis of the documents using correspondence analysis as a topic dendrogram is shown in figure 5 below. The topic dendrogram shows the clustering of documents.

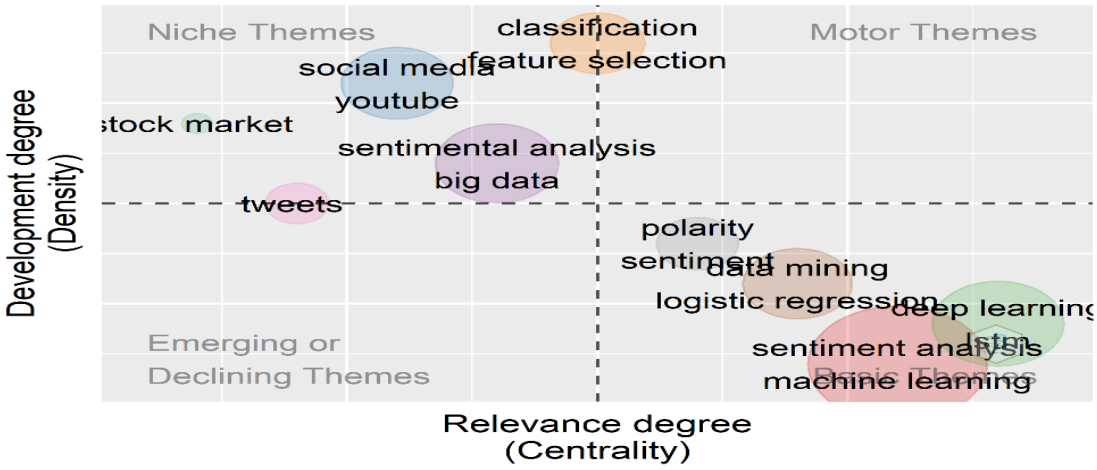

Figure 3: The thematic map of author keywords

Following figure 5 demonstrates a topic dendrogram on the topic area.

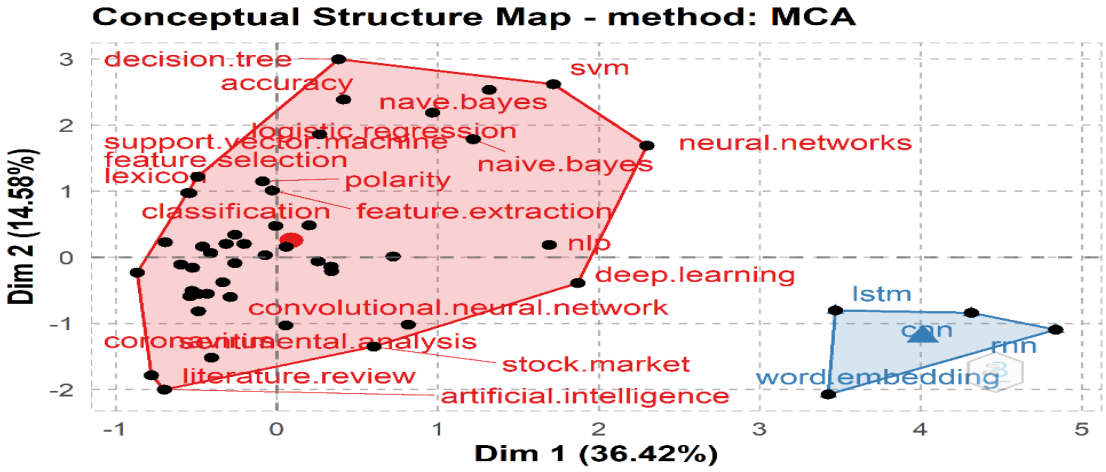

Figure 4: Factorial Map

The TreeMap (in figure 6) highlights the available keyword combinations, while figure 7 shows the wordcloud. Using this, we can identify them and use the word cloud to indicate what they stand for: with" sentimental analysis and social media" are areas of study, in order of magnitude.

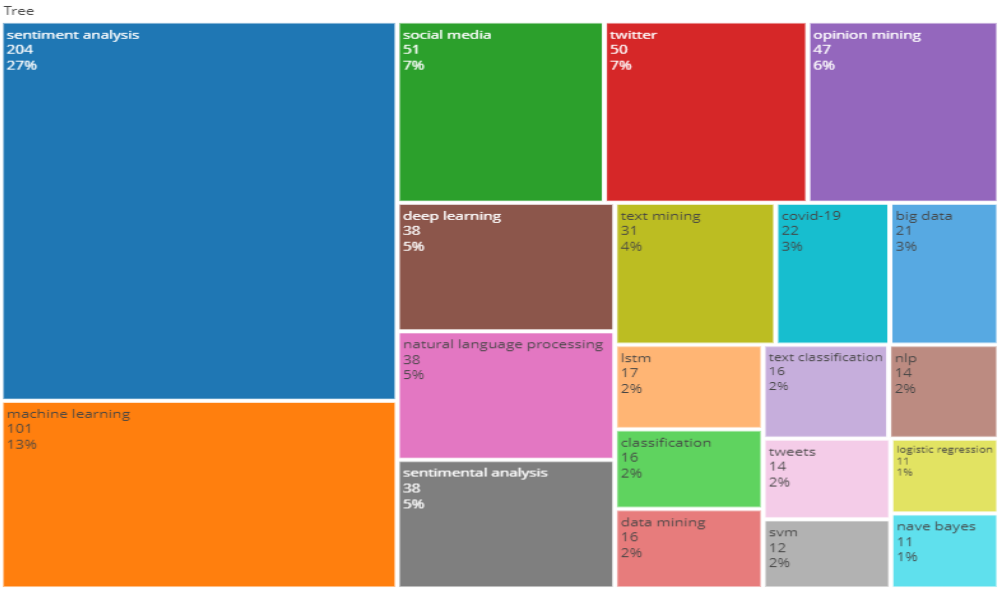

Figure 5: Word TreeMap

Figure 6: Word Cloud Author's keywords

5. DISCUSSION

The rise of SA research has spurred scholarly research in a variety of fields, from computer science to the social sciences, especially in the last two years. These are perhaps the two most notable findings of the bibliometric analysis, which lead us to expect that this field of research will continue to grow and be complemented by a variety of disciplines in the next few years. In this paper, we conducted a bibliometric analysis of academic papers from Scopus on the topic of SA in social media research from 2018 to 2022. The findings presented would provide future researchers and journal editorial board members with new insights into SA and its potentials, enhancing their understanding.

The study also found an exponential increase in the number of publications on the topic of SA in social media research since 2018. The growing profile of publications can be used to predict changes in the coming years in different countries. In addition, we identified influential articles in SA in social media research and the contribution to understanding the role of SA in social media in promoting the advancement of research, which is still needed for future directions.

6. CONCLUSION

Bibliometric analysis is a scientific method that can be used by both experienced and developing researchers to conduct a retrospective of large and rich business study topics. The analysis provides a comprehensive picture of the research trend and rapid development of SA in social media research. They can help concerned researchers gain a comprehensive understanding of the research status, find research assistants, allocate resources, and determine the best relevant research topics. It is very important to evaluate the quality of such a huge research project. This paper offered a high-level, intuitive understanding of how SA can be used to interpret new insights from various contents/posts on social media. This paper can be viewed as a useful resource for academics and early-career professionals who may have interests in exploring or adopting sentiment analysis for any social media-oriented research.

The following future research directions are proposed:

- We can use other databases, such as WOS as a substitute and perform it in R packages. Moreover, the bibliometric analysis proposed in this paper can be extended to databases other than the SCI /SSCI index and to data collected from different periods.
- We may use other software such as VOSviewer in further study for more précised outcome. An additional study is needed to investigate this area further.
- The introduction of the extracted data insights is entitled "Sentimental analysis" and "social media" only, which can be broadened in future study for higher number of sample collections. At the same time, a future study can be more specific by including other terms like "customers", "online retailer" and "organization" which have not yet been analysed within the consumer research domain.

Moreover, more studies can focus on specific countries to study the phenomenon of SA in social media from a different cultural background or a developing nation's perspective. Our further research may integrate big data research in other fields such as higher education (Fahd, Miah, and Ahmed, 2021; Miah, Miah, and Shen, 2020) and government developmental aspect (Miah, 2010) including healthcare information solution development (Aghdam, Watson, Cliff, and Miah, 2020). Various research areas More research is needed to develop a universal model of sentiment analysis that can be applied to different types of data transformation, to investigate other possible social media channels to obtain users' opinions, and to broaden the context in which SA can be applied in order to make future recommendations.

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