

Tweet, Like, Subscribe! Understanding Leadership through Social Media Use

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Abstract

The proliferation of digital data has opened the door for a 21st-century social science that explores human relationships on an unprecedented scale. A particular area of interest is that of leader social media (SM) usage. As studies on leader SM usage have grown dramatically in the past several years, we take stock of the extant literature across various research disciplines. Within this manuscript, we contextualize leader SM usage and demonstrate how it compares to analogous concepts. We subsequently abridge relevant findings and reflect on methodological and theoretical components of the research studies identified in this review. Further, we outline the nature of SM data and provide practical recommendations for leadership scholars to capitalize on this rich data source in their investigations. We also offer a theoretical framework and summary of how scholars have studied leader SM usage. Specifically, this review article synthesizes the current literature while also elevating the academic rigor of leader SM research.

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One of the 21st century's unique phenomena is the genesis, growth, and permeance of social media (SM). Testifying to SM's popularity, literally billions of individuals are adopters. Not only have the masses migrated a considerable amount of their social exchanges to online platforms, so have leaders. Prominent leaders that engage with SM include religious leaders (e.g., Joel Osteen), business leaders (e.g., Elon Musk, Doug McMillon, Mary Barra), educational leaders (e.g., Walter Kimbrough, Santa Ono), as well as other leaders (e.g., Derrick Johnson). Indeed, SM has served as the methodological vehicle for researchers to study leaders such as front line managers (e.g., Peluchette et al., 2013), a Liberian warlord (O'Mahony & Fair, 2012), the mayor of Bucharest (Dogaru-Tulică, 2019), political leaders around the world (Bulovsky, 2019), and hundreds of CEOs (Porter et al., 2015). However, due to the great diversity of research disciplines that traverse this domain, the leader SM usage literature is fractured and underdeveloped. Therefore, following best practices (Short, 2009), we take stock of the leader SM literature. We outline prior research, provide practical recommendations and best practices for scholars interested in leveraging leader SM data, and identify avenues for future scholarly work. We conclude with implications and final remarks.

Importance of Social Media Research in Leadership

Leidner (2020) draws attention to phenomena, method, and theory and their respective role in evaluating a contribution. Our literature review of leaders' SM use contributes to each of these areas. First, from a phenomena perspective, the broad adoption of SM among leaders invites scholars to appreciate the nuances of this medium and the subsequent implications for theory, practice, and policy. This area of investigation has particularly grown in the last few years. For example, Donald Trump (then The President of the United States) was banned from

Twitter in January 2021 due to his tweets' perceived role in an insurrection at the Capitol of the US. Relatedly, Elon Musk, one of the wealthiest and most influential CEOs in the world, was investigated by the SEC due to tweets regarding the possibility of taking Tesla private (Michaels & Rapoport, 2018). He also used Twitter to prop up the value of Bitcoin—a cryptocurrency of which he owns a substantial amount (Browne, 2021). Furthermore, the adoption of technology by international leaders, such as Pope Francis using Instagram (Golan & Martini, 2020), indicates that SM is becoming a new medium even for some of those in the most traditional leadership positions. These examples highlight the wide use and growth of SM use by leaders.

Second, SM has several methodological implications. SM represents a unique medium to capture expressed leader actions and is an effective research tool for social scientists. As noted in the introduction, a wide range of leaders have adopted SM, and this common denominator enables comparisons across contexts. Compelling research often adopts unique measurements to enhance further theoretical understanding, and our review empowers scholars to capitalize on this unique dataset. While SM can undoubtedly serve as the primary data source (e.g., Petrova et al., 2021), SM can also be used alongside other data sources (e.g., Kaewkitipong et al., 2016). SM represents an unobtrusive, publicly available measure to gather information about leaders. Overall, just as CEO quarterly reports and public statements have been adopted widely by scholars, we envisage that SM can be included as an additional method for assessing leadership.

Third, from a theoretical perspective, several defining characteristics demarcate leader SM usage from other mediums of leader-follower exchange (e.g., face-to-face). If theory building is genuinely “about the connections among phenomena, a story about why acts, events, structure, and thoughts occur” (Sutton & Staw, 1995, p. 378), then a ‘story’ about leader SM usage is likely to develop and expand theoretical constructs unique to this realm. In particular,

we note that leader SM usage can be conceptually conceived as a subset, or variation, of e-leadership (Avolio et al., 2000). Avolio and colleagues (2000) defined e-leadership as “a social influence process mediated by [advanced information technology] to produce a change in attitudes, feelings, thinking, behavior, or performance with individuals, groups, or organizations” (Avolio et al., 2000, p. 617); however, the proliferation of SM has significantly increased since the initial formalization of the e-leadership perspective (Avolio et al., 2014). Indeed, scholars have highlighted how technology in our day and age can be framed as a context, a sociomaterial practice, a creation medium, or even as a teammate (Larson & DeChurch, 2020). Building upon these sociotechnical perspectives, our review highlights key ways in which SM broadens the theoretical understanding of leadership.

Review Process

For our review, we searched Web of Science to identify relevant articles. Our search criterion required that at least one leadership key term (e.g., leader, CEO, supervisor, boss, governor, dean, reverend, pope, bishop, chief) be part of the abstract, title, or keywords, and at least one of the chosen SM platforms (i.e., Twitter/Tweet, Instagram, Facebook, social media) be included in the abstract, title, or keywords as well. Further, we performed manual Google searches to identify in-press research not in the Web of Science system at the time of the search, which helped ensure that our review was as current as possible. To adequately capture the extant research, we solicited journals from a broad range of disciplines. However, due to the volume of research on this topic and the breadth of our search terms, we strategically selected journals that are traditionally included in organizational science reviews while also sampling journals from other domains to provide a wide-ranging perspective into current trends. We included journals from areas of general leadership (e.g., *The Leadership Quarterly*), strategic management (e.g.,

Strategic Management Journal), information systems (e.g., *Information Systems Research*), political (e.g., *Government Information Quarterly*), communication (e.g., *Journal of Communication*), health (e.g., *Journal of Public Health*), religious (e.g., *Religions*), and other journals that promised relevant findings. In total, we sampled over 100 journals. A member of the authorship team reviewed the articles and systematically removed those manuscripts which did not meet our criteria. For example, if the manuscript did not explicitly explore leader SM usage, it was removed (e.g., papers on the general benefits of leader adoption of SM). Furthermore, we disqualified those articles with no English translation or if the manuscript's inclusion of a leader using SM was ornamental. The final number of articles included as part of this review proposal is 161¹.

Before framing the literature, we highlight several revealing, high-level insights regarding the extant leader SM use literature. Interestingly, leader SM usage can represent a(n) independent (e.g., a leaders' tweets; see Hornsey et al., 2020), moderating (e.g., SM use; see Khan & Khan, 2019), mediating (e.g., SM interaction; see Bhatti et al., 2020), control (e.g., number of SM accounts; see Dubois et al., in press) or dependent (e.g., Twitter adoption; see Lassen & Brown, 2011) variable. Additionally, leader SM usage may simply be employed as a research context.

The geographical range of the research was quite large. The most studied region within our review was the United States, followed by Spain. However, studied geographical contexts included China (Luqiu et al., 2019), South Korea (Choi, 2015), Pakistan (Bhatti et al., 2020), Brazil (Gilmore, 2012), Thailand (Kaewkitipong et al., 2016), Japan (Rufai & Bunce, 2020),

¹ Please contact the corresponding author for a full list of the articles included in our review.

Israel (Samuel-Azran et al., 2018), and dozens of other countries. This observation testifies to the global scale of the leader SM phenomenon.

Furthermore, leaders from a broad range of professions use SM. Leaders of interest included corporate (Lee et al., 2017), political (Brans & Scholtens, 2020), religious (Golan & Martini, 2020), academic (Naidoo & Dulkeek, 2017), and informal leaders (e.g., Park, 2013). Moreover, leader SM usage spans multiple communication mediums. Our review suggests that Twitter is the most utilized platform for understanding leadership, used in over two-thirds of all articles in our review. However, other popular platforms included Weibo (Chen & Fu, 2016), Orkut (Gilmore, 2012), WhatsApp (Bhatti et al., 2020), WeChat (Agur & Frisch, in press), Telegram (Agur & Frisch, in press), Instagram (O'Connell, 2018), Facebook (Snoeiijers & Nicolay, 2014), LinkedIn (Men, 2015) and others.

State of the Literature

Our review seeks to synthesize the current literature by highlighting key theoretical themes and ideas in this research stream. The articles in our review provided a plethora of insights from a wide variety of academic areas. Thus, in order to integrate the articles' findings, we have organized the articles and their findings based on five different conceptual frameworks: (1) signaling theory, (2) framing, (3) trait and demographic perspective, (4) boundary, and (5) network. Although not all of the articles in each section necessarily drew specifically upon these respective theoretical perspectives, by summarizing articles across these five perspectives, we can best analyze the current state of the literature and suggest directions for future research. Further, we interweave how these five theoretical perspectives relate to e-leadership (Avolio et al., 2014).

Signaling Theory Perspective

As noted by Avolio et al. (2014), the arrival of web-based tools has enabled actors to achieve a greater level of transparency. Of the modern digital age, they write, “followers now have access to information that influences their sense-making related to how they interpret their leaders’ transmissions” (p. 117). Oftentimes, the “information” related to followers’ sense-making process is best framed as signals. Thus, one of the most helpful frameworks for understanding leader SM usage is a signaling theory perspective (Spence, 1978). A signal is an attribute that is observable, malleable, and associated with an entity (Spence, 1973). Signalers intentionally create and/or reveal signals that are intended to provide reliable information regarding an object (e.g., product’s quality; ISO certification) or other entity (e.g., a person’s reputation; high-quality work references). Consistent with signaling theory, leaders employ SM to signal unobservable attributes (e.g., priorities, ideologies) to their followers to decrease information asymmetry. Examples of signals on SM could include rhetoric, number of followers, SM adoption, SM use frequency, etc., and each of these enables followers’ sense-making of leaders’ transmissions.

Some articles in our review directly referenced the concept of signaling in their research model (e.g., Golan & Martini, 2020; Tur et al., 2021). Drawing from transcripts of randomly selected TED talks and tweets from CEOs and politicians, Tur et al. (2021) found that verbal charismatic signaling generates higher views of TED talks and more retweets on Twitter. In this context, Tur et al. (2021) positioned charisma as a signal that can lead to salient outcomes for leaders.

Leaders can also signal other values (e.g., resistance, deal-making) through their SM posts. For example, Wang et al. (2021) used difference-in-difference analysis to understand how the presence of executives who use SM affects acquiring firm’s propensity to take on a Merger

and acquisition. Research has found that SM enables informal leaders the ability to quickly send out apologies to their followers (Park et al., 2015), which followers likely view as a signal of remorse. Business leaders can also signal certain attributes by simply using SM, which might be a signal of being current with the times or in touch with the masses (Hwang, 2012). For example, Men (2015) revealed that CEOs increasingly use SM for internal organizational communications and that a CEO is perceived to be responsive by employees when they show a strong SM presence. Leaders can also use images as signals. For example, the use of national flags by leaders can signal political ideology (Kariryaa et al., in press).

The communication medium is an integral part of the signaling process (Avolio et al., 2014; Daft & Lengel, 1984). Indeed, Connelly et al. (2011, p. 62) observe that “the signaling environment on the whole is an underresearched aspect of signaling theory.” Prior research has looked into the difference in follower reactions between SM and mass media. Grant et al. (2018) compared investor reactions to CEO’s comments on positive firm performance presented in two forms of disclosure media (Twitter versus conference calls) and observed that Twitter is better suited for CEO bragging. In particular, when Twitter is used as a disclosure medium, investors are more willing to invest in a firm when the CEO is modest than when the CEO brags; in contrast, when conference calls are used as disclosure medium, investors are more willing to invest when the CEO brags than when the CEO is modest. Even within the SM medium, SM platform choice can affect leader signals. For example, Snoeijers et al. (2014) reported that in times of crisis, university Dean’s messages presented on Twitter were more likely to elicit students’ responses compared to the same messages posted on Facebook. Elliott et al. (2018) adopted a lab-based experiment and found that individuals are more willing to invest in a firm when that firm’s CEO uses their personal Twitter account (as opposed to a website or the firm’s

Investor Relations website or Twitter account) to communicate negative earnings surprises. Further, corporate leaders often use SM to manage their personal or corporate image since SM provides a rich information channel between themselves and stakeholders in real-time (Men & Tsai, 2016; Yim, 2019). Men and Tsai (2016) identified that a CEO could boost authenticity and approachability by increasing SM presence, further enhancing stakeholders' trust toward the organization. Overall, these findings speak to the importance of understanding the distinct sociotechnical elements of different outlets, such as whether or not the SM message is text-based (e.g., Twitter) or primarily image-based (e.g., Instagram) since the communication medium can influence signal transmission.

Along with this line of inquiry about media type, the format of SM content is found to play a role in follower reaction. For example, Dumitrescu and Ross (2020) examined how followers react to Donald Trump's tweets reported in different formats (verbatim versus paraphrasing). They showed that compared to a paraphrasing format, a verbatim format appears to be more effective in soliciting positive reactions from Republican followers on SM. Also, the tone of SM content affects follower reactions. Luqiu et al. (2019) examined followers' reactions to uncivil comments and opinion leaders' follower size. They detected that comments with a higher negative-to-positive ratio give rise to a lower perception of opinion leaders, but more positive comments do not appear to boost perceived quality and willingness to follow opinion leaders. They also reported that follower size in Weibo reveals no influence on users' perception of and willingness to follow the opinion leaders. This finding is contrary to what is observed in western SM, where users are exceptionally subjective to the signal of follower size (i.e., an opinion leader with a larger follower size is a signal of popularity and credibility; Luqiu et al., 2019). This contrast might be due either to platform-specific functionalities and regulations

unique to Weibo or because Weibo users are aware that the number of followers could be inflated if opinion leaders purchased fake followers to increase popularity (Confessore et al., 2018).

Framing Perspective

A framing perspective (Entman, 1993) is also a common framework in the literature (e.g., Azer et al., 2019; Golan & Martini, 2020; Herrero-Jimenez et al., 2018; Hopkins, 2014; Perez-Curiel, 2020; Poell et al., 2016; Redondo, 2016; Ross & Rivers, 2018; Seo & Ebrahim, 2016). Framing comprises how individuals, groups, or societies create social construction around how to understand and respond to events and/or information. How information or actions are framed can influence how they are understood (e.g., framing effects; Tversky & Kahneman, 1981). Leaders often use SM as a way to frame actions or information. For example, Seo and Ebrahim (2016) performed a content analysis of the images posted on Facebook pages of Syrian government officials and discussed how significant themes (e.g., such as political unity, fearlessness, strength, care) are framed differently by opposing leaders. And several studies examined how leaders used SM to frame and initiate grassroots civic movements (e.g., Azer et al., 2019; Bakardjieva et al., 2018; Gerbaudo, 2017; Leong et al., 2019). Furthermore, many studies have analyzed SM to understand leaders' rhetoric (e.g., Coe & Griffin, 2020; Jacobs et al., 2020; Kiouisis et al., 2014; Lim, 2012; Pain & Chen, 2019; Ross & Rivers, 2018), which is often focused on framing a campaign or business initiative. Due to the technical components of SM (e.g., low barrier to entry, informal communication style, and broad follower usage), many leaders utilize SM to frame themselves or a particular issue in a certain light. This use of SM as framing aligns with key ideas of e-leadership. As Avolio et al. (2014, p. 114) note, "leaders may use [advanced information technology], such as video-sharing, instant messaging, and social

media, to more effectively transmit their leadership with the goal of reinforcing greater consistencies across their respective followers in how they are interpreted” (see also Kahai, 2013). This corroborates natural observation where many leaders take to several platforms to frame issues or their personal image.

Leaders can also use SM to influence how others perceive them, thereby helping frame their narrative. For example, a CEO is considered more authentic when the CEO tweets out political messages than when a CEO tweets out messages of other topics (e.g., professional; Yim, 2019). Tsai & Men (2017) also found that CEOs can improve the level to which others trust them through responsive and assertive communications. Alghawi and colleagues (2014) classified Chinese CEOs SM use by four types of strategies—Expert (professional and high levels of interactivity with followers), Friend (personal and high levels of interactivity), Textbook (professional and low levels of interactivity), and Daybook (personal and low levels of interactivity). They then illustrated that followers preferred CEOs who presented themselves as an expert rather than a friend. Kim et al. (2016) looked at how Jack Ma managed Alibaba’s false advertising crisis on SM and found that Jack Ma’s self-mockery (a refuting strategy) in Weibo appears to be a more effective reconciliation strategy than traditional cold and severe responses.

Another commonly studied topic was the specific outcomes from leader framing via SM. Recently, Chen et al. (2021) studied the Twitter accounts of S&P 500 executives to explore their SM personal branding. Via estimations from a two-sided matching model, the authors find support that SM personal branding does, in fact, benefit business leaders in labor markets. Among political leaders, an extensive focus is on President Trump’s SM use and subsequent societal impacts of how he frames issues. For example, Nicolau et al. (2020) examined Trump’s tweets on the United States’ tourism performance and found that Trump’s tweets affect the

country's public image, and his tweets framing other countries negatively hurt the market value of the U.S. tourism industry. Moreover, Brans and Scholtens (2020) found that companies experience a decrease in stock price following negatively framed tweets by President Trump but did not experience a significant increase in stock price following positive tweets. Niburski and Niburski (2020) examined the effects of Trump tweets which framed unproven remedies for COVID-19 as legitimate. They observed that these tweets swayed public attention and led to substantial increases in online searches and purchases for unproven remedies (e.g., hydroxychloroquine and chloroquine).

Trait and Demographic Perspective

The literature also frequently draws from the personality traits and demographics of leaders and followers that use SM (e.g., Lee et al., 2017; Obschonka & Fisch, 2018; Song et al., 2017; Winter & Neubaum, 2016). Within the broader e-leadership literature, much of the work has focused on which types of traits may be more likely to be aware of or use a certain technology (e.g., Liu et al., 2018) or how different traits of SM users influence certain outcomes. Our review reveals that SM provides a fruitful lens to examine leader traits because it endows scholars with data that can be leveraged to study the traits of high-level leaders using unobtrusive measures.

Several articles in our review looked at leader personality traits (e.g., overconfidence, grandiose narcissism, schadenfreude). For example, Lee and colleagues (2017) used Twitter data to measure leader overconfidence and reported that founder CEOs often display more overconfidence than non-founder CEOs. Gruda et al. (2021) used Twitter data to detect CEO traits and identified that CEO grandiose narcissism has predictive power for corporate funding success and that an admirable CEO shows more corporate funding success. Interestingly, this

effect was consistent across genders and was the same for men and women. In contrast, a rivalrous CEO shows less corporate funding success. Crysel and Webster (2018) focused on another “dark” personality trait—schadenfreude—a trait that “describes one’s happiness at the misfortune of others” (p. 1) and found that schadenfreude predicts why people want to share embarrassing news about leader failure on SM. And Obschonka and Fisch (2018) used Twitter statements to analyze the personality of President Trump and compare him to other influential entrepreneurs and business managers. By analyzing the Twitter accounts of 613 Chief Marketing Officers (CMO), Winkler et al. (2020) find evidence that CMO extraversion positively moderates the effect between a new venture’s maturity and web traffic and that a CMO’s conscientiousness negatively moderates this same relationship.

Scholars also explored demographic traits such as race and gender in relation to leader SM usage (e.g., Gruda et al., 2021; Suarez-Rico et al., 2018). For example, O’Connell (2008) found in their sample that women leaders are much more likely to use Instagram than their male counterparts. In another study, Heizmann and Liu (2020) found that many of the women entrepreneurs they studied produced idealized feminine identities on their Instagram account. The authors suggested that this might indicate female leaders are under pressure to present themselves as stereotypical women on SM. In addition to studying personality and demographic traits, some scholars have studied how culture affects leader SM use (e.g., Carrascosa et al., 2015; Valera-Ordaz & Sorensen, 2019). For example, Chu et al. (2020) found that SM opinion leaders had more influence on American consumers than on Chinese consumers, likely due to the tendency for informal (compared to formal) leaders to have less influence in high power distance cultures.

Boundaries Perspective

Another unique feature of SM is that it often blurs the lines of boundaries, and several articles explored the effect of boundaries (e.g., Hoffmann & Suphan, 2017; Peluchette et al., 2013). A boundary perspective emphasizes the fact that there are boundaries between different segments of life, such as between one's personal life and work (e.g., Bulger et al., 2007). As Avolio et al. (2014, p. 118) note, "Different forms of social media today are making organizational interactions more rapid and likely complex by enabling the development of social networks that span hierarchical levels and departmental boundaries" (see also Kahai, 2013). This rationale applies to other domains, such as the political sphere. For example, Hoffmann and Suphan (2017) identified four types of boundary management strategies employed by German members of parliament: open, audience, content, and hybrid.

In particular, the lines between personal and professional lives are frequently crossed in relation to SM. A few of the articles in our review examined how leadership and SM affect work-life boundaries. For example, Peluchette and colleagues (2013) looked at how people feel about getting "friend" requests from their direct supervisors. In order to analyze this, they reviewed relevant blogs and summarized bloggers' recommendations. Of all the bloggers, nearly half recommend ignoring the supervisor's friend request because boundaries between work and life are considered necessary. The balance of bloggers recommended accepting Facebook friend requests from supervisors with some cautions. For example, one strategy is to use setting privacy to limit what supervisors can view. Another strategy is to accept requests first and unfriend the supervisor later. The authors cautioned that while supervisors often consider sending subordinates friend requests on SM as "fun and friendly" (Peluchette et al., 2013, p. 298), it may engender a "negative undertone" because employees may accept supervisors' requests due to

pressure. Repeated friend requests may result in employees viewing these requests as sexual harassment.

In contrast to other traditional forms of e-leadership (e.g., video conferencing), the challenge of boundary management is more pronounced on SM, which places precedence on 24/7 social connections. Avolio et al. (2014, p. 118) note of e-leadership that “[participatory systems] impact leadership transmissions by promoting self-disclosure and the freedom to share details of leader and followers’ work and personal lives in real time.” In line with e-leadership, this defining feature should be at the forefront of investigating leader-follower interactions on SM.

Network Perspective

The “rise of social networks” is identified by Avolio et al. (2014) as one of the five primary changes occurring at work in relation to information technology and leadership. At the core of leadership, a dyad between at least one follower and at least one leader is essential, and SM has fundamentally changed the ways in which leaders network and communicate. Larson and DeChurch (2020, p. 4) note that “technology enables teams to form in new ways within and outside of formal organizations.” Nowhere is this truer than with SM, which connects leaders and followers in real-time, and this can provide a more constant feedback loop between followers and leaders. Fittingly, several articles in our review focused on the network component of SM (e.g., Choi, 2015; Guo et al., 2020; Eom et al., 2018). For example, one article in our review established that members of U.S. Congress who used their Twitter networks were more likely to vote in line with their constituents (Mousavi & Gu, 2014). From a methodological perspective, because leaders can follow and like other people on SM, SM data can help scholars to study leader networks and the outcomes of these networks. Eom et al. (2018) explored how

the different government leaders in South Korea (e.g., mayors) use Twitter to enhance government responsiveness to citizens by serving as a bridge between groups of citizens and public officials. Also, other articles analyzed the networks of Australian (Bruns & Highfield, 2013), European (Cherepnalkoski et al., 2016), and American (King et al., 2016) politicians.

Best Practices, Key Features, and Methodological Recommendations for Social Media Use in Leadership Studies

Based on the findings of our review, we recognize the need to consider best practices for leader SM use research. To address this question and issue, we outline (1) the nature of SM data, (2) collection methods, (3) analysis methods, and (4) best practices and practical guidelines. Each of these sections is curated to fit the context of e-leadership.

The Nature of Social Media Data

At the core, SM allows individuals to self-present, share content, interact with others, form relationships, arrange and manage groups, engage in meta-voicing, collaborate, lead, etc. (Karahanna et al., 2018). This arrangement of social life is bounded and defined by SM platforms, such as Twitter, Facebook, Instagram, WhatsApp, TikTok, etc. Although SM platforms are heterogenous, several defining characteristics umbrellas nearly all types of SM. One of the characteristics that elevates SM as a premium data source is its ubiquity. The term Big Data aptly describes the anatomy of SM data, that is, data that is high in volume, velocity, variety, and veracity (Goes, 2014). Several observations corroborate these four dimensions. Even back in 2014, Facebook generated four new petabytes of data per day (1M GB; Wiener & Bronson, 2014). During the 2014 FIFA World Cup Final, 618,725 tweets were tweeted in a single minute (Oakes, 2016). This large amount of data allows leadership scholars to use big data techniques (e.g., analyzing tens of thousands of tweets from a particular leader sample).

Further, in contrast to other mediums (e.g., in-person interviews), “most transactions and conversations in [online groups] leave a digital trace...this research data makes visible social processes that are much more difficult to study in conventional organizational settings” (Agarwal et al., 2008, p. 250). In addition to the actual content of focus (i.e., text, video, image) and the sender and recipient(s), collected SM data also provides rich meta-data that situates these communicative acts. For example, geospatial operators (i.e., profile location), reactions (e.g., retweet, liked, shared, number of views), and timing attributes allow researchers to triangulate and contextualize communication. This corresponds with the growing theme of “tracking,” which was identified by Avolio et al. (2014) as a major area in which leadership and technology are shifting. Thus, one of the greatest strengths of SM data is the accessibility of data-intense social interactions between leaders and their followers. Berente et al. (2019, p. 50) note, “the abundant and ever-increasing digital trace data now widely available offer boundless opportunities for a computationally intensive social science.” As will be iterated below, both technical and non-technical scholars can retrieve a highly structured dataset on a germane topic with relative ease, which increases the benefits of SM data for leadership scholars.

Collection Methods

Tools exist across the entire spectrum of technical expertise for collecting and analyzing SM data, as demonstrated in Table 1. In order to capture SM data, researchers often rely upon application programming interfaces (APIs). Conceptually, APIs bridge the gap between distinct entities, such as researchers’ queries and the data source of interest (e.g., Facebook’s databases), and APIs were used frequently in our review to attain SM datasets (e.g., Ecker, 2017; Mousavi & Gu, 2019). Via software scripts, researchers can interact directly with SM APIs. Further, several endpoints facilitate interaction with the Twitter API, such as Tweepy (tweepy.org). More

advanced endeavors can also consider web scraping techniques, which is the practice of downloading information from websites via scripts written in a programming language such as R or Python (see Braun et al., 2018).

Insert Table 1 & Figure 1

For scholars who are uninterested or unable to script, numerous applications provide graphical interfaces that automatically interact with APIs and collect information. For example, NodeXL (Smith et al., 2010)—an advanced Excel Add-in—advertises the tagline “network analysis & insights as easy as pie charts” and has been successfully leveraged in research endeavors within leader SM use research (e.g., Choi, 2015; Eddington, 2018; Eom et al., 2018; Guo et al., 2020; see Figure 1 for an example output of NodeXL). Several archival databases, especially for historical tweets, can be also be used to examine leader-follower interactions (e.g., Gruzd & Mai, 2020). Scholars can consider exploring open sources such as GitHub and publicly available SM datasets (see Hansen et al., 2010; Miranda, 2019; Mitchell, 2018 for additional recommendations on data collection).

Analysis Methods

Once the data is collected, researchers must prepare the data for analysis. Alongside Avolio et al. (2014), we recommend two valuable ways of testing future models are (1) social network analysis and (2) content analysis. Social network analysis dates back to the work of Jacob Moreno (Nolte, 2014) and his work on sociograms. It has been employed by researchers (Milgram, 1967), government operations (e.g., Angwin, 2014), and epidemiologists (Auerbach et al., 1984). Two main characteristics of networks are the path length and the clustering (Watts & Strogatz, 1998). Opsahl et al. (2017) explicate, “path length is a measure of the number of

intermediaries between two individuals in the network. Clustering measures the local density of ties around a specific individual, in other words, the proportion of an individual's contacts that are directly linked to each other" (p. 150). Scholars can compute relevant variables such as geodesic distance, communication efficacy, and network centralization using these two properties. Subsequently, scholars can explore the role of different actors and clusters within a social network, and scholars can also focus on various levels of analysis (i.e., dyad, node, network levels; see Borgatti et al., 2018).² These variables can then be leveraged to examine different leader-follower interactions, as was done in the leader SM use literature (e.g., Shi & Salmon, 2018).

In addition to social network analysis, content analysis also boasts a rich history within the broader domain of organizational studies (Douriau et al., 2007) and leadership studies (Insch et al., 1997; Spangler et al., 2012; Wasike, 2017). Content analysis refers to "any methodological measurement applied to text (or other symbolic materials) for social science purposes" (Shapiro & Markoff, 1997, p. 14). Scholars typically demarcate between content analysis and computer-aided content analysis (Neuendorf, 2002; Douriau et al., 2007), with the former requiring rigorous text coding (e.g., Weber, 1990) and interrater reliability measurements. Here, we elaborate on computer-aided content analysis since SM data lends itself to computer-aided mechanisms.

One of the most common methods for streamlining the content analysis process is applying curated tools, such as Linguistic Inquiry and Word Count (LIWC). LIWC is a robust tool for SM analysis (Park et al., 2015) and has been applied in more than 100 empirical studies (Pennebaker et al., 2015), including several articles in our review (Ceron et al., 2020; Kim et al.,

² For more information on the social network procedures, see Miranda (2019), Opsahl et al. (2017), Zwijze-Koning and De Jong (2005), and Williams and Shepherd (2017). See Borgatti et al., 2018 (p. 29-50) for additional information on social network research design.

2015; Naidoo & Dulek, 2017; Obschonka & Fisch, 2018; Winkler et al., 2020). Similar options for computer-aided content analysis include DICTION (Short & Palmer, 2008). For more information on content analysis, see Gottschalk (1997), Mehl (2006), Neuendorf (2002), or Krippendorff and Bock (2009).

Although social network analysis and content analysis are the two predominant methodologically approaches to SM data, innovative SM data approaches are emerging outside of the leader SM usage literature. For example, Chan and colleagues (2016) introduced a mixed-method approach that implements content analysis, statistical cluster analysis, and probability weighting functions. Han et al. (2012) focused on improving geolocation estimates from SM data, and scholars such as Guan and Chen (2014) have leveraged SM data to create Kernel density maps to comprehend social phenomena related to disasters. Other innovative approaches to SM data include the application of machine learning (Fan et al., 2020), such as unsupervised feature selection (Tang & Liu, 2012) and the identification of social bot targets (Fazil & Abulaish, 2017). For example, in order to study positive stakeholder sentiment in relation to CEO benevolence, Steinbach et al. (2021) used artificial intelligence (AI) to analyze firms' public tweets and their sentiment.

Best Practices and Methodological Recommendations

One significant shortcoming of the leader SM usage literature is the rigor of employed statistical approaches and the conflation of empirical observations with theoretical advancements. Although descriptive statistics inform, they fail to predict or explain relevant phenomena adequately. As Sutton and Staw (1995) write, "empirical results can certainly provide useful support for a theory. But they should not be construed as theory themselves" (p. 374). They continue, "diagrams or figures can be a valuable part of a research paper but also, by

themselves, rarely constitute theory” (p. 376). Within the leader SM use research, articles frequently made the mistake of simply reporting perfunctory findings without theoretical underpinnings. Manuscripts in the literature were often peppered with histograms and line charts but did not feature more sophisticated and robust statistical or qualitative analysis.

Consistent with other articles that articulate best practices (Aguinis et al., in press), we also reiterate that it is incumbent upon the authors to explicate design decisions and rationale. Aguinis et al. (2018) lament, “there is a proliferation of evidence indicating substantial reasons to doubt the veracity and, justifiably, the conclusions and implications of scholarly work because researchers are often unable to reproduce published results” (p. 83). They subsequently call upon the scholarly community to promote methodological transparency, which they define as “the degree of detail and disclosure about the specific steps, decisions, and judgment calls made during a scientific study” (p. 84). However, in our review of the leader SM research, the employed collection and analysis method was too often elusive or completely absent, and such practices threaten the integrity of this stream of research³. Frequently, scholars are non-transparent due to conundrums associated with the dataset. Common issues include mortality (e.g., a leader stops using SM), exogenous confounds (e.g., a two-week dataset included the week of Christmas), maturation (e.g., a leader improved their SM communication), selection (e.g., a specific subset of leaders do not use SM), etc. (Cook & Campbell, 1979). In and of themselves, these are not fatal flaws, and scholars are burdened with the reporting of corrective measures to ensure the integrity of their opined outcomes so that future researchers can replicate findings (Dennis & Valacich, 2015).

³ As an example of methodological transparency of the SM data collection process, we recommend referencing the work of Steinbach et al. (2021).

Additionally, a significant concern within this domain of research is endogeneity. Endogeneity can emanate from different sources, including variable omission, self-selection, reverse causality, common-method variance, and measurement error (Antonakis et al., 2010). Inadequately addressing endogeneity results in biased estimation and confound findings (Sajons, 2020). In our review, several authorship teams took steps towards countering the possible effect of endogeneity (e.g., Gandia et al., 2016; Mousavi & Gu, 2019; Walter & Brueggemann, 2020).

Research can also turn to natural experiments. Sieweke and Santoni (2020) provide guidelines on three common approaches used in natural experiments: standard natural experiment, instrumental variable design, and regression discontinuity design. The ideal approach is a standard natural experiment. While scant in leader SM literature, scholars have recently identified this as the new “gold standard” since this type of design exhibits internal validity and showcases a more robust level of external validity than classic lab experiments (Eden, 2020). In standard natural experiments, both treatment and control groups contain pre- and post-treatment observations, and causal effect can be estimated by the average difference in the dependent variable between treatment and control groups. While this design was not utilized widely in the current SM leadership research, future scholars should consider it in the future. For example, events such as natural disasters, economic downturns, and legislation can create situations for natural experiments. Research may examine how these events change how leaders act. Further, research could examine how gender or cultural differences influence how leaders behave in response to these events. Due to the wide use of SM by corporate, governmental, and other institutions, natural experiments are a feasible option for the study of leader SM usage.

In the instrumental variable design, the only variation in the treatment caused by the independent variable is retained. However, a valid independent variable must meet two criteria:

first, the independent variable should be exogenous; second, the independent should be relevant (i.e., correlated with dependent variable only via treatment; Kennedy, 2008). This design was uncommon in our review (see Mousavi & Guo, 2019 for an exception). In regression discontinuity design, the near cut-off point is where treatment or control assignment is almost random (Dunning, 2012). However, field and natural experiments have to be implemented with caution. For example, a random or as-if random assignment process must be ensured. Otherwise, the internal validity of field and natural experiments is compromised by the degree of as-if randomization. In relation to the leader SM usage literature, it appears that field and natural experiments are still scant and mostly found within the political sphere (e.g., Broockman & Green, 2014). However, this research design shows considerable promise to provide fresh insights into and causal evidence for leadership research.

Finally, we identify several “tips” that may be helpful for leader SM research. Both quantitative and qualitative research agendas should validate if the leader(s) of focus uses multiple outlets of SM (e.g., Facebook and Twitter; see Agarwal et al., 2014 for an example) since this can augment theoretical insights. When only one SM dataset is available, SM can be paired alongside other variables to increase the resiliency of the research investigation. For example, Tur et al. (2014) leveraged TED talks and Twitter to test the same set of hypotheses, and this attenuates concerns that an effect is unique to a specific platform. Lee et al. (2017) captured CEO tweets, earnings conference calls, management earnings forecasts, and CEO options to explore the single, multi-dimensional variable of CEO overconfidence. Lastly, we emphasize that creative mathematical tests can be performed to provide more robust results. For example, in our review, Petrova et al. (2021) conducted a placebo, or balance test, to verify the critical assumptions of their Twitter dataset.

Practical Implications from Experimental Evidence

Many studies in our review were unable to make casual claims due to issues related to endogeneity. However, several studies adopted experimental designs which provide more robust evidence of causal relations. Drawing upon experimental studies from our review, we highlight practical implications that can be used more confidently in policy decisions. First, Grant et al. (2018), using a randomized experiment, found that investors reacted more positively to modesty on Twitter but more positively to bragging on investor calls. This research provides casual evidence that the medium by which CEOs communicate affects how investors will react. These findings are essential for organizations since Twitter is becoming a more common means to communicate with external stakeholders. The norms around how leaders act on Twitter and other SM outlets are consequential but may need to be approached with strategic differences.

Second, Tamul et al. (2019) experimentally examined the effects of “fake news” tweeted by Donald Trump to see their effects on followers. Interestingly, in their pilot study, those assigned to the manipulation condition of Trump’s “fake news” tweets showed no difference in diminished trust towards the news than the control group. Moreover, in Tamul et al.’s (2018) follow-up study, they found that exposure to fake news increased trust in news outlets and a desire for readers to learn more about the topic. However, Hornsey et al. (2020) found in an experimental design that those assigned to Trump’s anti-vaccination tweets were more likely to experience negative views towards the vaccine, but only if they were his supporters. Thus, the medium of Twitter as a tool for leaders may have differential effects.

Finally, there is also experimental evidence that SM’s medium also influences followers’ reactions to leadership. Snoeijers and Nicolay (2014), in an experimental design, found that in times of crisis, followers were more responsive to leader tweets than Facebook messages. Given

Twitter and SM's complete range access, some followers may be neutral or produce opposite consequences than were intended by the leader. This insight is key for understanding current leaders since their leadership may need to pivot to accommodate the type of outlet.

Theoretical Recommendations for Future Research

Finally, while our review elucidated and summarized key components of leader SM usage research and noted best methodological practices, we now highlight theoretical next steps and practical implications of SM research in leadership. In particular, we highlight how the five perspectives we identified earlier (i.e., signaling theory, framing, trait and demographic, boundary, network) can be used to extend e-leadership. We also identify other perspectives outside of these five and outline how research may contribute to leader SM research by adopting these additional perspectives.

Signaling Theory

The orthodox view of signaling theory asserts that a signal's value lies in its cost to create (Connelly et al., 2011; Spence, 1978), and some even refer to the framework as "the theory of costly signaling" (BliegeBird et al., 2005, p. 223). Indeed, scholarship has reported that signals must be costly in order to be credible (Coff, 2002) and that a defining characteristic of a good signal is its cost (Certo, 2001). Yet, SM is a challenging outlet to send high-cost signals due to some of the inherent technical underpinnings (e.g., low barrier to entry). However, in contrast to the traditional viewpoint of signaling theory, rhetoric and other signals have been recently positioned as "costless signals" within the crowdfunding literature (Anglin et al., 2018; Johan & Zhang, 2020; Steigenberger & Wilhelm, 2018), and we argue that many SM signals sent by leaders align with this emerging sociocognitive perspective of signaling theory (Drover et al., 2018).

Costless signals are defined as signals that have little to no cost to create or counterfeit; yet, in certain contexts, these signals can “transmit important information” (Anglin et al., 2018, p. 473). Anglin et al. (2018) contend that these signals are especially relevant (1) when there is a lack of objective information regarding the signaler, (2) when there are no explicit norms regarding the types of signals that should be transmitted between signaler and receiver, and (3) when the receiver is unsophisticated. The nature of the SM environment often aligns with each of these three criteria for costless signals to be sent by leaders to followers. Given this reality, we invite future leadership research to explore how the cost of a signal (i.e., costless, lower cost, higher cost) influences signal reception on SM, as well as the moderating effects of signal medium, format, etc. For example, political leader scholars might investigate how a true signal’s cost is diluted (or preserved) in a high noise environment (e.g., campaigning on SM before an election). Other disciplines may explore how an informal or formal leaders’ power enables him or her to send costless signals. In relation to traits, are certain types of leaders (e.g., males, charismatic, narcissistic) permitted to send costless signals? Are other types of leaders (e.g., religious minorities, females, grateful, forgiving, emphatic) penalized for sending costless signals? Other potential research questions include in what ways do leaders change in their signal sending throughout their leadership tenure. That is, do leaders send higher cost signals and then slowly begin to send lower cost or even costless signals as their reputation solidifies? Many articles in our review showed meaningful outcomes for leaders who effectively use SM (e.g., Chen et al., 2021; Petrova et al., 2021). As such, scholars from an economic perspective may wish to capture the optimum level of signal cost that a leader should adopt to reach certain objective outcomes, such as monetary campaign contributions.

A meta-analysis recently revealed that the effect size for charismatic leader tactic signals appears to be smaller for virtual environments than face-to-face encounters (Ernst et al., 2021). As such, experimental research may wish to build upon extant research to explore how the effect of a leader's signal shifts between mediums and what are moderators of this relationship (e.g., follower SM usage levels). Overall, we believe that information asymmetry is likely to persist on SM and thus signaling theory, and especially the emerging sociocognitive perspective of this theory (Drover et al., 2018), provide a helpful framework for understanding leader-follower communication in this medium.

Framing Perspective

Many of the articles within our review that dealt with framing were couched in political contexts. In particular, President Trump was the modal focus in our review of the leader SM literature. Trump epitomized a new form of leader SM use, as evidenced by his tweet, "My use of SM is not Presidential – it's MODERN DAY PRESIDENTIAL" (@realDonaldTrump, 2017). This observation is reasonable given that politicians are often attempting to frame issues that directly relate to voters, especially before elections. Although the framing literature is well-established in the political sphere, we strongly urge leadership scholars to build, elaborate, and test theory by looking at how corporate leaders use SM from a framing perspective. For example, scholars may consider following business leaders throughout their careers to understand how different roles and companies shift how they frame their work, contributions, and ideas. Further, AI-driven research may try to identify when leaders' posts are more likely to be from ghostwriters, reviewed by legal teams, or boilerplate as opposed to language that matches the leaders' natural rhetoric. Such findings would further enable scholars to understand the framing process of leaders' communication (for a related article in our review, see La Bella et al., 2018).

Trait and Demographic Perspective

In our review, the literature is rather homogeneous in relation to personality and demographic traits. The studies skew towards dark personality traits (e.g., overconfidence, narcissism), and scholars have yet to thoroughly study positive leader traits, such as optimism. This is unfortunate since many content analysis tools (e.g., LIWC) are well equipped to measure these positive traits. The personality traits of followers can also influence the leader-follower relationship (Matthews et al., 2021). Future research could look at how followers may react to leader tweets differently depending on their personality.

Furthermore, the vast majority of studied leaders are White males, with few exceptions (e.g., Gruber et al., 2015). Although the studies in our review studied leaders from a variety of different countries, very few looked at cross-cultural and gender differences. Gender and culture influence the effects of leadership (Kirkman et al., 2009; Wang et al., 2013) and are argued to be important moderators of technology adoption and use since gender plays a role in technology use (Avolio et al., 2014; O'Connell, 2018). For example, Van Iddekinge et al. (2016) hypothesized differences in SM assessments between males and females, as well as between White and ethnic and racial minorities. In the context of job applications, they found evidence for the notion that Facebook ratings tended to favor female and White applicants. Thus, we encourage researchers to further explore how a leaders' gender, race, and culture affect their SM use and how their SM use is received by followers. For example, scholars could examine if (and how) female leaders generally behave differently on Twitter than male leaders. Or if leaders from collectivist cultures use different SM messaging strategies compared to leaders from individualistic cultures. Future research may also consider how gender affects the perceived personality of leaders on SM. Research could also examine the interplay between gender and country cultural values as they

can interact to influence the leadership SM process (Bullough et al., 2012). And future research might consider exploring how gender moderates leader-member exchange (LMX) on SM.

Overall, leader SM usage provides a powerful tool to test these relationships given the broad use of SM across demographics (e.g., gender, country of origin).

Boundary Perspective

Leader SM use often emerges in less formal situations (e.g., political revolts, opinion leaders, “friending” a subordinate). Our review corroborates the modern approach to e-leadership (Avolio et al., 2014) and frameworks such as Complexity Leadership Theory (Uhl-Bien et al., 2007) by emphasizing the fact that SM challenges “traditional” leader-follower relations. Avolio et al. (2014, p. 119) observe that “the 24/7 availability of leaders and followers is altering leadership behaviors and interactions whereby both leaders and followers reach out to each other, not only during work, but also after hours.” Thus, we invite scholars to further explore how boundaries relate to leader SM usage. For example, scholars may wish to compare and contrast how boundary violations apply on different SM platforms, such as Facebook, Instagram, and LinkedIn. That is, in what ways does the SM medium moderate the violation perception? As “cancel culture” (i.e., when a person becomes ostracized from a social or professional group) continues to manifest itself, a better understanding of how companies’ oversight of followers’ and leaders’ private use of SM is a fruitful area of investigation (e.g., a leader being fired for a tweet containing hate-speech). As Heavy et al. (2020, p. 1494) note, “because communication boundaries are porous on social media, messages targeted at one audience may spill over to others and have a raft of unintended consequences.” Further, scholars might explore how business leaders can effectively encourage the proper balance of non-work activities (e.g., sharing a funny video) versus work activities (e.g., trying to find someone in the organization

with a particular skillset) in climates where SM usage between leaders and followers is encouraged.

Network

SM enables Big Data approaches to e-leadership, and this opens doors that were previously unavailable, both from a methodological and a theoretical perspective. Leader SM enables scholars to explore a new kind of one-to-many leader-follower relationship. For example, one tweet from a prominent leader to millions of followers challenges the boundary conditions of traditional e-leadership that typically feature more minor interactions (e.g., a team leaders' e-mail to their dozen followers). With all the tracing data that is available on SM, these large networks provide interesting avenues for research on follower reactions, indirect social ties, etc. Furthermore, herding behaviors – when many people follow the masses even if it contradicts their intuition – (e.g., Choi et al., 2003; Sun, 2013) would be a promising area for leader SM research. Unique features of SM (e.g., likes, trending features) allow content to go viral in a way that other forms of e-leadership cannot. As leaders create herding among followers, how does that influence their sequent leadership and the leadership of others? Organizational science scholars may seek to leverage SM networks in the presence of telework. For example, how can business leaders effectively leverage enterprise SM networks to connect followers from different groups within the organization?

Further Theoretical Advances

Since leader SM data can also serve as a methodological vehicle or research context, our review prompts additional theoretical advances to many other perspectives. For example, leader SM data can significantly contribute to new-age leadership behaviors (e.g., transformational leadership, ethical leadership, authentic leadership, humble leadership), relational, and contextual

leadership. These areas of leadership research are growing (Day & Antonakis, 2020). However, most prior research on new-age leadership behaviors utilizes Likert scales from followers to capture these leader behaviors, which are not actual measures of leader behaviors but rather measures of perceived leader behaviors from followers. SM could allow leadership scholars to capture a form of expressed behavior, which allows scholars to directly measure actual leader behaviors to test these theories of leadership (Cf. Tur et al., 2021).

SM can also allow scholars to examine better contextual aspects of leadership (Oc, 2018). In circumstances where SM is a situational element in leadership systems, future research can use SM resources to examine contextual aspects of the leadership process such as time, leadership type, and extreme contexts. For example, extreme research contexts (Hällgren, 2018) could be examined with leader SM data. Extreme research contexts are situations that are “frequently portrayed as unique, unprecedented or even uncategorizable” (Christianson et al., 2009, p. 846) and often provide a rich amount of archival data (Hällgren et al., 2018). Examples include hurricanes, pandemics, terrorist attacks, seismic economic and political events, etc. The occurrence of events are meaningful constructs that can impact individuals (Folkman & Lazarus, 1984) and organizations (Morgeson et al., 2015), and SM can provide a window into the interplay between large-scale events and leadership. Indeed, these contexts can be excellent sources for natural experiments.

Finally, we believe our review provides a springboard for leadership scholars to leverage SM in theory building, elaboration, and testing in several ways. For example, Grounded Theory (Glaser & Strauss, 1967) approaches can seek to give rise to mid-range theories by examining how SM plays into the overarching digital transformation that the world is witnessing (Siebel, 2019). The boundary conditions of frameworks such as the Language Expectancy Theory

(Burgoon et al., 2002), Upper Echelons Theory (Hambrick & Mason, 1984), Romance of Leadership (Meindl et al., 1985; Hammond et al., 2021), Followership Theory (Uhl-Bien et al., 2014), and institutional theory (DiMaggio & Powell, 1983) are also fruitful avenues of investigation for leader SM researchers.

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Table 1 Example Social Media Analysis Tools

Tool	Tool Type	Strength	Platform	Learning Curve
DICTION*	Analysis	Ability to determine tone of verbal messaging via pre-defined dictionaries	All	Low
LIWC*	Analysis	Robust method to apply a dictionary-based approach to analyze a corpus	All	Low
NCapture/NVivo/Atlas.ti*	Collection & Analysis	Web-browser extension to collect data (NCapture), an ability to analyze descriptive statistics in a graphical format (NVivo), and manage and analyze qualitative SM data (Atlas.ti)	Twitter, Facebook, YouTube	Low
NodeXL*	Collection & Analysis	Ability to generate meaningful social network maps	Twitter (collection), All (analysis)	Medium
Pajek	Analysis	Ability to conduct large network analyzes	All	Medium
Scripting* (e.g., R, Python)	Collection & Analysis	Extreme flexibility and an ability to analyze a range of data types and handle a vast amount of data volume	All	High
QDA Miner	Collection & Analysis	Ability to collect via direct queries, complete text coding, and conduct a visual analysis of qualitative data	Twitter, Facebook, YouTube	Low
Receptiviti*	Analysis	Features an ability to garner insights into emotions, drives, and personality traits	All	Medium
SALT	Analysis	Streamlined process for analyzing language samples	All	Medium
SAS Enterprise Miner*	Analysis	Provides a variety of text-mining functionalities	All	Medium
ScrapyGram	Collection	User-friendly way to gather Instagram meta-data	Instagram	Low
SocioViz	Collection & Analysis	Quick insight into trends and ability to conduct social network analysis	Facebook & Twitter	Low
UCINET*	Analysis	Provides social network analysis	All	Medium
Vicinitas	Collection	Historical collection of tweets, hashtags, and accounts	Twitter	Low
WEKA*	Analysis	Tailored to discovery-based approaches of text mining	All	Medium

*Appropriate for rigorous research initiatives



Figure 1. Fruchterman-Reingold Network Diagram of Tweets with #Leadership