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TWO ESSAYS ON SOCIAL MEDIA IN ORGANIZATION

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MPhil

The Hong Kong Polytechnic University

2022

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# Two Essays on Social Media in Organization

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A thesis submitted in partial fulfillment of the requirements for the  
degree of Master of Philosophy

May 2022

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# Abstract

The emergency of social media has brought out remarkable opportunities but also challenges in organizational management. This research studies the impact of social media on organizations by two essays. In essay one, a comprehensive literature review for social media research is conducted by social network-based bibliometric analysis and thematic analysis. In essay 2, to understand the impact of tremendous information from social media on firm performance, we employ the event study method to examine how social media-based external information environment impact the firm performance under negative events.

Essay One: The increasing popularity of social media in the past decade has attracted the attention from many researchers to investigate its applications and implications for organizations, amassing a significant body of knowledge in the literature. To aid stakeholders to understand the latest development and discover research opportunities in social media research, Essay One of this research conducts a comprehensive literature study by using social network-based bibliometric analysis and thematic analysis. The analysis is based on 240 relevant top journal articles from a wide range of disciplines including operations management, information system management and marketing management etc. With our findings, we are able to chart the leaders in terms

of authors, universities and regions in social media literature, identify the major research themes for each cluster developed, and come up with suggested research directions for stakeholders' future research or application endeavors. This essay contributes to social media research field by providing a research agenda and guiding stakeholders to develop innovative research plans.

Essay Two: The suggested research directions proposed in Essay One indicate that the current literature examines social media mainly from an individual perspective and should be supplemented by studies adopting organizational or other perspectives; and that there is very limited attention paid to the roles of social media in helping organizations in dealing with negative events. Integrating these two suggested research directions, Essay Two investigates the impact of social media on firms' financial returns under corporate social irresponsibility (CSI) events. We adopt the three-factor Fama-French factors to calculate the abnormal stock returns of 1032 CSI events for 305 Chinese manufacturing firms with a three-day  $[-1,1]$  event window. Then, a firm fixed-effect regression is conducted to examine the impact of social media-based investor sentiment on firms' abnormal stock return. Moreover, by applying the heterogeneity test, we find the magnitude of such an impact varies over different levels of corporate intangible asset intensity, advertising intensity, board independence and forms of equity nature (whether it is a state-owned enterprise). This research offers insights in understanding the impact of social media information on firm performance under the corporate social irresponsibility events and the interaction effect between the

internal management and external information environment under negative events.

# Acknowledgments

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# Chapter 1 Thesis Introduction

## 1.1 Research background

Social media is defined as “[a] group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user generated content” (Kaplan& Haenlein, 2010). Social media research pays most attention to online opinions, e-word-of-mouth and social network (e.g., social ties, relationship types) and their impacts on corporate marketing management (Yazdani, Gopinath& Carson, 2018; You, Vadakkepatt & Joshi, 2015; Zhang & Godes, 2018; Yan et al.,2019). Some studies demonstrate the information generation and dissemination mechanisms (Yoo et al., 2016; Wang et al., 2019; Wei, Xiao & Rong, 2020; Yoo, Rabinovich & Gu, 2020). Other studies pay attention to the implications of social media for organizational management efficiency, for example, the impact of social media on human resources management (Van Iddekinge et al., 2016; Roth et al., 2016), operations management (Tang et al., 2019; Lam et al, 2016), innovation performance (Zhan et al., 2020) ,etc. Moreover, social media as important external information environment for organizations has attracted much attention. Social media plays an essential role for organizations to disseminate information to stakeholder, impose positive impact on them, collect feedback from them, be impacted by online content, etc. (Wang, Greenwood & Pavlou, 2020; Valsesia, Proserpio & Nunes, 2020; Ordenes et al., 2017). Nevertheless, social media arise challenges for organizations due to its dark side effect. Tremendous online information contains fake news. These rumors diffuse by a certain pattern and is motivated by certain contingency

factors (e.g., no clear source of information) (Oh, Agrawal & Rao, 2013; Minas & Dennis, 2020). Previous studies on social media presents strong argument that social media is influencing organizational management from various perspectives, e.g., the interaction of organizations and stakeholders, the improvement opportunities, the unforeseeable challenges, etc.

## 1.2 Research motivation

There is a significant body of social media research investigating interactions of inter-individuals, inter-organizations, individuals and organizations. These studies involve in different disciplines regarding to organization management, e.g, information system management, marketing management and operations management etc. There are a few review papers that focus on a specific area of business and management, but none of them analyzes and reviews social media studies from a comprehensive and broad view for organizational management. For example, In the field of information management, Ngai et al. (2015), and Alavi and Denford (2011) revealed the association between social media practice and information management and knowledge sharing. Testa et al. (2020) discussed why and how social media mediates corporate innovation from the perspective of innovation seekers and providers. In operations management, Huang et al. (2020) systematically reviewed and examined the value of social media for operations and supply chain management. In marketing management, Alves et al. (2016) reviewed social media studies by concentrating on the implementation, optimization, and implications of social media. To better learn the research outcomes of previous studies and to effectively develop innovative and valuable research plans,

we conduct a comprehensive literature review on high-quality social media publications by applying the social network-based bibliometrics method and thematic analysis. The combination of quantitative and qualitative methods helps us obtain collective and objective conclusions and insights.

Furthermore, based on the literature review, we find that social media research is mostly developed from individual perspectives and lacks organizational or other macro perspectives studies. Also, previous studies tend to focus on the bright side of social media and lack enough attention on the uncertainties and challenges that social media arises. We enrich the social media research by exploring the impact of social media information on firm performance under a negative event scenario. Specifically, we set corporate social irresponsibility (CSI) behaviors as our research context by the following reasons. First, CSI behaviors have negative impacts on firm performance and cause significant uncertainties to the focal organization (Kölbel et al., 2017; Li & Wu, 2020; Liu et al., 2022). The impact of social media information may be more significant than during positive scenarios and the social media attention to the focal firm may be more significant as well. Second, CSI research pays most attention to event and focal firm-related characteristics, but few investigate how the external information environment can impact firm performance under CSI events. As such, we investigate the association between social media information and firm performance under CSI events to improve our understanding on the uncertainties and challenges from social media.

This research is organized by the following two chapters. Chapter 2 presents the literature review research. Chapter 3 presents the research on the impact of social media information on firm performance.

## **Chapter 2 Reviewing the literature of social media in organizational management: A bibliometric study based on network analysis**

### 2.1 Introduction

Social media, “[a] group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content” (Kaplan & Haenlein, 2010), has been receiving extensive attention from both practitioners and academics. Social media platforms, including general platforms (e.g., Facebook, Twitter, Instagram), professional platforms (e.g., LinkedIn, Quora, Slack), and many other firm-owned platforms and online communities, provide a tremendous amount of information for corporations to understand their customers’ demands (Miah et al., 2017), improve customer experience (Zhang et al., 2014), and obtain feedback on their services and products. Moreover, social media facilitates online interactions and communication, offering great opportunities for information exchange and knowledge transformation. This makes it a fertile place for ideating for new or innovative products (Testa et al., 2020). As the role of social media in the business environment has grown, the number of academic studies of social media applications and implications has also increased exponentially. As Figure 2.1 shows, when we searched the keywords “social media” and limited the search results to those in the business, management, and accounting categories in *Scopus*, we observed an increase in the number of articles on social media after 2010. We inferred that this trend will continue in the future. The current literature on social media forms a significant body of knowledge, allowing for comprehensive literature

reviews with rigorous analysis methods. In addition, social media is widely considered an interesting and promising research area that constantly offers new research opportunities. For example, the rebranding of Facebook as Meta will be accompanied by it offering an unprecedented user experience through the use of 3D virtual technology. After the outbreak of the COVID-19 pandemic, social media platforms have become increasingly popular avenues through which the public can create, obtain, and share information while working from home (Goel & Gupta, 2020). The pandemic has also influenced what information online users disclose on social media platforms and how they do so; Nabity-Grover et al. (2020) found that the motivations for information disclosure have shifted from self-interest to public interest. These recent changes have led more and more researchers to investigate various phenomena and managerial implications regarding the use of social media. Thus, a literature review to map the extant studies and explore directions for future research will offer useful insights to support current or new social media researchers in formulating or evaluating their studies, thereby supporting the development of social media research as a whole.

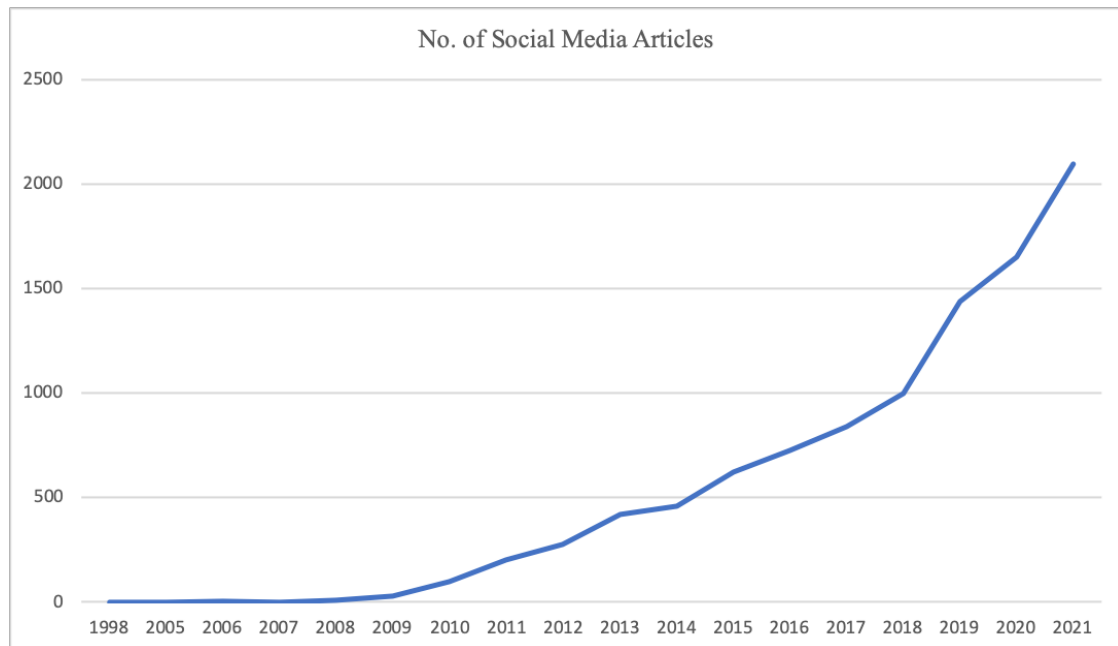
The current social media literature has implications for different management disciplines, including information systems, marketing, and operations management. Although a few review studies have been conducted, they either focus on a specific management discipline or do not reflect the multidisciplinary nature of social media. In the field of information management, Ngai et al. (2015), and Alavi and Denford (2011) revealed the association between social media practice and information management and knowledge sharing. Testa et al. (2020) discussed why and how social media

mediates corporate innovation from the perspective of innovation seekers and providers. In operations management, Huang et al. (2020) systematically reviewed and examined the value of social media for operations and supply chain management. In marketing management, Alves et al. (2016) reviewed social media studies by concentrating on the implementation, optimization, and implications of social media. From an entrepreneurship perspective, Secundo et al. (2020) investigated the management implications of social media in entrepreneurship activities and relationships. Ali et al. (2022) studied the effect of social media platforms and entrepreneurial practices on social enterprises' performance. Most of these review papers adopted systematic review methods and focused on reviewing a relatively small number of publications. They also paid little attention to journal quality when selecting publications. In our study we recognize the multi-disciplinary nature of social media research and cover publications from a broader range of management disciplines, including information systems, organizations, marketing management, strategic management, and operations management. To obtain insights relevant to different organizational settings, we select empirical studies with data at both individual and organizational levels. Finally, by adopting rigorous analysis methods such as social-network-based bibliometric analysis and thematic analysis, we are able to achieve objective results, leading to the development of reliable and useful implications for social media researchers.

**Figure 2.1**



### *Number of Social Media Articles in Business*



Considering the increasing number of stakeholders (e.g., social media researchers, consultants, business practitioners) that are working on or will start studying or applying social media in their differing contexts (e.g., research in academic institutions or innovations in customer communication), we aim to help stakeholders remain up to date on the latest findings of social media research and to identify the leading researchers and institutions in the field for those seeking collaboration opportunities. To achieve these two aims, we first selected 240 articles from a wide range of top business and management journals, and ranked the popularity and influence of the authors, their institutions, and their regions by assessing their degree centrality and eigenvector centrality through social network analysis (Bonacich, 1972; Wasserman & Faust, 1994). The results identified the leading authors in the field, the academic cooperation networks they belong to, and their research interests in the field

of social media. Second, we conducted a thematic analysis that combined quantitative and qualitative methods including citation and cocitation analysis and content analysis. The resulting thematic analysis of the selected (highly cited) articles showed the authors' research themes, providing a broad picture of the current body of knowledge and a road map to help predict future social media research. Finally, we integrated our findings to develop a research agenda that suggests potential directions for future research. To summarize, we address the following two research questions concerning the literature on social media:

1. Who are the leading authors in the field, and which institutions and regions are they from?
2. What are the current major research themes and the corresponding recommendations for future work?

We organize the rest of the paper as follows: In Section 2.2 we introduce our research methodology, including our data collection methods and data analyses, i.e., social-network-based bibliometric analysis. In Section 2.3 we present the results of our analysis of the leading authors in the field, generated from degree centrality and eigenvector centrality. In Section 2.4 we present the thematic analysis using citation and cocitation analysis, and content analysis within each research theme. In Section 2.5 we suggest directions for future research based on our results, and discuss the contributions and limitations of our study.

## 2.2 Research Methodology

### 2.2.1 Journal Set

One critical step of the research process was the development of a journal list for identifying relevant and representative social media articles in business research. We identified the Academic Journal Guide 2021 (Chartered Association of Business Schools, 2021) as a useful guide. For example, Cheng et al. (2020) focused on journals rated 4\*, i.e., journals of distinction in the Academic Journal Guide 2018 (Chartered Association of Business Schools, 2018) for their review of social media research across a broad range of business and management disciplines. After excluding 4\* journals without a focus on business or management and those without publications employing empirical methodologies, they ended up with a list comprising 26 journals: *Academy of Management Journal*, *Accounting Review*, *Accounting, Organizations and Society*, *Administrative Science Quarterly*, *Information Systems Research*, *Journal of Accounting and Economics*, *Journal of Accounting Research*, *Journal of Consumer Psychology*, *Journal of Consumer Research*, *Journal of Finance*, *Journal of Financial Economics*, *Journal of International Business Studies*, *Journal of Management*, *Journal of Marketing*, *Journal of Marketing Research*, *Journal of the Academy of Marketing Science*, *Management Science*, *Marketing Science*, *MIS Quarterly*, *Organization Science*, *Research Policy*, *Review of Financial Studies*, *Strategic Management Journal*, *International Journal of Operations and Production Management*, *Production and Operations Management*, and *Journal of Operations Management*. We also found that another highly regarded journal list is the University of Texas at Dallas Top 100 Business School Research Rankings<sup>1</sup>. Based on a review of the journals on this list, we

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<sup>1</sup> University of Texas at Dallas Top 100 Business School Research Rankings: <https://jindal.utdallas.edu/the-utd-top-100-business-school-research-rankings/list-of-journals>

identified three additional highly relevant journals: *INFORMS Journal on Computing*, *Manufacturing & Service Operations Management*, and *Journal of International Business Studies*. By integrating these two existing journal lists, we constructed a journal list consisting of 29 top business and management journals for identifying leading social media articles in the current literature.

### 2.2.2 Data Collection

We identified the articles reviewed in this study by searching keywords such as “social media,” “Facebook,” and “Twitter” in *Scopus*. We focused on reviewing empirical studies because social media is tightly connected to practical and production scenarios, such as using social media to promote products and forge connections between business partners. Through this method we identified 240 empirical studies that were published in 24 out of the 29 journals on our journal list during the 2007-2021 period. Figure 2.1 summarizes the 24 journals identified and suggests that business information systems is the most relevant discipline. *MIS Quarterly* and *Information Systems Research* were the two most relevant journals; they published 45 and 42 articles, respectively. The second most relevant discipline was marketing management, which was represented by articles published in *Marketing Science* (22 articles), *Journal of Marketing* (17 articles), *Journal of Marketing Research* (15 articles), *Journal of the Academy of Marketing Science* (13 articles), *Journal of Consumer Psychology* (eight articles), and *Journal of Consumer Research* (four articles). The next most relevant discipline was operations management (including management science), which was represented by articles published in *Management Science* (21 articles), *Production and*

*Operations Management* (11 articles), *International Journal of Operations and Production Management* (nine articles), and *Journal of Operations Management* (three articles). Accounting and finance was also found to be a relevant discipline; it was represented by articles published in *Accounting Organizations and Society* (seven articles), *Accounting Review* (four articles), *Journal of Accounting Research* (three articles), *Journal of Accounting and Economics* (one article), *Journal of Financial Economics* (one article), and *Review of Financial Studies* (one article). Finally, the remaining relevant journals included *Organization Science* (four articles), *Strategic Management Journal* (three articles), *Journal of Management* (two articles), *Research Policy* (two articles), *Academy of Management Journal* (one article), and *Journal of International Business Studies* (one article). Figure 2.2 shows the most relevant journals. Top two journals are from information management discipline. The second popular discipline is marketing management since there are five journals with more than five social media papers during this period.

**Figure 2.2**

*Plot of Most Relevant Journals*

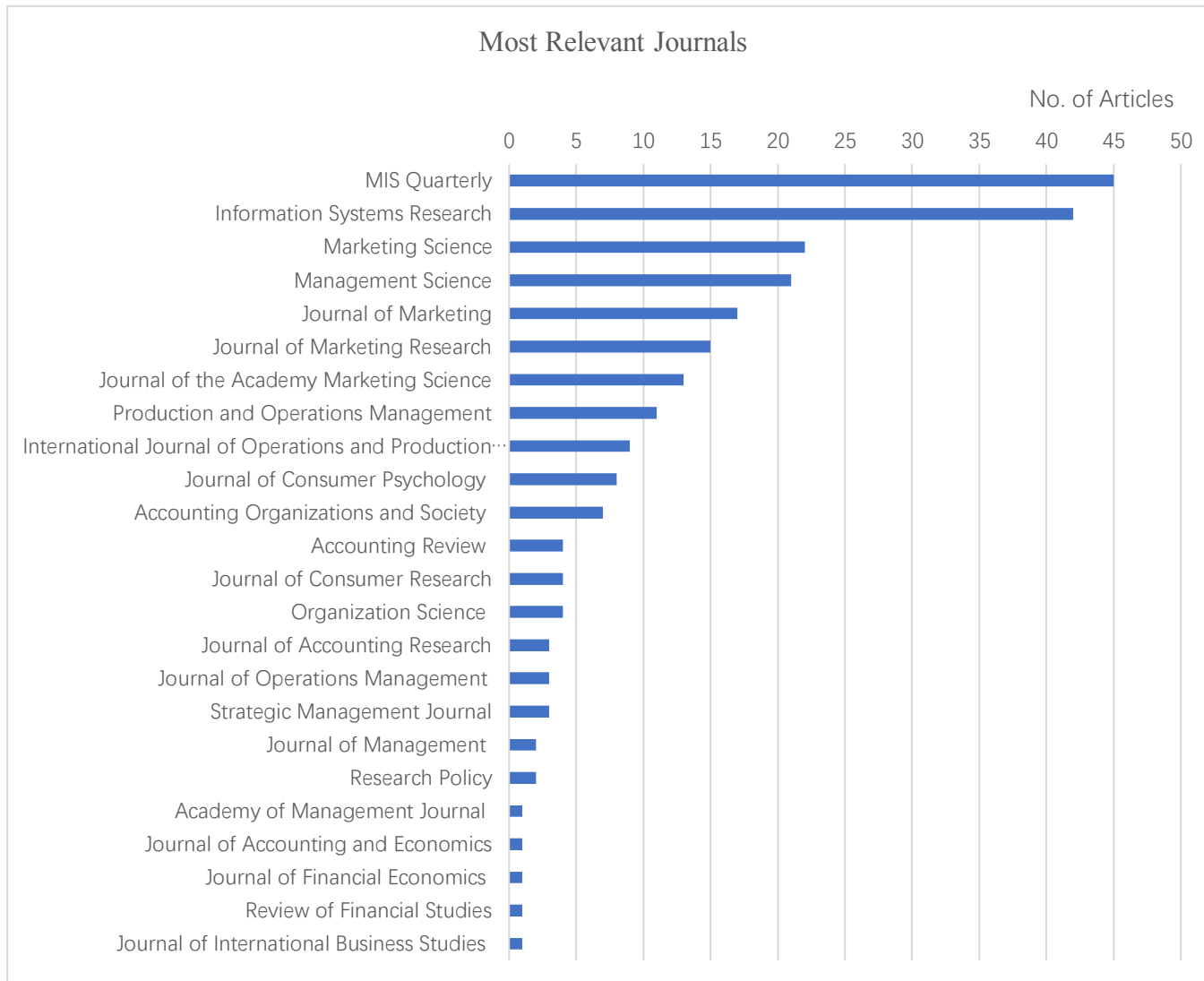
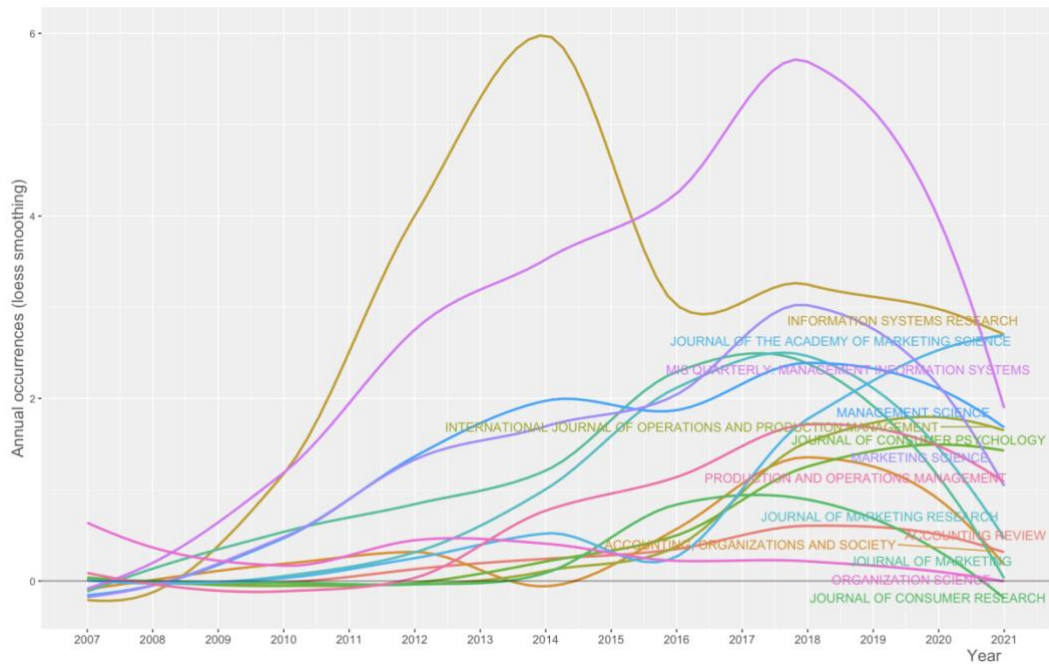


Figure 2.3 shows the dynamics (timing and number of publications) of the journals that contributed more than four articles. Most of the journals displayed a peak in 2018 or 2019 in terms of number of publications each year. The number of publications in *Information Systems Research*, however, peaked in 2014 and showed a marked decline afterwards. In contrast, the number of publications in *Journal of Academy of Marketing*, *International Journal of Operations and Production Management*, *Journal of Consumer Psychology*, and *Journal of Marketing Research* displayed a steadily increasing trend after 2016.

**Figure 2.3**

*Journal Dynamics*



**2.2.3 Review of Major Analysis Methods**

The bibliometric analysis adopted in this review is based on social network analytics. Social network analytics has been broadly applied in the social sciences to identify patterns in human interaction and information spread. We adopt the social media analytics methods to conduct this literature review for its objectivity in reviewing a large quantity of relevant papers. In dealing with our identified research questions, we mainly apply centrality analysis and thematic analysis, which are both based on social network analysis. We identify the key research methods by following Babbar et al.(2018), Ding & Cronin (2011) and Xu et al.(2018) etc. Social network analytics generally maps the linkages between agents (Carter et al., 2007). “Agents” in this research refers to authors, institutions, or regions of publications with coauthorship

experience. By applying social network analytics, i.e., the degree centrality and eigenvector centrality measurements (Bonacich, 1972; Wasserman & Faust, 1994), we can examine interactions and relationships involving multiple agents quantitatively. By studying the coauthorship network, the centrality results, i.e., degree centrality and eigenvector centrality, can provide insights into the network relationships among authors, institutions, and regions, thereby identifying the agents that are leaders in the field. With regard to the major themes in existing social media publications, we applied cocitation analysis to form clusters of publications (Hjørland, 2013; Leydesdorff, 2015; Small, 1973) and then selected the top-ranking publications of each cluster based on citation analysis (Ding & Cronin, 2011; Garfield, 1979). Cocitation analysis measures how frequently articles have been cocited by another article and thus reveals the semantic similarity among articles, whereas citation analysis measures research quality and influence by calculating how frequently articles have been cited (Hsiao & Yang, 2011; Lee & Chen, 2012; Shiao et al., 2017; Taylor et al., 2010). We then further conducted content analysis on representative articles to identify the research theme in each cluster.

#### ***a. Network Centrality Analysis***

In graph theory, nodal centrality measures the importance of a node in an undirected network (Wasserman & Faust, 1994). The current research is based on the undirected coauthorship network and investigates leading authors, institutions, and regions in selected social media articles, i.e., Research Question 1. When examining an undirected coauthorship network, network centrality is a major indicator of the agent's



(authors, institutions, or regions in their research) importance and prominence, disregarding the number and quality of their publications (Babbar et al., 2018; Koufteros et al., 2021). Network centrality is composed of degree centrality, i.e., degree, and Bonacich power centrality, i.e., eigenvector centrality (Bonacich, 1972); they are used extensively to measure how important and influential an agent, i.e., node is in a network (Babbar et al., 2019; Babbar et al., 2020; Brass, 1984; Faust, 1997; Freeman, 1978).

Specifically, the degree centrality of an agent measures the direct connections the agent has, i.e., the direct exchange of intellectual capacity in the form of ideas, knowledge, experience, and so on. The more connections one has, the greater the mind capacity exchange, and the more central an agent is in a network. Furthermore, the prominence and popularity of the neighbouring agents/nodes that a node connects to are important indicators of the extent of influence of the node. Bonacich power measures the influence of an agent by examining the influence of its neighbouring agents. When agents connect to more influential neighbours, their ideas, knowledge, and experience can be spread more effectively and broadly through such neighbours. The total degree centrality and Bonacich power centrality are both calculated based on the agent  $\times$  agent matrix (Bonacich, 1972; Wasserman & Faust, 1994). Furthermore, network density can offer extra insights to supplement the results of degree centrality and Bonacich power centrality, which measures the strength of connections between agents in a network by calculating the ratio of the number of connections among nodes relative to the maximum possible connection number (Babbar et al., 2018).

### ***b. Citation and Cocitation Analysis***

To address Research Question 2, we primarily adopted citation analysis and cocitation analysis, two commonly used methods in bibliometric analysis. Citation analysis, which measures the total number of citations of a publication globally, is an accurate indicator of publication influence and quality (Ding & Cronin, 2011; Garfield, 1979). Cocitation analysis examines the frequency of the co-occurrence of publications as cited articles in a given pool of articles; the more cocitations a pair of papers has, the greater the possibility that the papers cover similar content or share the same research theme (Hjørland, 2013; Leydesdorff, 2015; Small, 1973). We deployed a cocitation-based clustering analysis and citation-based PageRank analysis to identify the major research themes among our selected articles, i.e., Research Question 2. We then further conducted content analysis to identify the research theme of each cluster by reading the top-ranking articles in full and the abstracts of the other articles in each cluster (Xu et al., 2018).

Clustering analysis, i.e., modularity, has been widely used in review studies of several disciplines to investigate and identify research themes predominant in a set of published articles (e.g., Ben-Daya et al., 2019; Fahimnia et al., 2015; Hsiao & Yang, 2011; Lee & Chen, 2012; Pournader et al., 2020; Shiau et al., 2017; Taylor et al., 2010; Xu et al., 2018). In cocitation analysis, the clustering algorithm divides all the agents/nodes, i.e., articles in this context, into several well-connected article groups. This process uses the principle that the more times a pair of articles is cocited, the higher the likelihood of them sharing a research theme and belonging to the same cluster. A

commonly used clustering algorithm is the Louvain algorithm (Blondel et al., 2018), which is also the default clustering algorithm in the popular visualization software Gephi. The modularity index  $Q$  in the Louvain algorithm measures the strength of connections within versus between clusters, and it gives a value, between -1 and 1, that we used to determine the validity of a proposed cluster.

The original Google PageRank algorithm (Brin & Page, 1998) was first introduced to prioritize web pages by finding linkages among web pages in the search engine, and it was later extended to investigate citation linkages among articles (Ma et al., 2008; Xu et al., 2018). In the PageRank analysis adopted in our study, article ranking was based on not only article popularity (its number of citations) but also prestige (citations by other highly cited papers) (Ding et al., 2009). The PageRank of Article  $A$  can be calculated as follows:

$$PageRank(A) = \frac{(1-d)}{N} + d \left( \frac{PageRank(T_i)}{c(T_i)} + \dots + \frac{PageRank(T_n)}{c(T_n)} \right),$$

where  $N$  denotes the number of articles in a network and the parameter  $d$  is a damping factor between 0 and 1 that represents the fraction of random walks that continue to propagate along the citations (Chen et al., 2007). Parameter  $d$  is often set as 0.85 in analyses of web pages, but in citation analysis of publications,  $d = 0.5$  is generally considered more appropriate (González-Pereira et al., 2010; Ma et al., 2008; Xu et al., 2018).

### 2.3 Analysis Results

In this section we identify the leading authors, institutions, and regions based on their ranks in terms of the degree centrality and eigenvector centrality measures.

There were 595 authors, 276 institutions, and 27 regions in the set of 240 articles selected. The coauthorship networks were considered undirected in the analyses.

### 2.3.1 The Leading Authors

We imported the author  $\times$  author matrix in the CSV format into Gephi, following Yari et al. (2020), to calculate the degree centrality and eigenvector centrality of each author and visualize the coauthorship network.

#### *a. Top Authors Based on Degree Centrality*

Based on the results of degree centrality analysis, the top 30 authors from the 240 articles were identified (Table 2.1). Tan Y. and Stephen A.T. were the two authors with the highest degree centrality (13), which means they had the most coauthorship experience (13 times in this network) and thus more opportunities to influence the perspectives, knowledge, and interests of others through collaborations. The top 30 authors were from seven regions: 20 from the United States, four from the United Kingdom, two from the Netherlands, and the other four from China, India, Israel, and France, respectively.

**Table 2.1**

*The Top 30 Authors Based on Degree Centrality*

Ranking	Author	Institution	Region	Degree	Eigencentality
1	Tan Y.	University of Washington	US	13	0.787946
2	Stephen A.T.	University of Oxford	UK	13	0.635348
3	Grewal D.	Babson College	US	10	1
4	Kumar V.	Mudra Institutions of Communications	India	9	0.518181
5	Ghose A.	New York University	US	9	0.23274
6	Eisingerich A.B.	Imperial College London	UK	8	0.502584
7	Gu B.	Arizona State University	US	8	0.265639
8	Gray P.H.	University of Virginia	US	8	0.160028
9	Ludwig S.	University of Surrey	UK	7	0.862782

10	Whinston A.B.	University of Texas at Austin	US	7	0.63324
11	Hewett K.	University of Tennessee	US	7	0.499042
12	Hosanagar K.	University of Pennsylvania	US	7	0.386806
13	Abbasi A.	University of Virginia	US	7	0.310759
14	Kane G.C.	Boston College	US	7	0.233184
15	Oestreicher-Singer G.	Tel Aviv University	Israel	7	0.179361
16	Ordenes F.V.	University of Massachusetts Amherst	US	6	0.862782
17	Wetzels M.	Maastricht University	Netherlands	6	0.862782
18	He S.	University of Connecticut	US	6	0.601871
19	Yan L.	Indiana University	US	6	0.384158
20	Rand W.	North Carolina State University	US	6	0.317
21	Majchrzak A.	University of Southern California	US	6	0.289172
22	Vir Singh P.	Carnegie Mellon University	US	6	0.179135
23	Rishika R.	North Carolina State University	US	6	0.175425
24	Bezawada R.	City University Of New York	US	6	0.175425
25	Van Iddekinge C.H.	University of Iowa	US	6	0.165472
26	Roth P.L.	Clemson University	US	6	0.165472
27	Chan H.K.	University of Nottingham Ningbo China	China	6	0.164777
28	De Valck K.	HEC Paris	France	6	0.164777
29	Wiertz C.	City University of London	UK	6	0.133204
30	Mahr D.	Maastricht University	Netherlands	5	0.767891

### ***b. Top Authors Based on Eigenvector Centrality***

Based on the results of eigenvector centrality analysis, Table 2.2 shows the top 30 authors that collaborated with influential authors in the network. The top-ranked author was Grewal D. that had a degree centrality of ten. Ludwig S., Ordenes F.V., and Wetzels M. ranked second with similar degree centralities of six or seven. These 30 authors came from eight regions: 12 from the United States, four from the United Kingdom, five from Hong Kong, three from Brazil, two from the Netherlands, two from Portugal, one from India, and one from Canada. Moreover, the authors from the Netherlands, Brazil, and Hong Kong came from the same institution. There were two top-ranking authors, Lee K.-C. and Cetintas S., working in industries (Alibaba Group and Yahoo Research Labs, respectively) rather than in universities, so it can be inferred that social media research has practical implications and attracts attention from both academic institutions and businesses.

**Table 2.2**

*The Top 30 Authors Based on Eigenvector Centrality*

Ranking	Author	Institution	Region	Eigencentality	Degree
1	Grewal D.	Babson College	US	1	10
2	Ludwig S.	University of Surrey	UK	0.862782	7
3	Ordenes F.V.	University of Massachusetts Amherst	US	0.862782	6
4	Wetzels M.	Maastricht University	Netherlands	0.862782	6
5	Tan Y.	University of Washington	US	0.787946	13
6	Mahr D.	Maastricht University	Netherlands	0.767891	5
7	Ruyter K.D.	City University of London	UK	0.767891	5
8	Stephen A.T.	University of Oxford	UK	0.635348	13
9	Whinston A.B.	University of Texas at Austin	US	0.63324	7
10	De Ruyter K.	King's College London	UK	0.633054	4
11	He S.	University of Connecticut	US	0.601871	6

12	Shin D.	Arizona State University	US	0.548235	5
13	Lee G.M.	University of British Columbia	Canada	0.548235	5
14	Lee K.-C.	Alibaba Group	US	0.548235	5
15	Cetintas S.	Yahoo Research Labs	US	0.548235	5
16	Kumar V.	Mudra Institutions of Communications	India	0.518181	9
17	Eisingerich A.B.	Imperial College London	UK	0.502584	8
18	Hewett K.	University of Tennessee	US	0.499042	7
19	de Oliveira Santini F.	UNISINOS	Brazil	0.423651	5
20	Chau M.	University of Hong Kong	HK	0.423651	5
21	Li T.M.H.	University of Hong Kong	HK	0.423651	5
22	Pinto D.C.	NOVA University Lisbon	Portugal	0.423651	5
23	Wong P.W.C.	University of Hong Kong	HK	0.423651	5
24	Xu J.J.	Bentley University	US	0.423651	5
25	Sampaio C.H.	Pontifical Catholic University of Rio Grande Do Sul	Brazil	0.423651	5
26	Yip P.S.F.	University of Hong Kong	HK	0.423651	5
27	Ladeira W.J.	UNISINOS	Brazil	0.423651	5
28	Herter M.M.	European University	Portugal	0.423651	5
29	Babin B.J.	University of Mississippi	US	0.423651	5
30	Hosanagar K.	University of Pennsylvania	US	0.386806	7

### *c. Profiles of Top Authors*

Coauthorship network mapping of the leading authors can paint a more vivid picture of how they achieved significant influence in the network. Stephen A.T. and Tan Y. were the two authors that ranked first on the degree centrality measure (Table 1), and Grewal D. was ranked first based on the eigenvector centrality measure (Table 2). Table 2.3 shows the research areas of these leading authors as derived from our analysis.

**Table 2.3**

#### *Research Areas of Top Authors*

Author	Degree	Eigen	Research Area
Tan Y.	13	0.787946	Social networks; Information systems management
Stephen A.T.	13	0.635348	Digital marketing; Consumer behaviour

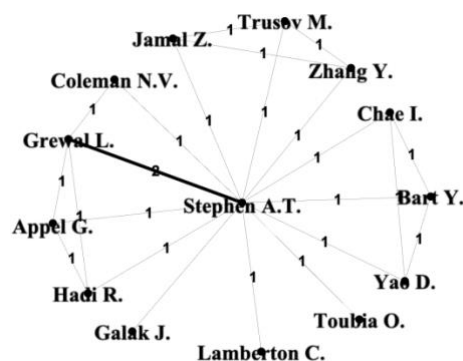
Grewal D.	10	1	Retailing; Branding; Consumer research
Kumar V.	9	0.518181	Branding; Customer relationship management; Firm performance
Ghose A.	9	0.23274	Mobile platforms; Big data analytics; Digital marketing
Eisingerich A.B.	8	0.502584	Technology and digital marketing
Gu B.	8	0.265639	Social networks; Online platforms
Gray P.H.	8	0.160028	Social networks; Information systems; Online communities
Ludwig S.	7	0.862782	Online reviews; Text analysis
Whinston A.B.	7	0.63324	E-commerce; Information systems
Hewett K.	7	0.499042	Branding; Marketing strategy
Hosanagar K.	7	0.386806	Internet marketing; Search engines
Abbasi A.	7	0.310759	Predictive analytics; Machine learning
Kane G.C.	7	0.233184	Social media; Digital business; Healthcare IT
Oestreicher-Singer G.	7	0.179361	User engagement; E-commerce; Social networks
Ordenes F.V.	6	0.862782	Text analysis; Digital marketing; Services research
Wetzels M.	6	0.862782	Online reviews; Supply chain management; Digital marketing
He S.	6	0.601871	Social media analytics; Online advertising
Yan L.	6	0.384158	Social media in healthcare; Big data analytics
Rand W.	6	0.317	Social media analytics; Artificial intelligence
Majchrzak A.	6	0.289172	Digital innovation; Information systems research
Vir Singh P.	6	0.179135	Information systems research; Digital marketing
Rishika R.	6	0.175425	Information systems research; Digital marketing; Online communities
Bezawada R.	6	0.175425	Multichannel marketing; Social media analytics
Van Iddekinge C.H.	6	0.165472	Job performance; Social media in personnel selection
Roth P.L.	6	0.165472	Personnel selection
Chan H.K.	6	0.164777	Supply chain; Operation management
De Valck K.	6	0.164777	Virtual communities; Digital marketing; E-word-of-mouth
Wiertz C.	6	0.133204	Digital marketing; Consumer behavior
Mahr D.	5	0.767891	Digital services; Online communities
Ruyter K.D.	5	0.767891	Services marketing; Online communities
Shin D.	5	0.548235	Information systems research; Big data analytics
Lee G.M.	5	0.548235	Information systems; Social media analytics
Lee K.-C.	5	0.548235	Machine learning
Cetintas S.	5	0.548235	Machine learning
de Oliveira Santini F.	5	0.423651	Customer relationship; Branding
Chau M.	5	0.423651	Information systems research; Data mining
Li T.M.H.	5	0.423651	Digital mental health
Pinto D.C.	5	0.423651	Consumer behavior; Social marketing; Marketing analytics
Wong P.W.C.	5	0.423651	Suicidal behavior
Xu J.J.	5	0.423651	Social media analytics; Business intelligence
Sampaio C.H.	5	0.423651	Customer behavior research; Branding
Yip P.S.F.	5	0.423651	Suicide prevention and population health
Ladeira W.J.	5	0.423651	Customer relationship; Consumer behavior
Herter M.M.	5	0.423651	Consumer behavior; Social marketing; Digital marketing



Stephen A.T. coauthored with 13 authors (Figure 2.4), and among them only Grewal L. coauthored with him more than once. This mapping shows us an evenly dispersed network where most authors in Stephen A.T.'s network except himself coauthored with other authors no more than once in one publication. However, the network density was 0.253, markedly higher than that of the whole coauthorship network (0.005). Moreover, his network included authors from only three regions: ten from the United States, three from the United Kingdom (including Stephen A.T.), and one from Singapore. Therefore, it can be inferred that this is a highly concentrated subnetwork in terms of the coauthors and geographic regions relative to the whole network, with 595 authors from 27 regions. Stephen A.T. focused on digital marketing and consumer behaviour research, which are also mainstream research topics in social media and business.

**Figure 2.4**

*The Coauthorship Network of Stephen A.T.*



Similarly, Tan Y. also had an evenly dispersed and centralized coauthorship network (Figure 2.5), with 14 authors from just two regions (nine from the United States

and five from China). These 14 authors coauthored five publications, with a network density of 0.264, significantly higher than that of the overall coauthorship network (0.005). The subnetwork densities of Stephen A.T. and Tan Y. suggest that their subnetworks were more concentrated whereas the overall network was more generally dispersed with a significantly lower network density. Tan Y.'s research concentration lay in social networks and information systems management, which are as popular and important as topics related to digital marketing. Although both Stephen A.T. and Tan Y. were top-ranked authors based on the degree centrality measure, they had no direct connection because their research interests consisted of two different and important topics in social media studies, i.e., marketing versus information systems management.

**Figure 2.5**

*The Coauthorship Network of Tan Y.*

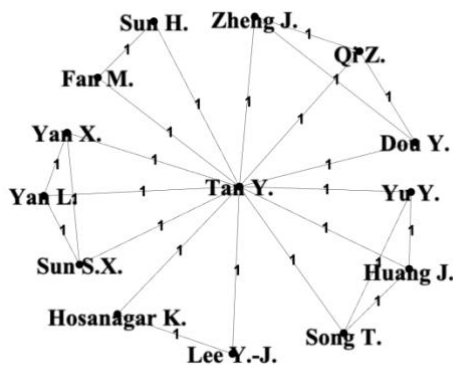
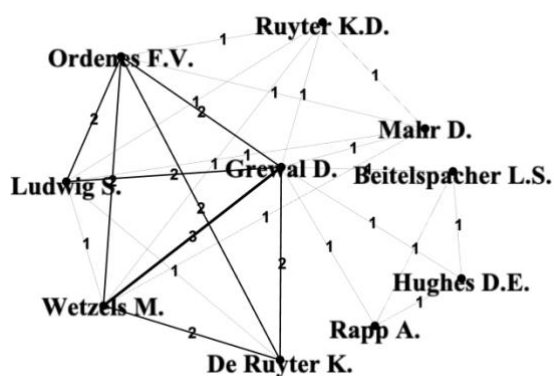


Figure 2.6 shows the mapping for the top-ranked author based on the eigenvector centrality measure, Grewal D., who coauthored with nine other authors from three regions (five from the United States, three from the United Kingdom, and

two from the Netherlands). Four out of these nine authors coauthored with Grewal D. more than once, and six of them coauthored more than once, so the network density (0.556) of this subnetwork was significantly higher than that of the overall network (0.005). This subnetwork spanned across eight institutions: Babson College from the United States and Maastricht University from the Netherlands contributed two authors, respectively, and the other six institutions each contributed one author. A comparison of the networks in Figures 2.6 and 2.7 and their network densities (0.556 versus 0.005) suggested that the coauthorship network was evenly dispersed overall but significant connections existed within subnetworks. Grewal D. studied subsections of marketing such as retailing, branding, and consumer research in which social media plays a proactive role.

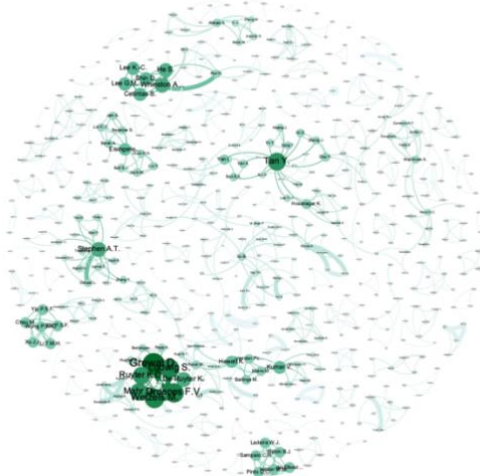
**Figure 2.6**

*The Coauthorship Network of Grewal D.*



**Figure 2.7**

*The Overall Network of Coauthorship (Magnitudes of Nodes and Edges Scaled by Eigencentrality)*



Moreover, to provide further information about the leading authors, we identified and summarized the primary research areas of the top authors in Table 3, including those ranked in the top 30 based on either degree centrality or eigenvector centrality measure. The research areas were identified by collecting and analyzing the titles, keywords, and abstracts of the authors' papers presented on their Google Scholar pages. The most common research areas included social network analysis, information systems management, digital marketing, consumer research, big data analytics, social media analytics, and online community management. There were also some scholars studying the applications and implications of social media for personnel selection, supply chain and operations management, psychological research, and so on. This information can be useful for social media researchers that wish to understand and seek potential opportunities for collaboration with top authors.

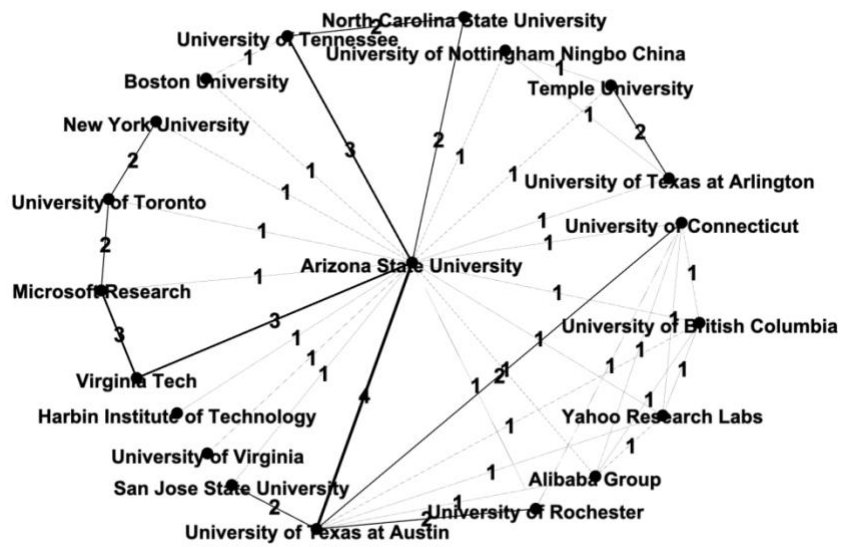
### 2.3.2 The Leading Institutions

We imported the institution  $\times$  institution matrix into Gephi to calculate degree centrality and eigenvector centrality, and visualize the institution coworking network (Yari et al., 2020).

Table 2.4 shows the top 20 institutions based on the degree centrality and eigenvector centrality measures, respectively. There were 18 institutions overlapping in these two rankings, i.e., 18 institutions ranked in the top 20 based on not only the degree centrality but also the eigenvector centrality measure. These top-ranked institutions spanned only four regions, with 19 institutions from the United States, three from Canada, one from the United Kingdom, and one from China. Arizona State University ranked first on both degree centrality and eigenvector centrality measures. Figure 2.8 shows the network of Arizona State University, which had a network density of 0.211, significantly higher than that of the overall network for all 277 institutions (0.014) of the selected articles. Figure 2.9 shows the overall cooperation network (network density of 0.014) in which the magnitudes of nodes and edges were scaled by eigenvector centrality and weights, respectively. Figures 2.8 and 2.9 show that the top-ranked institutions listed generally had their own subnetworks and that these subnetworks were separate but interrelated.

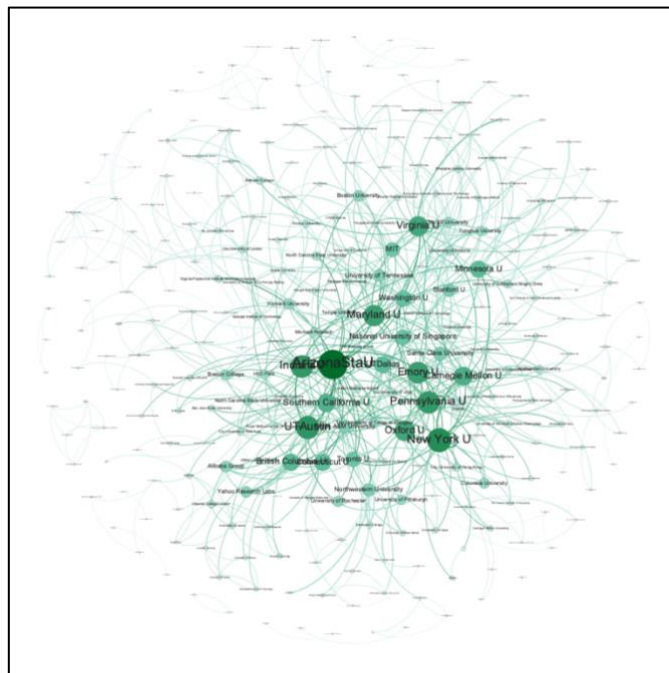
### **Figure 2.8**

*The Cooperation Network of Arizona State University*



**Figure 2.9**

*The Cooperation Network of the 277 Institutions*



**Table 2.4**

*The Top 20 Institutions Based on Degree Centrality and Eigencentrality*

Institution	Region	Degree centrality	Eigencentrality	Ranking (degree/eigen)
Arizona State University	US	19	1	1/1
Indiana University	US	18	0.726328	2/5
University of Maryland	US	17	0.786522	3/2
New York University	US	17	0.729653	4/4
University of Southern California	US	16	0.565993	5/12
University of Washington	US	16	0.481596	6/19
University of Texas at Austin	US	15	0.734274	7/3
University of Pennsylvania	US	15	0.673255	8/6
University of Virginia	US	15	0.636897	9/8
University of Oxford	UK	13	0.630335	10/9
Massachusetts Institute of Technology	US	13	0.510401	11/16
University of Minnesota	US	13	0.50368	12/17
Emory University	US	12	0.657529	13/7
University of British Columbia	Canada	12	0.611253	14/10
University of Texas at Dallas	US	12	0.526084	15/15
Carnegie Mellon University	US	11	0.544834	16/14
University of Toronto	Canada	11	0.499349	17/18
North Carolina State University	US	10	0.554654	18/13
University of Tennessee	US	10	0.430894	19/21
McGill University	Canada	10	0.313286	20/22
University of Nottingham Ningbo China	China	10	0.28391	21/23
University of Arizona	US	10	0.251136	22/24
Santa Clara University	US	9	0.464119	23/20
University of Connecticut	US	8	0.585608	24/11

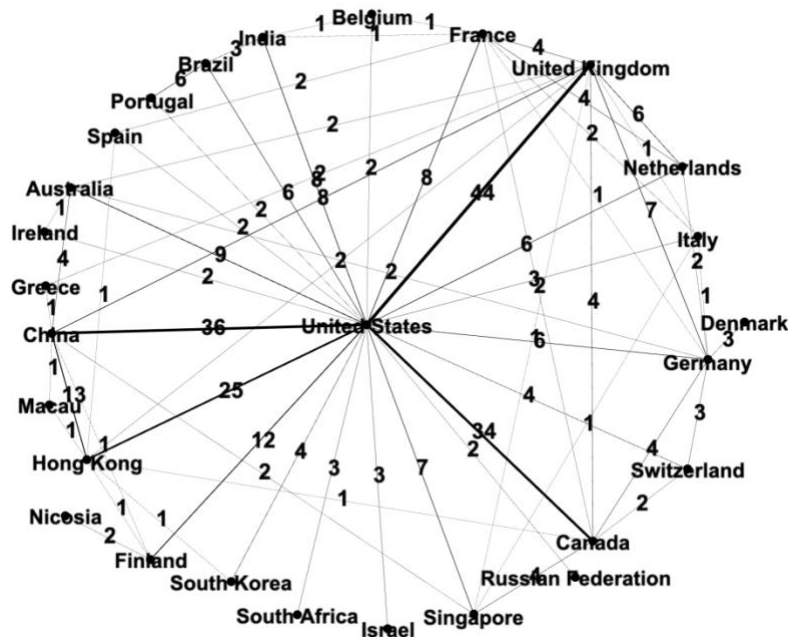
### 2.3.3 The Leading Regions

We imported the region  $\times$  region matrix into Gephi to analyze the region network of our selected articles. The results showed that there were 27 regions in the network with a network density of 0.182. Table 2.5 shows that the top ten regions based on the degree centrality measure were also the top ten regions based on the eigenvector centrality measure. The United States ranked first on both measures, far ahead of the other regions and followed by the United Kingdom, France, Germany, Canada, Hong Kong, China, Italy, Singapore, and Australia. Figure 2.10 shows a graphical

representation of the network layout of region cooperation, which can also be viewed as a U.S.-based subnetwork because the United States is central in the layout and has connections with most of regions in the network. Specifically, the United States connects to the United Kingdom, China, Canada, and Hong Kong with an edge weight of more than 20.

**Figure 2.10**

*The Cooperation Network of the 27 Regions*



**Table 2.5**

*The Top 10 Regions Based on Degree Centrality and Eigenvector Centrality*

Region	Degree centrality/Ranking	Eigencentality/Ranking
United States	22/1	1/1
United Kingdom	11/2	0.722364/2
France	9/3	0.589811/3
Germany	9/3	0.584091/4
Canada	7/7	0.538919/5
Hong Kong	8/5	0.480792/6
China	8/5	0.475935/7



Italy	5/8	0.437389/8
Singapore	5/8	0.419551/9
Australia	5/10	0.393788/10

## 2.4 Thematic Analysis

We conducted PageRank analysis and clustering analysis on the selected articles, i.e., nodes in the network, and article citations and cocitations, i.e., edges in the network, to identify the articles' research themes, i.e., Research Question 2. We exported the CSV data from *Scopus* and then developed the bibliometric data using Bibexcel (Persson et al., 2009) to transform the CSV data into the NET format, before importing the data into Gephi (Gephi, 2013) to perform the calculations and network visualization.

### 2.4.1 PageRank Analysis

In addition to citation analysis, Ding et al. (2009) argued that PageRank is a measure of prestige, not just popularity, because it computes not just an article's citation frequency but also the number of times the article is cited by other highly cited articles. Our analysis results indicated that out of the 240 articles, the 226 cocited articles had PageRank values ranging from 0.0025 to 0.032. Table 2.6 shows the top ten articles based on the PageRank analysis; the higher the PageRank, the more prestigious the article. However, a higher citation number does not necessarily correspond to a higher prestige rank, i.e., PageRank. The top-ranking articles were published in eight journals, with six articles in journals focusing on marketing management, two focusing on operations management, one focusing on information management, and one focusing on organization management. This implied that marketing management was the discipline most associated with prestigious social media articles. We also identified the

research themes of these prestigious research articles. Online content analysis is a mainstream research method many marketing and information researchers use. Social-media-based social networks are also an important topic, especially given how social ties and social-learning-related studies are rooted in social networks. The mechanism of information dissemination is another common research focus. These findings can be useful for future social media researchers building their research foundations and wishing to find innovative directions for future research.

**Table 2.6**

*The Top 10 Articles Based on PageRank Analysis*

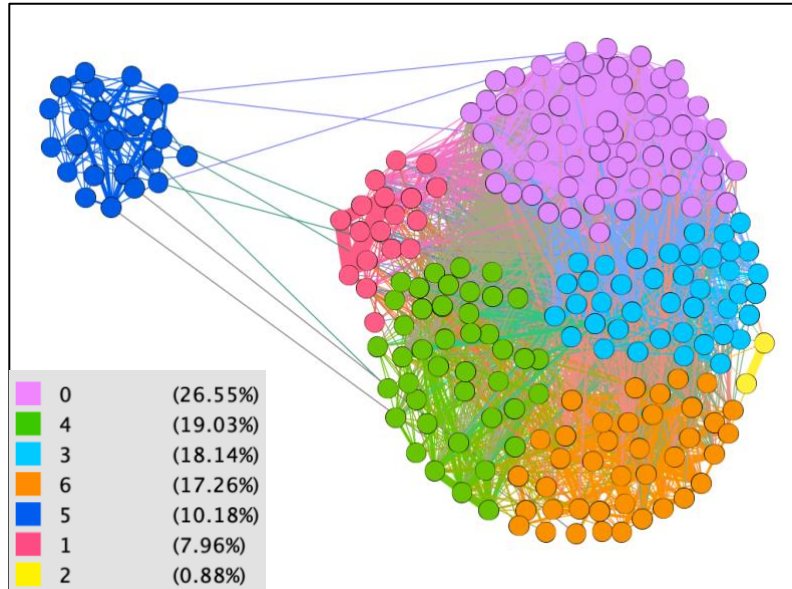
	Article	Research Theme	Journal	Citation Frequency
1	Zhang & Godes, 2018	online social ties	Marketing Science	6
2	Zhong & Schweidel, 2020	online content, topic model	Marketing Science	2
3	Zhang et al., 2015	social learning	Marketing Science	38
4	Yang et al., 2019	user-generated content	Information Systems Research	12
5	You et al., 2015	e-word-of-mouth	Journal of Marketing	181
6	Yazdani et al., 2018	reviewers, product sales	Marketing Science	5
7	Zammuto et al., 2007	IT, organization	Organization Science	597
8	Yan et al., 2019	collaborative information sharing	Production and Operations Management	12
9	Yoo et al., 2016	information diffusion	Journal of Operations Management	58
10	Wang et al., 2019	online content spread	Journal of the Academy of Marketing Science	5

## 2.4.2 Clustering Analysis

We conducted clustering analysis using the function of “modularity” with the default Louvain algorithm in Gephi (Gephi, 2013). Of the 240 selected articles in our sample, we focused on the 226 that other articles cocited within the sample. The analysis revealed that there were seven clusters (Figure 2.11) in the 226 articles. In Figure 2.11, each node represents one article, and an edge between the two nodes indicates that they were cocited at least once. The more times two articles were cocited, the more likely they were to be assigned to the same cluster, i.e., labelled with the same colour. The visual representation in Figure 2.11 also shows how articles between clusters were cocited. Except for Cluster 5, articles of clusters were fairly close to one another, indicating that articles in the other six clusters were also cocited to some extent. Cluster Zero accounted for the highest proportion of articles, followed by Cluster Four, Cluster Three, Cluster Six, Cluster Five, Cluster One, and Cluster Two with less than 1% of all the articles. We combined these results with the results from the PageRank analysis to identify the research theme of each cluster.

### **Figure 2.11**

*Visual Representation of the Clusters*



### 2.4.3 Thematic Discussion on the Clusters

To analyze and understand the research themes of each cluster, we reviewed and analyzed the top ten articles of each cluster, as Table 2.7 shows. The top ten articles were selected using the PageRank algorithm in Gephi. By examining the representative articles of each cluster, we found that Cluster Zero had the highest number of articles ( $n = 60$ ) and focused on online content, including online reviews, user-generated content, and branding conversations and their impact on marketing, sales, organizational public relationships, and so on. Cluster One ( $n = 18$ ) focused on the spread and detection of fake news and other uncertain or negative effects of social media on businesses or the public. Cluster Two formed the smallest group ( $n = 2$ ) with only two articles and focused on the impact of social media on employment decisions. Cluster Three ( $n = 41$ ) focused on the mechanism of information diffusion and content sharing and their relationships with operational and marketing management efficacy. Cluster Four ( $n = 43$ ) paid attention to how social media influences organizational

performance outcomes, including organizational learning and innovation, customer satisfaction, financial market performance, and employment relationship effectiveness. Cluster Five ( $n = 23$ ) focused on external information management and online interactions between firms and individuals by applying text mining and deep learning methods. Finally, Cluster Six ( $n = 39$ ) was concerned with how information aggregation through social media changes stakeholder engagement activities and organizational engagement in market prediction, financial market reactions, and so on.

**Table 2.7**

*Top-ranking Articles in Each Cluster*

Cluster 0	Cluster 1
Zhang & Godes, 2018	Papanastasiou, 2020
Zhong & Schweidel, 2020	Oh et al., 2013
Zhang et al., 2015	Moravec et al., 2020
Yang et al., 2019	Krasnova et al., 2015
You et al., 2015	Hildebrand et al., 2013
Yazdani et al., 2018	Naylor et al., 2012
Yan et al., 2019	Moravec et al., 2020
Cluster 3	Cluster 4
Yoo et al., 2016	Zhan et al., 2020
Wang et al., 2019	Wang et al., 2020
Wei et al., 2020	Tóth et al., 2019
Yoo et al., 2020	Yiu et al., 2021
Peng et al., 2018	Tang et al., 2019
Pechmann et al., 2020	Steinhoff et al., 2019
Schulze et al., 2014	Schmidt et al., 2020
Cluster 5	Cluster 6
Weingarten & Berger, 2017	Zammuto et al., 2007
Zhang et al., 2017	Xu & Zhang, 2013
Valsesia et al., 2020	Toubia & Stephen, 2013
Ordenes et al., 2019	Vaast et al., 2017
Shin et al., 2020	Shore et al., 2018
Ordenes et al., 2017	Vaast et al., 2013
Wang et al., 2020	Qiu & Kumar, 2017
Cluster 2	

***Cluster Zero: Online Opinions and Their Impacts on Customers***

The major research topics of the representative articles of this cluster were word of mouth, user-generated content, and online reviews, all of which are online opinions in different forms. The studies in this cluster examined how and why online opinions influence behaviours such as customer decision-making and engagement.

Opinions from online social networks were considered sources of information signals for customers. They need to learn about the online community before taking its opinions into consideration, especially when customers have more unidirectional relationships than bidirectional relationships within the community; this process is known as social learning (Zhang & Godes, 2018). Social learning from the online community influences customers' purchase decisions and online activity engagement and thus affects companies' revenue prediction (Song et al., 2019) and sales or web page traffic performance (Yazdani et al., 2018; You et al., 2015). In addition, studies have shown that there are four major factors that influence customers' interpretation of online content: (a) online opinion characteristics (e.g., content sentiment, post volume and valence, reviewer identity; Yang et al., 2019; Yazdani et al., 2018); (b) social network features (e.g., social ties, relationship types, i.e., friends or strangers, and the homogeneity or heterogeneity of networks; Zhang & Godes, 2018; Yan et al., 2019); (c) the method of delivery of online opinions (e.g., by sponsored search or social media endorsement; Sun et al., 2020); and (d) customer characteristics (e.g., past experiences with the online community, deal sensitivity, purchasing habits; Rishika et al., 2013).

Overall, in the development of strategies for online marketing involving different kinds of social media, organization managers need to prioritize customer profitability, which is the antecedent to organizations boosting customer engagement (Rishika et al., 2013).

### ***Cluster One: The Negative Side of Social Media***

This cluster was concerned primarily with the negative or uncertain side of social media in relation to both businesses and the public. Several representative articles focused on the spread of fake news on social media platforms, intervention systems for flagging fake news, fact-checking approaches, and platform policies for mitigating the detrimental impact on users (Moravec et al., 2020; Papanastasiou, 2020). Moreover, Oh et al. (2013) found that the three most important factors that motivate rumor diffusion are a lack of a clear information source, personal involvement, and anxiety. Similarly, applying information process cognition, Minas and Dennis (2020) found that confirmation bias, i.e., people tend to believe what they already are inclined to believe, is pervasive. Furthermore, there are some uncertain effects of social media on businesses and customers. According to social comparison theory, following friends on social networks can affect cognitive well-being and increase reactive self-enhancement because of envy (Krasnova et al., 2015). Finally, there are no conclusive findings on whether displaying demographic characteristics of participants in online interactions can affect the decision-making of potential customers (Naylor et al., 2012).

### ***Cluster Two: The Effect of Social Media on Employment Decisions***

This cluster comprised two articles only. They examined the adverse effects of personal social media use on job application, and offered insights into the validity of

using social media to assess potential employees during recruitment (Roth et al., 2016; Van Iddekinge et al., 2016).

### ***Cluster Three: Online Content Sharing and Management Efficacy***

Cluster Three and Cluster Zero both discussed online content and its effects, but Cluster Three concentrated more on the effects of online content on corporate management efficacy, whereas Cluster Zero focused on individuals and corporate customers. Content sharing mechanisms, their determinants, and their effects on important management aspects, including operational and marketing efficacy, were extensively discussed in this cluster. The rate of information diffusion efficiency can affect the operational efficacy of humanitarian organizations, especially under uncertain and complex circumstances. Yoo et al. (2016) applied information diffusion theory to investigate the determinants of efficient diffusion in social media and found that the determinants include where the information originated from (inside or outside of the platform), who originated the information, and when the information was spread. Such determinants were expanded to include considerations of social network size (hub users with more social ties to others can achieve more effective information dissemination) and content characteristics (content with stronger connections with followers' personal lives and higher emotional valence can be more impactful; Wang et al., 2019). To promote online user engagement and improve online operational efficacy, some other articles in this cluster examined user incentives for generating and sharing content. For example, Wei et al. (2021) found that users that follow more people generate less content because they spend much more time on others' content and on



dealing with conflicting information. Yoo et al. (2020) also found that content sharing may encourage general users, especially those users at high risk of receiving obsolete information, to become followers of an organization. In addition, to improve online marketing efficacy, some articles addressed the effect of network overlap, e.g., Peng et al. (2018) found that social network overlap has positive but decreasing effects on content sharing because, over time, many common or mutual followers share similar content. However, Schulze et al. (2014) suggested that the sharing mechanism of online games promotion is likely ineffective in promoting utilitarian products. Self-disclosure as a specific kind of content sharing can have a positive effect on strengthening social ties in groups with demographic differences (Pechmann et al., 2020). Moreover, social networks with rich information flows can positively influence employment management efficacy in terms of work performance and job security (Wu, 2013).

#### ***Cluster Four: Social Media and Organizational Performance Outcomes***

The use of social media can affect different organizational performance outcomes. For instance, the use of social media affects organizational learning and product innovation through various mechanisms, and there are enablers that can strengthen the link between these mechanisms and organizational innovation performance (Zhan et al., 2020). Furthermore, customer satisfaction management (Wang et al., 2020) and online customer relationship cultivation (Steinhoff et al., 2019) have received much research attention, and the findings indicate that social media's impact on customer satisfaction is contingent on different characteristics of external stakeholders, and that online customer relationships can be enhanced by examining

customers' characteristics. Furthermore, continued social media connectivity after work hours, commonly considered the dark side of social media, can affect human resource management performance in terms of indicators such as employee turnover intention (Tang et al., 2019). From the perspective of supply chain performance management, there has been evidence suggesting that the intensity of suppliers' social media activities is positively related to supplier attractiveness (Tóth et al., 2019). With regard to financial market performance, stock returns are associated with social media activities (e.g., Twitter responses to supply chain glitches; Schmidt et al., 2020). Meanwhile, social tagging as a novel way to share categorized online content can help measure brand performance and predict financial returns (Nam & Kannan, 2014).

#### ***Cluster Five: Social Media and Organizations' External Information Management***

Customer reviews, user-generated content, firm-generated content, and motivations for and actions of generating and sharing such online information on social media are prevalent in organizations' external information management. Specific content characteristics are important; whether an event occurred in the past or will occur in the future affects users' propensity to share and discuss it. This can be explained by psychological drivers, namely affective arousal and self-presentation; people are more willing to talk about topics that reflect well on them or about future experiences, which have greater affective arousal effects (Weingarten & Berger, 2017). Moreover, content characteristics are important in social media because rhetorical styles, cross-message compositions, and image-based content can stimulate online content sharing (Ordenes et al., 2019). One article in this cluster suggested that blanket and noncustomized firm-

generated content can exacerbate the adverse effects of online content sharing, causing customers to unfollow the firm's social media pages and thus reducing the firm's sales in the long run (Wang et al., 2020). To maintain a positive influence on potential customers through social media, organizations should choose microinfluencers according to established criteria, e.g., microinfluencers that follow fewer others are likely to enjoy greater autonomy and influence (Valsesia et al., 2020). Finally, to gain better insights from the spread of information outside of organizations, Shin et al. (2020) adapted deep learning and text mining methods to enhance the understanding of unstructured visual and textual information, and Ordenes et al. (2007) explored the use of implicit and explicit sentiments through the theoretical lens of speech act theory.

#### **Cluster Six: Social Media Affordances**

The concept of affordance has been embraced and theorized in information systems research; it broadly corresponds to the action possibilities and opportunities coming from the actor engaging with the focal technology (Faraj & Azad, 2012). Social media affordance may vary for different actors because of their different characteristics, intentions, and contexts (Faraj & Azad, 2012; Leonardi, 2013). One of the core articles of this cluster identified five different forms of social media affordances and discussed how these affordances play an important role in organizational changes (Zammuto et al., 2007). Another article presented the link between social media affordances and forms of organizing collective engagement by using the concept of connective action, which refers to actors collaborating to generate and share online content on the basis of a shared mutual interest (Vaast et al., 2017). Information integration, one of the most

important social media affordances, can generate extensive attention to social media and has been shown to be capable of improving the information environment of financial markets for both information receivers and suppliers (Xu & Zhang, 2013). Several articles in this cluster investigated information sharing patterns and their changing impacts. For example, some findings showed that community members of a tiny network can become polarized because users can choose whom to follow, and a new category of actors in the discourse field can emerge because of the dynamic interaction of discursive practices, identity claims, and social media practices (Shore et al., 2018; Vaast et al., 2013). The richness of voluntary information is another critical affordance of social media. Even though it brings virtually no commercial benefit, users are still willing to generate and share online content because of two main motivations: intrinsic utility and image-related utility, where the latter has been found to be a stronger motivator (Toubia & Stephen, 2013). Finally, voluntary information, which can be categorized according to audience size and the presence of online endorsement, can improve the accuracy of predicting market participants (Qiu & Kumar, 2017).

#### **4.5 Cluster Discussion: Alternative Research Directions**

The themes developed from our clusters above offer useful insights that can help scholars identify the popular and dominant research areas in the current literature on social media. Scholars can then continue their ongoing research efforts in these dominant domains. To offer scholars deeper insights to make their research more thorough, we next identify and discuss three research directions that we believe have not received adequate attention in the current literature on social media.

First, existing studies tend to use traditional data collection methods such as laboratory experiments, quasi-experiments, questionnaires, and case studies. Even though these traditional methods can provide valid insights from experienced scholars, they may lack broader generalizability because the conclusions drawn are valid for only a relatively small sample size. Moreover, social media data tend to be unstructured with huge quantities of text, picture, and video information, and even complicated interaction records. Only in Cluster Five were there some articles with an emphasis on advanced and objective data collection and analysis methods such as deep learning and text mining. To better understand and parse the underlying information from unstructured and complicated social media data, some new and more objective methods, as observed in Cluster Five, should be applied in future research.

Second, we suggest that future research pay attention to the different contexts of social media usage. Our findings showed that most of the articles across the clusters studied social media from an individual perspective; only a few did so from corporate or other (e.g., function, sector, network) perspectives. Investigation of the mechanisms underpinning individuals' social media usage is inevitable, but studying the applications and implications of social media beyond the context of individuals will yield valuable additional insights. For example, social media should play different roles in manufacturing versus service industries and business-to-business versus business-to-customer businesses. With regard to business functions, marketing management and information management are two dominant areas for social media research, but other areas such as operations management, strategy management, and human resource

management should also be further studied to develop insights specific to their unique functional environments.

Finally, whereas scholars in general recognize that social media usage can improve corporate performance, very few recognize the role of social media in dealing with negative events. For example, Elliott et al. (2018) demonstrated that investors tend to have more faith in firms whose CEOs have communicated negative news with investors via their personal Twitter accounts before disclosing the news on other official channels. Given the increasingly uncertain global environment, businesses will face disruptions caused by many different events from wars to trade disputes. With better knowledge of social media, businesses will grow in their capacity to communicate with their stakeholders on such events, their implications, and their solutions. In addition, social media information (e.g., anecdotal user comments) can be used for predicting service or product problems and their negative effects on customer satisfaction, thereby helping businesses prevent or solve such problems with a more proactive approach.

## 2.5 Conclusions

Social media research has been established as an important and trendy research area in the business domain, as evidenced by the increasing number of high-quality publications in the past several years. As such, a comprehensive literature review based on extant research can play an important role in providing a comprehensive road map for future stakeholders. In this study, by using network and content analyses, we identified the leading social network in social media research. To construct this network, we charted the leading authors, institutions, and regions in social media research and

identified the research areas and interests of the leading authors. Moreover, based on citation and cocitation analysis and content analysis, we identified seven research clusters and summarized the research theme for each of the clusters, thus identifying the dominant research areas in the existing literature. With our cluster results, we proposed three research directions for future research. The overall contributions of this research are as follows.

First, by ranking the authors, institutions, and regions based on a network analysis of high-quality social media publications, we contribute by charting the scholarly leadership and mapping the social network of social media research. Furthermore, we identify the research areas of each of the top-ranking authors to provide extra information for future stakeholders to track and tap into the top authors' research networks. With this information about the leading authors, institutions, and regions in social media research, stakeholders can better identify interesting opportunities for future research, in particular those that involve collaborations or networking.

Second, our research encourages future researchers to cooperate with practitioners in industries. Our results provide evidence that there are plenty of authors from within the industry, such as Alibaba Group, with some of them even entering the top ranks. Social media usage is novel for most traditional industries; as such, insights from experienced practitioners are as critical as robust theoretical knowledge. Moreover, social media is constantly evolving alongside technological developments.

We suggest that the way to keep theoretical research and practical application in sync is to create and grasp collaboration opportunities with practitioners.

Third, charting leading institutions and regions that produce high-quality publications also helps stakeholders consider regional characteristics that affect future research directions. Our findings show that many influential institutions are from the United States, and the United States plays a central role in regional-level networks. In fact, social media applications and implications should vary regionally; other scholars in the European and Asian regions should not neglect social media practices originating from their regions or overlook how regionally specific social media practices can have unique effects on organizational performance. With more attention and effort, future stakeholders can reshape the regional-level network of social media research, helping it achieve global relevance.

Fourth, by adopting a combination of citation analysis, cocitation analysis, and content analysis, we were able to conduct thematic analysis to identify seven clusters that covered research themes including online opinions and their impacts on customers, the negative side of social media, the effect of social media on employment decisions, online content and management efficacy, social media and organizational performance outcomes, social media and organizations' external information management, and social media affordances. The results contribute to mapping the extant research and knowledge structure and in providing collective insight into the prevailing research themes of social media publications in top journals. These research themes can guide researchers to avoid more mature and saturated research areas and thus help them



formulate innovative research plans more effectively. Furthermore, with our thematic analysis, we contribute to the literature by presenting future research trends in methods and topics.

Finally, by adopting quantitative and qualitative methods simultaneously, we also make a methodological contribution to understanding literature review methods. We found that quantitative methods of bibliometric and network analyses can allow comprehensive and rigorous analysis, whereas content analysis as a part of thematic analysis can give finer insights into topic details. By combining these two methods, this literature review effectively accomplishes its purpose of mapping the extant research and providing guidance for future research.

However, this study has a few limitations. First, we focused on publications in business journals. Social media can be relevant to a wide range of disciplines, from computer science to engineering management and from education to behavioural science. Future researchers should review publications from a wider range of disciplines to generate more innovative insights for the relevant literature. Second, we investigated business journals focusing on the use of empirical methodologies. Future researchers should also cover journals that publish discussion-oriented articles or theoretical articles with mathematical models. Third, we primarily focused on publications in top journals, but there are likely more high-quality journals overlooked by our selected journal set, such as the Academic Journal Guide 3 and 4 journals (CABS, 2021). With a more extensive and comprehensive journal sample, the social network of social media research can be mapped better. In particular, a more representative

network of institutions and regions can be constructed. The increased number of articles in clusters could, in turn, enable a more accurate charting of the leadership structure in each cluster, offering more thorough information for stakeholders to identify research leaders with more diverse research topics and methodologies.

## **Chapter 3 The Impact of Social Media Investor Sentiment on Firm Performance: Evidence from Corporate Social Irresponsibility Events under the Chinese Context**

### 3.1 Introduction

Corporate social irresponsibility (CSI) events refer to corporate actions that harm the stakeholders' legitimate claims (Strike et al., 2006), and media reporting on CSI becomes the mark for researchers to identify a CSI event (Kölbel et al., 2017; Li & Wu, 2020; Liu et al., 2022). Based on the stakeholder theory and attribution theory, CSI research pays most the attention to how traditional media report on CSI frames the event information and how this CSI event-relevant information influences the stakeholder perception of such events (Roulet & Clemente, 2018; Dorobantu et al., 2017; Wiersema & Zhang, 2013). Some other CSI studies are conducted from the focal firm characteristics as contingency factors in studying the impact of CSI on firm performance. For example, Nardella et al. (2020) studied how social recognition for corporates impacts the stakeholder perceptions of the CSI behaviors, which is measured as the firm reputation. Also, Lo et al. (2018) specifically pay attention to how personal political ties, ownership structure, and social recognition affect the stakeholder perception of environmental incidents as one type of CSI. However, drawing upon the resource dependency theory (Hillman et al., 2009), organizational performance partially depends on the external environment and resources. Moreover, to our best knowledge, no study pays attention to how the external environment impacts the firm performance under the CSI events scenarios. We fill this research gap by investigating

the link between the external environment and firm performance under CSI scenarios.

As a vital part of the corporate external information environment, social media gathers tremendous online opinions and transfers these opinions to the public. A few social media studies pay attention to how social media plays an essential role in marketing management (Alves et al., 2016) and how online opinions impact stock price (Deng et al., 2018; Nguyen et al., 2018). Nevertheless, most previous social media studies are conducted from individual levels, and few are from the corporate level. In this study, we enrich the social media research by conducting the research from the corporate perspective and help corporates understand the impact of the external information environment on firm performance. Specifically, we study the investor opinions generated from online stock message forums and quantify such external information as investor sentiment. In behavioral finance, investor sentiment was defined as a belief and expectation about the future cash flow and investment risks, and investor sentiment is used to explain the overreactions and underreactions in stock markets by underlying in the investor psychology (Barberis et al., 1998; Baker & Wurgler, 2006). Moreover, stock information platforms provide opportunities for investors to express opinions and exchange information. For example, EastMoney as the most popular stock message platform in China generates tons of user generated contents every day. In this study, the social media investor sentiment is defined as the investor expectations and emotions expressed through social media. By analyzing the social media-based investor sentiment before the CSI events, we can identify the impact of such external information on firm performance under CSI scenarios. Moreover, some

studies emphasize actively disseminating information and communicating with stakeholders or shareholders (Jung et al., 2018; Chung et al., 2020; Elliott et al., 2018). In this study, we supplement the previous literature by offering insights on helping corporates understand the external information environment and its impact on firm performance such that corporates can leverage social media as a management and communication tool effectively.

We investigate such linkage between social media investor sentiment and firm performance under CSI by conducting a short-term event study to measure the abnormal stock return caused by CSI events, followed by the firm fixed-effect regression. Specifically, we collect the event data from the RepRisk database, which provides the actual event data in terms of event date and media reach that reports the event. And then, we collect the social media investor sentiment before CSI from CSMAR, which collects and quantifies the investors' online opinions from the most prominent Chinese financial forum, EastMoney. Furthermore, we investigate the interaction effect of internal management and the external information environment and present how corporates can diminish such dependency on the external information environment under negative events scenarios from the agency perspective (Eisenhardt et al., 1989). Our research questions are as follows.

1. Does social media information as an important external information mitigate the negative impact on firm performance from CSI events?
2. Can corporates diminish such dependency on external information by adjusting resource allocation and internal governance?

Our findings show a significantly positive association between social media investor sentiment before CSI and firm performance under CSI events. Moreover, our analysis results suggest that high intangible asset intensity, advertising intensity, and board independency weaken such a positive association. Finally, this positive association is weaker for State-Owned Enterprises.

Our research contributes to the literature and practitioners by showing the critical influence of social media investor sentiment on firm performance during CSI events and provides specific insights on the situations that such an influence from social media investor sentiment is particularly strong. Also, we offer insights to extend the CSI literature from an agency perspective, showing the importance of internal corporate management in reducing agency problems through boosted investor faith in expected firm performance.

## 3.2 Literature Review and Hypothesis Development

### 3.2.1 The impact of social media-based investor sentiment on firm performance

In behavioral finance studies, investor sentiment is argued to present investor perceptions and influence decision-making and information processing (Barberis et al., 1998; Baker & Wurgler, 2006). It has been proved to be an essential factor in predicting stock returns (Chung et al., 2012; Stambaugh et al., 2012), influencing corporate disclosure (Bergman& Roychowdhury, 2008), and enhancing the corporate social performance (Naughton et al., 2019). Previous studies apply proxies to measure investor sentiments, such as the closed-end fund discount (Lee et al., 1991), the consumer confidence index (Bergman& Roychowdhury, 2008; Schmeling, 2009;

Zouaoui et al., 2011), the trading volume (Baker & Stein, 2004) and the dividend premium (Baker& Wurgler, 2004; Naughton et al., 2019), etc. These proxies are developed and used because the investor sentiment could not be measured straightforwardly (Baker& Wurgler, 2007). However, studies have found a direct way to measure investor sentiment in recent years. Investors' social media criticisms reflect real-time emotions and reactions towards corporate activities and performance (Ang et al., 2021; Zhang & Yang, 2021).

Microblog sentiment of general stakeholders is proven to have the predictability of firm performance in sales growth and stock returns since the emotional information on microblogs can be perceived as customers' feedback on products or services. Moreover, the opinion dissemination on the social network can influence other stakeholders' consuming and investing decision-making (Nguyen et al., 2020). To be more specific in microblog sentiment, scholars further indicate that investor sentiment uncovered by social media criticisms can precisely predict the stock return using hourly social media data (Deng et al., 2018) and predict the acquisition decisions since small investor sentiment is an essential source for acquirers to obtain additional valuable information about acquirees corporate governance (Ang et al., 2021). Moreover, in international acquisitions, the sentiment of the host country towards the home country can affect the ownership level as the acquisition outcome (Yiu et al., 2021). In the supply chain management field, the microblog sentiment on stock information-focused social media platforms positively moderates the relationship between supply chain glitches and abnormal stock returns (Schmidt et al., 2020).

Moreover, extant studies indicate that the external information environment influences investment decisions and reduces the agency problems since external information provides an extra channel for investors to evaluate and monitor executive actions (Armstrong et al., 2010; Shroff et al., 2014). Unlike organizations unilaterally communicating with their stakeholders by making announcements and reports, social media as an emerging dual communication channel brings tremendous external stakeholder opinions to organizations. Depending on the external information, organizations make strategical alterations in communication actions and corporate social responsibility actions, etc. (Antweiler & Frank, 2004; O’Leary, 2011). Before making an appropriate and effective strategic adjustment, it is necessary to understand the external stakeholders' opinions, attitudes, etc. As a significant group of stakeholders, investors post their opinions and read other investors' opinions on the stock information-focused social media platform. Social media-based investor sentiment presents the small and retail investor's perceptions of the corporates' managerial activities, financial and social performance, and other fundamentals. Such sentiment is an incremental information source other than official announcements, analyst reports, etc., for investors to monitor and understand firm behaviors and management outcomes. Furthermore, unsophisticated retail investors account for a dominant proportion. Small and retail investors are prone to be conceived as uninformed investors with negligible ability to impact firm management and performance in contrast to institutional investors and analysts as informed investors (Chen et al., 2007; Menzly& Ozbas, 2010). However, with the emergence of social media, small investors are able to express their opinions



in real-time without costing any fortune. Meanwhile, small and retail investors can easily access and be affected by these publicly posted opinions since individuals are more willing to believe information that is easy to process instead of finding the important but sophisticated facts (Kahneman, 2011). Social media-based investor sentiment has excellent potential to impact firm performance, and organizations need to understand such impact from the external information environment.

### 3.2.2 The impact of social media-based investor sentiment on stock reactions towards

Corporate social irresponsibility (CSI) is defined as the "set of corporate actions that negatively affect an identifiable social stakeholder's legitimate claims" (Strike et al., 2006) or "some observer needs to judge whether a firm's actions have negatively affected a stakeholder's legitimate claims" (Kölbel et al., 2017). The essential characteristic is that CSI negatively impacts stakeholders' legitimate claims. As such, drawing upon the legitimacy theory and stakeholder theory, previous studies indicate that CSI breaks the social contract with stakeholders. When the media report the CSI events, stakeholders take sanctioning actions, such as ending the transactional relationships, boycotting the focal firm, and withdrawing trust in the firm management. Subsequently, these sanctions will cause corporate reputation damage, sales decrease, and cost increase because of production delays, for example. Finally, stakeholders punish the firm for CSI by hurting the corporates' earnings and stock returns (Carberry et al., 2018; Trautwein & Lindenmeier, 2019; Nardella et al., 2020; Liu et al., 2021). Consistent with previous studies, we propose our baseline hypothesis that CSI events will cause a significant negative reaction in stock returns.

*H0*: The abnormal stock return caused by CSI is significantly negative.

Investors make investment decisions based on the anticipation and expectations based on the current information. Previous studies investigated how different CSI event characteristics affect stakeholders to react differently, rooting on the attribution theory. Kölbl et al. (2017) indicate that a higher frequency of CSI events causes higher financial risk, and this relationship is more pronounced when the reporting media outlet is in high reach. Liu et al. (2022) found that when a CSI news covers a single violator, the stakeholder punishment will be harsher since stakeholders attribute such CSI events to internal causes and thus perceive them as more blameworthy. Nardella et al. (2020) discovered the impact of previous social performance on organizational reputation damage due to CSI events. That is, highly socially responsible firms will be damaged in reputation when the CSI event is verified culpable by the court. However, the least socially responsible firms will suffer in reputation when the CSI event occurs even without verifying culpability. Previous studies focus on the impact of CSI events related or CSI focal firm related characteristics, such as CSI frequency and firm reputation, respectively. However, there should be other contingency factors that may impact investors' information processing and decision-making.

In this study, social media-based investor sentiment prior to the CSI event refers to the online opinion sentiment detected from posts on online stock message forums prior to CSI events occurrence. Extant studies indicate that the external information environment influences investment decisions and reduces the agency problems because external information provides an extra channel for investors to evaluate and monitor

managerial actions (Armstrong et al., 2010; Shroff et al., 2014). The social media investor sentiment prior to the CSI event as important external information may be considered in predicting the future performance since it reflects the firm performance and management quality prior to the CSI. More importantly, this information is easy to access and process for retail investors. On the other side, grounded on the nature of the agency problem, this problem shows up with CSI events being revealed because corporate managers as agents have not prevented stakeholder value damage from CSI events. To reduce such agency conflicts, it is reasonable for investors to seek additional external information to help them make investment decisions (Shroff et al., 2014). We propose that social media-based investor sentiment impacts investors' information processing and decision-making. In other words, the firm performance variation caused by the CSI event is partially dependent on social media-based investor sentiment. If such sentiment is high, which means there are more positive posts or fewer negative posts, investors may tend to boost faith in the corporates' future management and performance. This faith can mitigate part of the negative impact of CSI. If such sentiment is low, which means there are more negative posts or fewer positive posts, investors' faith may be damaged. They may predict a non-positive future performance and make investment decisions accordingly. Eventually, the negative impact caused by CSI may be exaggerated.

*H1:* social media-based investor sentiment before CSI is positively associated with the abnormal stock return caused by CSI.

### 3.2.3 Firm-level characteristics relevant to the external dependency and agency

problems

Firm performance is dependent on the social media-based investor sentiment because such external information is a supplementary source for the investor to evaluate the managerial actions and predict the future performance. In this case, if corporates proactively disseminate information to keep retail investors as informed as possible, investors can make decisions with less uncertainty and then be less impacted by other investor sentiments. Based on the informative view of advertising, Cheong et al. (2021) indicate that advertising can diminish the information asymmetry problem and help individual investors in financial markets learn about firms with the most resource constraints. Moreover, advertising can increase the visibility of overall corporate performance to investors and has been proven to be a valid proxy of firm visibility (Grullon et al., 2004; Singh et al., 2005). Even though advertising is mainly directed to customers, the information covered by advertisements is also accessible to investors (Chemmanur & Yan, 2009). More importantly, advertising information serves as an indirect signal to indicate a high-quality corporate (Kirmani & Rao, 2000). As such, we propose that when a firm proactively improves its visibility through advertising, the dependency of firm performance on external information such as social media-based investor sentiment may be diminished.

*H2: The high advertising intensity of the CSI event focal firm weakens the positive association between social media-based investor sentiment before CSI and the abnormal stock return caused by CSI.*

Intangible assets encompass external stakeholders' perceptions of the corporate, such as corporate reputation, legitimacy, customer satisfaction, corporate trust, word-of-mouth, etc. (Kreiner & Ashforth, 2004; Miotto et al., 2020; Nunes et al., 2021). The presence of higher intangible assets can act as a quality signal to inform investors that the corporate managerial actions and outcomes are also good. High intangible assets help improve their consumption and investment decisions even under limited information (Luo et al., 2014; Heinberg et al., 2018) because the previous good performance and socially well-recognized status can boost investors' faith in the future performance. As an important internal resource, it may mitigate the external dependency of firm performance reaction towards CSI events on social media-based investor sentiment.

*H3: The high intangible asset intensity of the CSI event focal firm weakens the positive association between social media-based investor sentiment before CSI and the abnormal stock return caused by CSI.*

Considering the resources dependency of firm operations and performance, Chinese State-owned enterprises (SOEs) have more stable external resources to meet their operation demand than non-SOEs and thus have higher organizational resilience (Karolyi & Liao, 2017; Xie et al., 2022). Under the CSI being revealed situations, the preferred treatment for SOEs in terms of superior resource allocation, financial support for innovation, and more favorable tax rates, etc. (Lo et al., 2018; Xie et al., 2022) will not be affected. As such, the entity of SOE presents investors with a strong reason to

have faith that these corporates will survive through negative events with higher resilience and also under smaller stock return variations. Under this faith, the investor will not have enough motivation to seek additional external information sources to make an investment decision and have less chance to swag with other investors' sentiment. So, the dependency of firm performance variation towards CSI events on external information will be mitigated by government ownership.

*H4:* The positive association between social media-based investor sentiment before CSI and abnormal stock return caused by CSI is weakened when the focal firm is a state-owned enterprise.

Ang et al. (2021) demonstrate that social media as an external information source provides incremental value-relevance information in corporate governance and reduces corporate agency problems. However, corporate governance is still significantly associated with addressing agency problems and improving corporate management (Withers & Fitza, 2017; Paniagua et al., 2018). Previous studies indicate that governance experts and shareholder activists show a preference for separating the roles of the chief executive officer and board chairman, and also more independent directors on the board are perceived as effective corporate governance insurance (Peng et al., 2007; Hashim & Devi, 2008; Nguyen & Nielsen, 2010; Dalton & Dalton, 2011; Black & Kim, 2012; Larcker & Tayan, 2016). We propose that more effective internal governance may boost investors' faith in corporates dealing with CSI scenarios and behaving better in preventing stakeholder value damage from such negative events, and

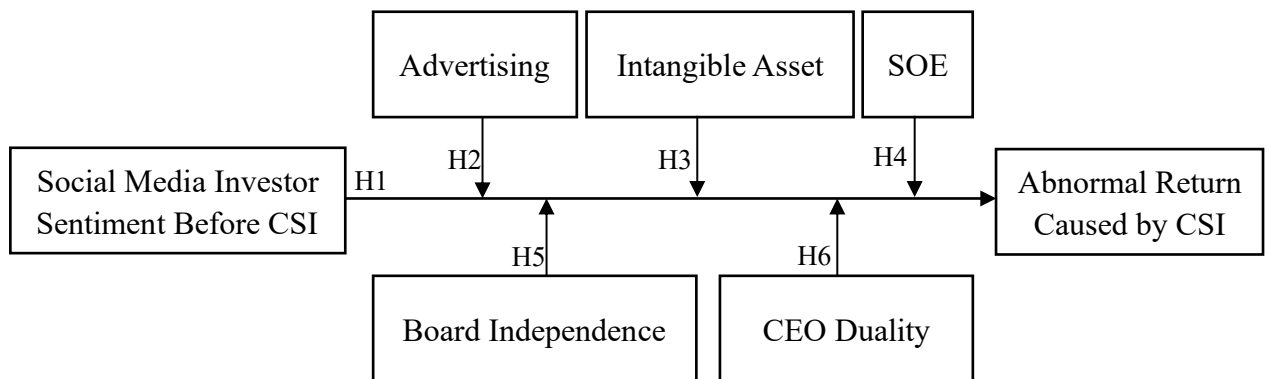
that faith may mitigate the impact on firm performance variance towards CSI events from social media-based investor sentiment.

*H5:* The high proportion of independent directors on the board weakens the positive association between social media-based investor sentiment before CSI and the abnormal stock return caused by CSI.

*H6:* The CEO duality (i.e., CEO and board chairman are separately held) of the focal firm weakens the positive association between social media-based investor sentiment before CSI and the abnormal stock return caused by CSI.

We conduct this research following the conceptual model shown in figure 3.1.

Figure 3.1: Conceptual model



### 3.3 Methodology

#### 3.3.1 Dependent variable: Cumulative Abnormal Return caused by CSI

Following previous studies (Breitinger & Bonardi, 2017; Kölbel et al., 2017; Li & Wu, 2020; Harjoto et al., 2022), we obtain CSI events data for all publicly listed Chinese companies from 2016 to 2020 from a database provided by a Zurich company

RepRisk AG. Based on a big data approach, RepRisk screens and collects a wide range of media coverage on environmental, social and governance (ESG) related negative events in 20 different languages for more than 80,000 listed and unlisted companies, including Chinese companies, on a daily basis. The database firstly captures and screens CSI news by big data techniques. Then a group of RepRisk analysts further analyze and quantify the news in terms of the severity of the event (harshness of the criticism on the event), the reach of source (influence of news source) and novelty (newness of the event). Once the news is identified, the RepRisk analysts will label news with specific pre-defined 28 ESG Issues and identify if the company has violated the United Nations Global Compact (UNGC). Finally, before CSI news is officially published in the RepRisk database, a senior analyst takes charge of a quality assurance check on the news to ensure that the overall analysis is in line with the strict RepRisk rules.

We develop our sample by the following steps. Firstly, we collect all listed manufacturing and service industry firms in China Stock Market and Accounting Research (CSMAR) database and then search CSI events with firms' International Security Identification Number (ISIN) in the RepRisk database. The initial sample includes 1062 CSI news involving 407 firms after excluding duplicates, and the result shows that 407 firms are all from the manufacturing industry. Secondly, we adopt the short-term event study method (Ding et al., 2018) to calculate the abnormal stock return caused by CSI events (there are 2037 listed manufacturing and service firms by 2020 December). We define the news date that is the first time the negative event was reported as the event date 0. Following previous studies (Lo et al., 2018; Brandon-Jones



et al., 2017; Schmidt et al., 2020), we use the three-factor model to estimate an expected stock return for firm  $i$  on day  $t$  and then compare it to the actual stock return (Fama & French, 1993). Specifically, we collect market-related data and firm related data from CSMAR and then conduct the event study to obtain the abnormal stock returns by the following four steps:

$$R_{it} = \alpha_i + \beta_{i1}(R_{mt} - R_{ft}) + \beta_{i2}SMB_t + \beta_{i3}HML_t + \varepsilon_{it}. \quad (1)$$

Where  $R_{it}$  is the return on firm  $i$  for day  $t$ ;  $\alpha_i$  is the intercept of stock  $i$ ;  $R_{ft}$  denotes the risk-free rate on day  $t$ ;  $R_{mt}$  represents the market return of an equally weighted market portfolio on day  $t$ ;  $SMB_t$  is the small minus big (market capitalization) portfolio return on day  $t$ ;  $HML_t$  denotes the high minus low (book-to-market ratio) portfolio return on day  $t$ . To measure the market reaction towards CSI events, we define event day 0 as the first day the CSI event pressed on the media and the event window as a three-day window  $[-1,1]$  (one day before the event day 0, the event day 0 and one day after the event day 0) (Stäbler & Fischer, 2020; Dinner et al., 2019). Following prior studies (e.g., Brandon-Jones et al., 2017; Schmidt et al., 2020), for each event, we consider a 200-day  $[-210, -10]$  estimation window with a 10-day offset prior to the event to avoid spillover effect. Based on the estimation window data, the estimate of  $\hat{\alpha}_i, \hat{\beta}_{i1}, \hat{\beta}_{i2}, \hat{\beta}_{i3}, \hat{S}_{\varepsilon_i}^2$  can be obtained by adopting the OLS (the ordinary least squares estimation). The abnormal stock returns  $A_{it}$  of stock  $i$  on day  $t$  are defined as the difference between actual returns and expected returns as follows:

$$A_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_{i1}[R_{mt} - R_{ft}] + \hat{\beta}_{i2}SMB_t + \hat{\beta}_{i3}HML_t). \quad (2)$$

Considering all  $N$  CSI events in our sample, the average abnormal stock return

$\bar{A}_t$  on day  $t$  is:

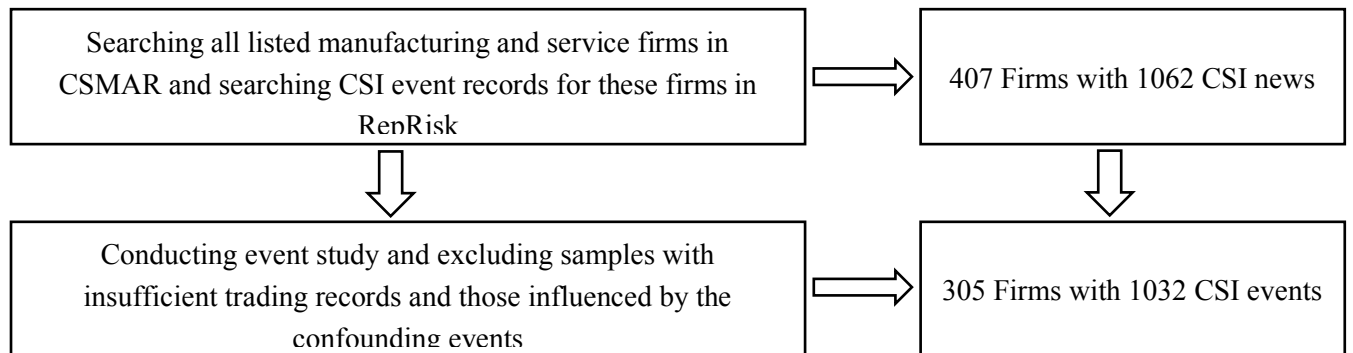
$$\bar{A}_t = \sum_{i=1}^N \frac{A_{it}}{N}. \quad (3)$$

The cumulative abnormal stock return  $CAR(t_1, t_2)$  for a period of  $[t_1, t_2]$  is:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} \bar{A}_t. \quad (4)$$

We exclude samples with an insufficient number of trading records in the estimation period or the event window during the calculation process. Also, we exclude events for which the cumulative abnormal stock returns were calculated for the same period to exclude the impact of the confounding events. There are 1032 CSI events involving 305 firms within our final sample, and the collection process is shown in Figure 3.2.

Figure 3.2 Data collection process



### 3.3.2 Independent variable: Social media investor sentiment before CSI

Following Ang et al. (2021), the social media-based investor sentiment data is also collected from the most popular stock message boards in China, *EastMoney* (guba.eastmoney.com) and Sina (guba.sina.com). China Stock Sentiment in Public Forum Database provided by CSMAR collects investors' posts from EastMoney and

Sina stock message boards and then analyzes the textual content by deep learning-based natural language processing, which performs better than sentiment dictionary, conventional machine learning methods, such as Supported Vector Machine and Naive Bayes. By quantifying the unstructured textual content, the database presents structured post data in terms of post sentiment, post time, comments, thump-up, poster characteristics, etc., for all listed Chinese companies. We collect the number of positive posts, neutral posts, and negative posts on a daily basis for all 305 firms for five years from 2016 to 2020. Following Piñeiro-Chousa et al. (2016) and Domingo et al. (2020), we define the sentiment value for each positive post as 1, each neutral post as 0, each negative post as -1, and then aggregate the sentiment value for each company on a weekly basis. As such, we construct the investor sentiment as the weekly aggregated sentiment for each focal firm one week prior to the CSI event since the impact of investor sentiment on firm performance mainly explains the anomalies for short-term stock returns (Daniel et al., 1998).

### 3.3.3 Moderating factors

There are five moderators in our posited hypotheses: Advertising Intensity, Intangible Asset Intensity, SOE, Board Independency, and CEO Duality. We obtain their data from CSMAR.

*Advertising Intensity.* Because of its informative nature, advertising can be a good proxy for overall corporate visibility to investors (Grullon et al., 2004; Cheong et al., 2021). We use the natural logarithm of annual advertising expenditure a year prior to the CSI event for each firm to measure how much effort the corporate pay to keep its

investors as informed as possible.

*Intangible Asset Intensity.* We obtain the natural logarithm of the intangible asset from the Balance Sheet for each firm a year prior to the CSI event to measure the proxy for firm reputation and stakeholder recognition.

*SOE.* As a dummy variable, we define SOE as 1 if a company is a State-Owned Enterprise and 0 if a company is not a State-Owned Enterprise.

*Board\_Independency.* We define board independency as the ratio of the number of independent directors over the total number of directors on the board.

*CEO\_Duality.* We define if the firm's CEO and board chairman are separately held, CEO\_Duality equals 1, otherwise equals 0.

#### 3.3.4 Control variables

We control the impact of investor sentiment on abnormal stock return from the firm characteristics and CSI news characteristics, respectively. Firstly, in terms of the firm-related characteristics, bigger firms tend to receive more stakeholder and investor attention and more strict scrutiny so that firm size will be controlled (Kölbel et al., 2017). Following Liu et al. (2022), we also control the following firm-related factors that can impact investor perception of corporates' restorative capacity after misconducting. We capture the leverage as the ratio of total liabilities over total assets to measure firm risk, ROA as the ratio of net income over the total asset to measure firm performance, and R&D intensity as the natural logarithm of annual R&D expenditure to measure the future performance expectation. CSR performance is studied as insurance-like protection against corporate misconducting (Godfrey, 2005;

Godfrey et al., 2009), so we control CSR performance with CSR ranking obtained from Hexun CSR reports ([www.hexun.com](http://www.hexun.com)) (Huang et al., 2022). Secondly, we also control for CSI events and news-related characteristics that may affect the perception and reaction of investors and stakeholders on CSI. Liu et al. (2022) reveal that when the CSI event covers multi-violators, the negative impact of CSI on firm performance will be weakened compared to single violators. The negative impact will also be weakened when more than one CSI event is covered in one news. So we also control if the CSI event is covered in multi-substories and multi-violators with dummy variables. We also control the reach of information source (the influence of media reporting the CSI event), the severity of the CSI event (the harshness of criticism on the outcome), and the novelty (how novel the event being reported for the focal firm), because these factors may impact the stakeholders' reaction (Kölbel et al., 2017). Thirdly, we control the number of total posts a week prior to the CSI event for each firm, which is a proxy for the investor's attention to the firm.

### 3.4 Results

#### 3.4.1 Descriptive statistics and correlation analysis

We test our hypotheses with a firm fixed-effect model. Table 3.1 shows the descriptive statistics for all variables, including the number of observations, mean, median, minimum, maximum, and standard deviation. The mean and median of CAR caused by CSI are negative, indicating that CSI events are correlated to the negative market reaction, consistent with our baseline hypothesis. The reason for the high standard deviation of social media-based investor sentiment and total posts may be that

the stock message forum was not popular in earlier years, such as 2016 and 2017, in our sample range. Some sample events match zero social media posts, especially those in earlier years. Table 3.2 presents the correlation coefficients for all variables. The results show a significant correlation between the CAR caused by CSI and the social media-based investor sentiment. The variance of inflation (VIFs) of the explanatory variable is below 3, and the mean VIF is 1.89, indicating no multicollinearity problem.

Table 3.1: Descriptive statistics

Variable	N	Mean	Median	Min	Max	SD
CAR	1032	-1.648	-1.681	-14.13	10.44	3.780
Sentiment	1032	-29.51	0	-1751	882	141.5
Intan_Asset	1032	20.78	20.80	0	23.96	1.883
Advertising	1032	20.66	21.04	16.36	24.77	1.751
SOE	1032	0.473	0	0	1	0.500
Brd Indep	1032	0.384	0.364	0.286	0.625	0.0700
CEO Duality	1032	0.286	0	0	1	0.452
Firmsize	1032	24.02	24.26	17.65	27.47	1.503
ROA	1032	0.144	0.103	-0.784	0.987	0.185
Leverage	1032	0.518	0.559	0.0430	0.976	0.183
RD	1032	10.12	0	0	24.18	10.45
CSR	1032	2.167	2	1	5	0.627
Multiviolators	1032	0.348	0	0	1	0.477
Multisubstories	1032	0.255	0	0	1	0.436
Reach	1032	1.849	2	1	3	0.564
Severity	1032	1.213	1	1	3	0.420
Novelty	1032	1.488	1.500	1	2	0.489
TotalPosts	1032	204.6	16	0	5500	502.2

Table 3.2: Correlation coefficient matrix

	CAR	Sentiment	Intan_Asset	Advertising	SOE	Brd_Indep	CEO_Duality
CAR	1.000						
Sentiment	0.212***	1.000					
Intan_Asset	0.074**	-0.025	1.000				
Advertising	0.086***	-0.046	0.632***	1.000			
SOE	0.028	0.044	0.131***	0.252***	1.000		
Brd_Indep	-0.043	0.040	0.131***	0.260***	0.281***	1.000	
CEO_Duality	0.046	0.077**	0.094***	-0.003	-0.397***	-0.140***	1.000
Firmsize	0.081***	-0.047	0.803***	0.782***	0.269***	0.217***	0.040

ROA	0.014	0.003	0.046	0.260***	0.097***	0.192***	-0.057*
Leverage	0.027	-0.049	0.365***	0.244***	0.005	-0.088***	0.133***
RD	-0.072**	-0.220***	0.211***	0.185***	-0.178***	-0.121***	0.079**
CSR	0.008	0.074**	0.052*	0.101***	0.070**	0.122***	-0.004
Multiviolators	0.016	-0.005	-0.162***	-0.067**	0.025	0.115***	-0.120***
Multisubstories	-0.004	-0.010	-0.066**	-0.047	-0.055*	-0.025	0.073**
Reach	-0.112***	-0.089***	0.004	0.014	-0.107***	0.018	0.078**
Severity	0.000	0.002	0.039	-0.007	0.063**	0.009	-0.069**
Novelty	-0.063**	-0.027	-0.218***	-0.213***	0.030	0.008	-0.155***
TotalPosts	-0.141***	-0.680***	0.158***	0.157***	-0.060*	0.090***	-0.010

	FirmSize	ROA	Leverage	RD	CSR	Multiviolators	Multisubstories
FirmSize	1.000						
ROA	0.145***	1.000					
Leverage	0.406***	-0.517***	1.000				
RD	0.221***	0.022	0.152***	1.000			
CSR	0.082***	0.108***	-0.091***	-0.299***	1.000		
Multiviolators	-0.134***	-0.038	-0.123***	-0.098***	0.104***	1.000	
Multisubstories	-0.056*	0.042	-0.041	-0.010	0.050	0.231***	1.000
Reach	0.012	-0.056*	0.072**	0.053*	-0.049	-0.107***	0.086***
Severity	0.043	-0.023	0.062**	-0.045	-0.033	0.009	-0.029
Novelty	-0.234***	-0.092***	-0.095***	-0.063**	0.049	0.155***	-0.164***
TotalPosts	0.201***	0.137***	0.052*	0.399***	-0.101***	0.014	-0.044

	Reach	Severity	Novelty	TotalPosts
Reach	1.000			
Severity	-0.116***	1.000		
Novelty	-0.179***	0.124***	1.000	
TotalPosts	0.054*	-0.004	0.027	1.000

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### 3.4.2 Hypotheses test results

To test our baseline hypothesis, we conduct an independent sample t-test for all CAR over different event windows and find that the mean for different event windows is significantly negative, as shown in Table 3.3. The mean for CAR for a three-day window (-1,1) shows the greatest absolute value (CAR=-1.6480%, T=-14.0054,  $p < 0.01$ ). Therefore, the cumulative abnormal stock returns caused by CSI events are significantly negative, and H0 is supported.

Table 3.4 presents the regression results. In model 1, we examine the impact of the independent variable (social media-based investor sentiment) on cumulative abnormal stock returns(H1). Model 2 tests the two-way interaction between investor sentiment and corporates' intangible asset intensity(H2). Model 3 tests the two-way interaction between investor sentiment and corporates' advertising intensity (H3). Model 4 tests the two-way interaction between investor sentiment and corporate ownership structure (H4). Model 5 tests the two-way interaction between investor sentiment and corporates' board independency (H5). Model 6 tests the two-way interaction between investor sentiment and corporates' CEO duality (H6).

Table 3.4 Regression results

	Dependent Variable: CAR [-1,1]					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Sentiment	0.0050*** (0.001)	0.0785*** (0.020)	0.0411*** (0.015)	0.0062*** (0.001)	0.0158*** (0.004)	0.0057*** (0.002)
Intan_Asset		0.7509 (0.575)				
Sentiment#Intan_Asset		- 0.0033*** (0.001)				
Advertising			0.3188 (0.936)			
Sentiment#Advertising			-0.0017** (0.001)			
SOE				13.7759*** (3.782)		
Sentiment#SOE				-0.0042* (0.002)		
Brd_Indep					-5.9923 (5.477)	
Sentiment#Brd_Indep					- 0.0250*** (0.010)	
CEO_Duality						-1.0213 (0.805)
Sentiment#CEO_Duality						-0.0021



						(0.003)
Firmsize	3.7654***	3.2775***	3.4553**	4.1450***	3.9516***	3.7640***
	(1.196)	(1.225)	(1.442)	(1.188)	(1.196)	(1.197)
ROA	-2.4930	-2.0447	-2.3454	-2.4298	-1.7219	-2.3766
	(2.111)	(2.097)	(2.115)	(2.105)	(2.121)	(2.116)
Leverage	-7.3677*	-6.5619	-7.3814*	-7.5775*	-7.6330*	-7.2629*
	(4.306)	(4.274)	(4.295)	(4.264)	(4.325)	(4.307)
RD	-0.0460**	-0.0479**	-0.0447**	-0.0514**	-0.0457**	-0.0485**
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
CSR	0.1925	0.1477	0.1619	0.1337	0.1883	0.1828
	(0.276)	(0.274)	(0.276)	(0.273)	(0.275)	(0.276)
Multiviolators	0.1792	0.1565	0.2053	0.2393	0.2467	0.1745
	(0.323)	(0.320)	(0.323)	(0.321)	(0.323)	(0.323)
Multisubstories	0.0185	0.0254	-0.0083	-0.0071	-0.0089	0.0278
	(0.330)	(0.327)	(0.329)	(0.327)	(0.328)	(0.330)
Reach	-	-	-	-1.0946***	-	-
	1.0870***	1.0534***	1.0834***		1.0681***	1.0597***
	(0.246)	(0.244)	(0.246)	(0.244)	(0.246)	(0.247)
Severity	0.3095	0.2958	0.3447	0.2978	0.2769	0.2997
	(0.350)	(0.346)	(0.351)	(0.346)	(0.348)	(0.350)
Novelty	-0.1381	-0.1771	-0.1562	-0.1764	-0.2070	-0.1433
	(0.325)	(0.323)	(0.325)	(0.323)	(0.325)	(0.325)
TotalPosts	0.0003	0.0004	0.0003	0.0000	0.0002	0.0005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	1032	1032	1032	1032	1032	1032
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.3884	0.4011	0.3933	0.4022	0.3949	0.3900
Adjusted $R^2$	0.1181	0.1339	0.1227	0.1356	0.1250	0.1180

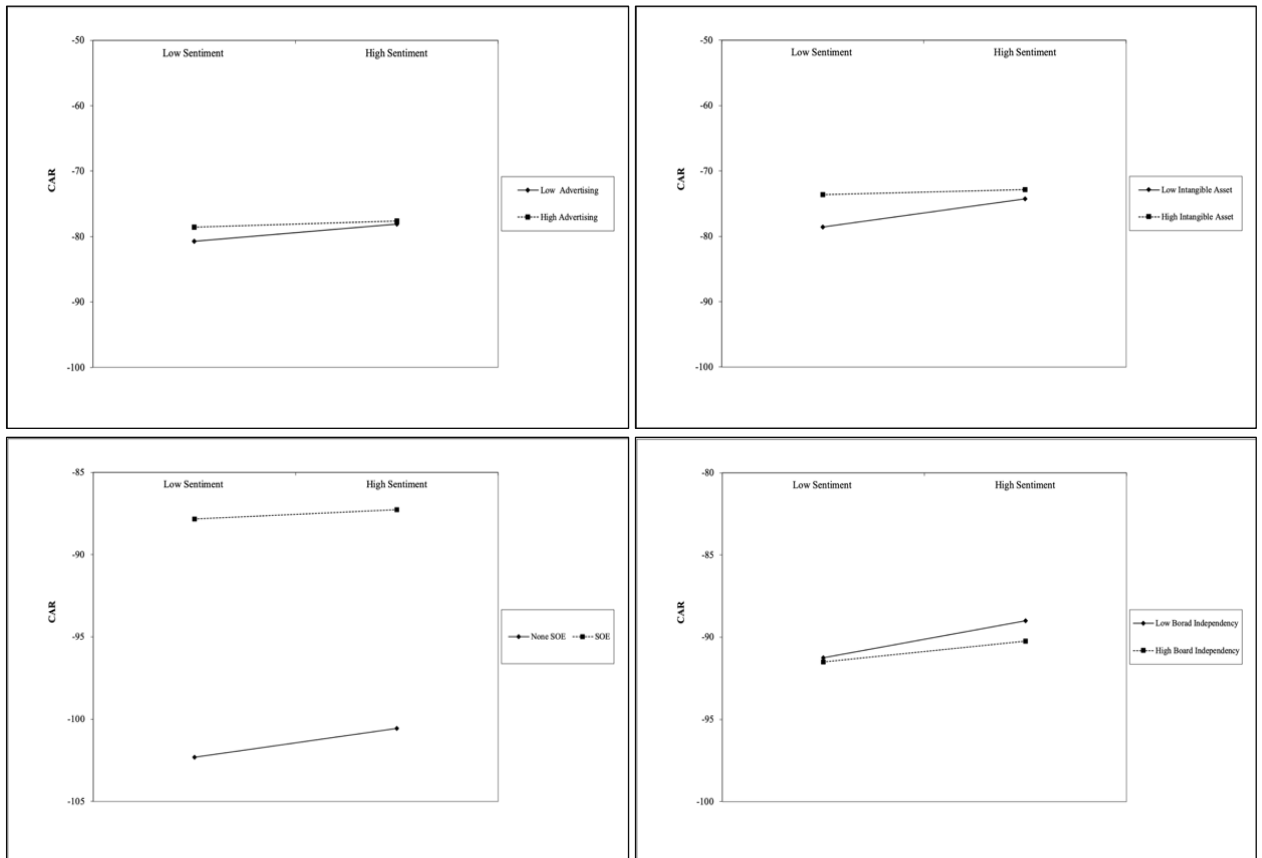
Standard errors in parentheses; \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Model 1 presents that social media-based investor sentiment has a significantly positive impact on cumulative abnormal stock returns caused by CSI events ( $\beta = 0.0050, p < 0.01$ ), indicating the firm experiences less negative market reaction when there are more positive posts or fewer negative posts on stock message forums. Especially when there is an additional positive post a week prior to the CSI event, the CAR will be 0.005% higher. Ceteris paribus, when there is an additional negative post a week prior to the CSI event, the focal firm will experience an additional 0.005%

decrease in cumulative stock return. For a firm with a market value of 22,420 million CNY (median of our sample), CSI events cause a loss of 369.4816 million CNY in average and a positive post can save a loss of 0.0185 million CNY, but a negative post can exaggerate the loss of 0.0185 million CNY. Therefore, even though the coefficient for social media investor sentiment is relatively small, investor sentiment is significant, and H1 is supported. Model 2 presents that the coefficient of the interaction term between investor sentiment and corporate intangible asset intensity is negative ( $\beta = -0.0033, p < 0.01$ ), indicating that the positive association between investor sentiment and CAR caused by CSI will be weakened with the increasing intangible asset intensity. Therefore, H3 is supported. Model 3 shows that the interaction term of investor sentiment and corporate advertising intensity has a negative coefficient ( $\beta = -0.0017, p < 0.05$ ), indicating a negative moderating effect on the positive impact of investor sentiment on market reaction. As such, H2 is supported. In model 4, we test the moderating effect of corporate ownership structure and find that the impact of investor sentiment on the market reaction towards CSI events will be weakened if the corporate is a State Owned-Enterprise with the coefficient of interaction term negative ( $\beta = -0.0042, p < 0.1$ ). So, H4 is supported. Model 5 and 6 test the moderating effect of corporate governance structure. The coefficient of the interaction term between investor sentiment and board independency is negative ( $\beta = -0.0250, p < 0.01$ ), but that between investor sentiment and CEO duality is insignificant with a p-value larger than 0.1, indicating that a higher proportion of independent directors on the board can mitigate the impact of investor sentiment on cumulative abnormal stock returns toward

CSI events and CEO duality shows no similar effect. Therefore, H5 is supported, but H6 cannot be supported. The moderating effects of supported moderators have been shown in Figure 3.3.

Figure 3.3: Moderating effects



### 3.4.3 Robustness test

We test the robustness of the main effect between social media-based investor sentiment and market reaction towards CSI. As shown in Table 3.5, all coefficients for investor sentiment are positive and significant, with a p-value lesser than 0.05. As such, the main effect of social media investor sentiment before CSI on the market reaction towards CSI is supported in the different event windows.

Table 3.5 Robustness test

	CAR with different event windows					
	(-1, -1)	(0,0)	(1,1)	(-1,0)	(0,1)	(-1,1)
Sentiment	0.0020** (0.001)	0.0018** (0.001)	0.0018** (0.001)	0.0037*** (0.001)	0.0036*** (0.001)	0.0050*** (0.001)
Firm size	1.0055 (0.726)	1.2948* (0.777)	1.3977** (0.697)	2.3003** (1.084)	2.6925** (1.045)	3.7654*** (1.196)
ROA	0.7394 (1.282)	-1.0589 (1.371)	-1.9080 (1.230)	-0.3194 (1.914)	-2.9669 (1.845)	-2.4930 (2.111)
Leverage	1.5387 (2.615)	-5.1932* (2.796)	-3.3881 (2.508)	-3.6545 (3.903)	-8.5812** (3.762)	-7.3677* (4.306)
RD	-0.0254** (0.013)	-0.0024 (0.014)	-0.0141 (0.012)	-0.0278 (0.019)	-0.0166 (0.018)	-0.0460** (0.021)
CSR	0.2017 (0.167)	0.0065 (0.179)	0.0392 (0.161)	0.2081 (0.250)	0.0457 (0.241)	0.1925 (0.276)
Multiviolators	0.1363 (0.196)	0.1733 (0.210)	-0.1343 (0.188)	0.3096 (0.293)	0.0390 (0.282)	0.1792 (0.323)
Multisubstories	0.3315* (0.200)	-0.0015 (0.214)	-0.2532 (0.192)	0.3300 (0.299)	-0.2547 (0.288)	0.0185 (0.330)
Reach	-0.2859* (0.150)	-0.3834** (0.160)	-0.4564*** (0.144)	-0.6693*** (0.223)	-0.8398*** (0.215)	-1.0870*** (0.246)
Severity	0.0109 (0.212)	-0.1408 (0.227)	0.4719** (0.204)	-0.1299 (0.317)	0.3311 (0.305)	0.3095 (0.350)
Novelty	0.2188 (0.197)	-0.0147 (0.211)	-0.4129** (0.189)	0.2041 (0.295)	-0.4276 (0.284)	-0.1381 (0.325)
TotalPosts	0.0002 (0.000)	-0.0001 (0.000)	0.0002 (0.000)	0.0001 (0.000)	0.0001 (0.000)	0.0003 (0.000)
N	1032	1032	1032	1032	1032	1032
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.3371	0.3116	0.3750	0.3389	0.3687	0.3884
Adjusted $R^2$	0.0441	0.0074	0.0988	0.0467	0.0897	0.1181

Standard errors in parentheses; \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### 3.5 Discussion and Conclusions

Unlike other indirect measures, social media investor sentiment as a direct measure of investor sentiment presents a direct impact on investors' information processing and firm performance. Previous studies examine the effect of CSI event characteristics from the attribution theory and the effect of firm-level characteristics from the expectation violation perspective and stakeholder theory. Nevertheless, few studies investigate the impact of the external information environment on firm performance in such negative event scenarios. This paper focuses on studying the impact of social media investor sentiment on firm performance in firm misconducting scenarios. Our results show a significantly positive association between social media investor sentiment and firm performance in terms of abnormal stock returns, indicating that the effect of the external information environment is unneglectable. Grounded on the resource dependency theory (Hillman et al., 2009; Drees & Heugens, 2013), the external environment and resources are uncertain and highly limited, and the dependency on the external environment should be reduced by altering the internal resource allocation and management structure, etc. As such, we further discuss the interaction between the internal management environment and the external information environment. Our findings support the hypotheses that the external dependency of firm performance on social media investor sentiment will be weakened when the firm has high advertising intensity, high intangible asset intensity, high board independency, or is a state-owned enterprise. This section discusses how these findings contribute to operations management theoretically and practically.

### 3.5.1 Theoretical implications

First, extant social media studies are conducted from marketing management and information management perspectives on the individual level, but few from operations management perspectives on the organizational level. This study extends the social media studies by discovering the link between social media and corporate management in a negative event management scenario. Social media as an important external information environment has its uniqueness in encouraging tremendous individuals to share opinions publicly and also providing easy access to the public. Such uniqueness presents the root of how social media impacts corporate management and performance. Moreover, investor sentiment has been extensively discussed in impacting investor decision-making and firm performance (Baker & Wurgler, 2006; Chung et al., 2012). In our study, social media provides a direct channel to collect and detect investor sentiment. As such, we not only provide empirical evidence of how social media impact firm performance but also contribute to presenting social media investor sentiment as an important direction to understanding the external information environment.

Second, previous studies understand the impact of CSI from stakeholder theory, attribution theory, expectation theory, etc. (Kölbel et al., 2017; Nardella et al., 2020; Liu et al., 2022). We enrich the understanding of CSI by employing the agency perspective (Eisenhardt, 1989; Hill & Jones, 1992). Corporate misconduct brings out agency conflicts because corporate management has not protected the shareholder value

from diminishing in negative events. In this case, agency conflicts exist not only in huge management decisions and activities, such as mergers and acquisitions (Ang et al., 2021) and dividends payout (Baker & Wurgler, 2004), but also in negative events and crisis management. Moreover, agency conflicts in such negative events testify to investors' need to seek external information to better monitor the corporate behaviors and even speak out for shareholders' benefit.

Third, we emphasize the importance of intangible assets, which mainly refer to patent and innovation value, brand value, corporate reputation, etc. The resource investment in research and development can put pressure on short-term earnings (Cheng & Zhang, 2022). However, these investment chances can build a good corporate image and boost investors' trust in future performance in the long run.

Fourth, advertising is not an expense for selling products but also for actively disseminating corporate information to shareholders due to its informative value (Cheong et al., 2021). Retail and individual investors, which account for an important proportion of the Chinese stock market, have highly limited resources searching for official financial reports, such as annual reports and analyst reports, etc. Advertising can be the most important channel for them to access first-hand information about corporates. Also, advertising can help corporates build a good image and boost investor faith in future performance.

Fifth, consistent with previous conclusions that the high quality of internal governance effectively reduces agency problems (Gaur et al., 2015; Kilincarslan, 2021), our research raises the importance of governance quality when facing negative events

and crises management scenarios. Specifically, we point out the importance of independent directors on the board by examining the investors' sensitivity to corporate governance structure during CSI events.

Sixth, in the Chinese business context, State-Owned Enterprises have more privileges in resources than non-state-owned Enterprises. Our research further emphasizes the impact of the external information environment on non-SOEs since our results show that they are more easily affected by the external information environment. Also, it is more urgent for non-SOEs to properly manage the CSI events and protect their shareholders' value since non-SOEs experience more significant market reactions toward CSI than SOEs do.

Our findings extend the resource dependency theory and agency theory studies by examining the impact of the external information environment on firm performance and the interaction between the external information environment and internal resources allocation and governance structure.

### 3.5.2 Practical implications

Our research makes its contributions to practitioners in the following aspects. First, it provides a novel perspective to understand the impact of CSI on firm performance and, more importantly, points out the value of the external information environment in impact on firm performance. Corporate managers should pay more attention to the external information environment when dealing with negative events and crisis management. Second, our research demonstrates to corporate managers an effective method to measure a critical form of investor sentiment, the social media-



based investor sentiment, and we also test this method's validation empirically. Third, based on the understanding of CSI impact and social media investor sentiment, corporates are aware of the method and content to achieve effective communication with their stakeholders and shareholders, thereby imposing a positive impact on investor sentiment. Finally, one important implication for corporate management is that learning from their individual retail investors' online opinions can be the first step to tapping into the wisdom of crowds and thus building up a better corporate image and preventing firm value damage from miscommunication or value-reducing actions.

### 3.5.3 Limitations and future directions

First, our research studies the social media investor sentiment by combining the positive and negative sentiments together. However, the impact magnitude of positive posts and negative posts may vary (Deng et al., 2018). Also, to be more specific, investors' opinions can be categorized into different emotions, e.g., joy, surprise, sadness and anger, etc. (Nguyen et al., 2020). Investor sentiment detected from opinions focusing on a specific topic can be more valuable in a specific area, such as investor opinions towards acquisitions (Ang et al., 2021). Thus, we may study the investor sentiment separately in future work and provide more specific insights. Second, the impact of social media on firm performance can be further studied in scenarios other than CSI events. For instance, social media sentiment relating to political events such international trade disputes could impact corporate performance. Thirdly, there should be more internal management factors (e.g., CEO leadership style) that are significant in interacting with the external information environment, and such factors should be

identified and investigated.

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