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ORGANIZATIONAL IMAGE AND REPUTATION CONSTRUCTION BY VARIOUS

STAKEHOLDERS USING SOCIAL MEDIA

By

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ABSTRACT OF THE DISSERTATION

ORGANIZATIONAL IMAGE AND REPUTATION CONSTRUCTION BY VARIOUS

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Dr. Craig R. Scott

This study aims to investigate how organizational image and reputation are constructed and shaped through the use of social media by organizations and a variety of organizational stakeholders. Organizational images that are communicatively constructed by organizations and key stakeholders on organizationally-sanctioned social media and counter-organizational social media, and how stakeholders' social media use affect the perceived organizational image and perceived organizational reputation are examined. A mixed-method, multiple-case-study design is adopted and BP and Monsanto are selected as the two case companies for this study.

The data collection and analyses include two phases. In Phase 1, textual messages were collected from the three social media sites related to BP and the three social media sites related to Monsanto; and semantic network analysis was conducted to analyze the textual messages to identify organizational images conveyed on those sites. In Phase 2, online surveys were conducted and Amazon MTurk workers were recruited to participate in the study to examine

public perceptions of the communication between organizations and stakeholders on social media, the organization-stakeholder relationship, organizational image, and organizational reputation.

Findings of the study suggest social media not only provide opportunities for organizations to build preferred images and reputation, but also bring substantial risks and could significantly damage an organization's image and reputation. Contrasting organizational images were built on organizational and counter-organizational social media sites and both types of social media sites strategically built and conveyed specific images of BP and Monsanto according to their goals. The study found that social media provide platforms for stakeholders to express voices, unite people who intend to make changes, and declare their resistance to the big corporate giants. In this respect, social media do empower otherwise disadvantaged stakeholders to some extent by providing communication channels to them that even large organizations are unable to control. The systematic communication activities of the two counter-organizations, Boycott BP and Occupy Monsanto, reveal that in the era of social media, organizational image and reputation are co-created/co-constructed by both organizations and stakeholders, rather than solely constructed by organizations. The study found social media become interaction arenas of organizational image and reputation construction, and multiple images and reputations coexist in these arenas. Stakeholders' social media use positively predicted organization-stakeholder dialogic communication on both types of social media sites, which positively predicted organization-stakeholder relationships. Organizational image and reputation were strongly and positively related, and both of them were positively predicted by organization-stakeholder relationships. No direct effects of organization-stakeholder dialogic communication were found

on organizational image and reputation. The effects of dialogic communication and

organizational image/reputation were mediated by organization-stakeholder relationship.

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DEDICATION

This dissertation is dedicated to my mother Xiaoman Wu, my father Zuosheng Li, my husband Yongwei Yang, and my brother Ji Li. Thank you for your love and support.

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Chapter 1

Introduction

In recent years, organizations have adopted various social media tools such as corporate blogs, Facebook, Twitter, and YouTube to communicate with different stakeholders (Bonsón & Flores, 2011). Social media can be used to serve the purpose of critical business functions such as public relations, marketing, lead generation, customer service, and market research (Blanchard, 2011). Social media were found to have a strong positive effect on customers' brand attitudes, and a subsequent positive effect on their purchase intention (Abzari et al., 2014). According to a study conducted by the Center for Marketing Research at the University of Massachusetts Dartmouth (Barnes & Lescault, 2015), 157 (31%) of the Fortune 500 companies had public facing corporate blogs, 413 (83%) of them had corporate Twitter accounts, and 401 (80%) of them had Facebook accounts. Companies adopting one or more social media are from a variety of industries such as retail, food consumer products, insurance, telecommunications, utilities, food consumer products, and so forth (Barnes et al., 2012; Guo, 2012).

Organizations have used social media as effective tools for public relations, crisis communication, stakeholder engagement, and more (Elefant, 2011). By examining the Twitter profiles of Fortune 500 companies, Rybalko and Seltzer (2010) found these companies used the popular social networking sites to facilitate dialogic communication with their stakeholders. Social media marketing was found to exert positive effect on customers' brand loyalty when the brand offered advantageous campaigns and relevant and popular content on social media (Erdoğmuş & Çiçek, 2012). From the perspective of public relations leaders, the primary functions of social media included broadcasting and disseminating organizational information, building communities, monitoring issues and concerns, and managing crisis (Luo et al., 2015).

Social media were used for purposes in organizations including advertising and promotion, branding, information search, and building customer relations (Parveen et al., 2015). Organizations endeavored to create corporate characters on social media to promote public engagement and a favorable organizational reputation (Men & Tsai, 2015). These organizational activities regarding social media indicate that organizations have already realized social media as tools help build organizational image and reputation. Organizations are actively, consciously and strategically engaged in activities of building positive organizational images and reputation on social media. They are adopting a variety of types of impression management strategies in company-consumer interactions on social media such as Facebook (Lillqvist & Louhiala-Salminen, 2014). Consumers' intensity of social media use positively affected their engagement in corporate social media activities, which was positively related to corporate reputation (Dijkmans et al., 2015).

The Empowerment of Stakeholders/Publics on Social Media

Although social media have been used by organizations to cultivate a positive organizational image and build good reputation, perhaps the key revolutionary consequence of social media is not that it provides a new channel for an organization to manage its image, but that social media potentially empower previously disadvantaged stakeholders and publics. Berthon et al. (2012) proposed a concept of "creative consumers" (p. 263) to describe those customers who can creatively produce a wide variety of types of content and messages regarding the company on various social media platforms. They pointed out that due to Web 2.0 technologies, the "locus of value production" (p. 262) and "the locus of power" (p. 262) are both shifted away from the firm to the consumer. They listed an example to illustrate how the power had been shifted. Dave Carroll, a United Airlines passenger, found his guitar was broken by the

baggage handlers after a flight to Chicago. He spent a year negotiating with United Airlines in order to have his claim for damages honored. After United Airlines refused him, he wrote a song, created a video of the incident, and uploaded the song and video to YouTube and distributed the fact on Twitter. His story was then reported by traditional media such as CNN and other television channels, and it was even published in *The Times* of London. On the day it was published, the market capitalization of United Airlines declined by around 20%.

The scenario portrayed by Berthon et al. (2012) is not hard to understand. Brand managers are losing the pivotal role as authors of brand stories and consumers are empowered to share their own brand stories easily and widely through social networks (Gensler et al., 2013). Gensler et al. (2013) argued that it is because consumers have become pivotal authors of brand stories that social media affect brand management. Both firm-generated brand stories and consumer-generated brand stories are communicated through a plethora of communication channels, including social media. The previously disadvantaged customers can distribute their complaints and express voices faster and much easily in the social media space. As O'Connor (2012) argued, growing networks of ordinary people are using social media to "bypass state censorship, outpace traditional news organizations, and compel corporations and governments alike to listen to and act on their demands" (p. 9). The allied publics on social media no longer rely on traditional media and corporate brands are now moving to "a new era of decentralized, distributed and networked social media" (p. 15). For example, when the "Occupy" Movement of Wall Street and the surrounding financial district was initiated in September 2011, the protest was ignored and ridiculed by the powerful global media corporations. In response to this, the demonstrators employed their own media including viral emails, blogs, Facebook, YouTube, and Twitter to spread messages. Even when under arrest, some tech-savvy demonstrators persisted in

posting commentary, photographs, and video on social networking websites to tell their own stories. Messages, posts, and tweets emanating from the renowned "Occupy Wall Street" Movement were widely distributed on social media and the established media were forced to change their stance and began reporting the protests in a more comprehensive and respectful way (O'Connor, 2012). This example illustrates that social media provide powerful, free, and easily accessible tools of communication for ordinary people to express their voices and oppose the dominant organizations such as large media corporations and financial institutions. In this process, these ordinary people are empowered. As a type of stakeholders of the financial institutions, their participation on social media influenced the image and reputation of these institutions. This example shows that some features of social media and how they are utilized may influence organizational stakeholders' role in organizational image and reputation construction processes.

The empowerment effect demonstrates a distinguishing feature of social media; namely, through using social media, organizations lose some control in the image building process. Aula (2010) pointed out several implications of social media for corporate strategic endeavors. The first implication is stakeholder liaisons; namely, corporations have less control over stakeholder relations and stakeholder groups can have more effective communication through the use of social media. It is nearly impossible for organizations to control conversations about themselves among stakeholders on social media. Second, compared with traditional media such as TV or newspapers, social media content cannot be controlled in advance and that content cannot be managed in the same way as in conventional media.

Smith's (2010) exploration of Twitter users' response to the earthquake in Haiti somewhat empirically supports Aula's (2010) argument. Smith suggested that most public relations research

examining how social media facilitate relationship cultivation mainly studied organization-initiated efforts, ignoring that on social media platforms, online publics can be active communicators who can either fulfill or impede public relations strategies. Smith pointed out that by posting public content reflecting on organizational reputation, social media users may participate in public relations activities. Findings suggest that Twitter users posted comments on the commitment of organizations involved in Haiti relief as they debated the effectiveness and credibility of relief efforts and their participants. Smith argued that the engagement of Twitter users to respond to Haiti earthquake relief indicated a socially distributed model of public relations. This model of public relations differs from traditional public relations in that, in this model, public relations responsibilities are initiated and fulfilled by online publics through online interactivity, facilitated by communication technology.

The New Landscape of Organizational Image and Reputation Construction on Social Media

Although it might be disputable whether an online public's reflections and discussions about an organization's reputation can be considered as public relations activities or not, results of Smith's (2010) study empirically support Aula's (2010) argument that on social media organizations have less control over stakeholder relations, stakeholder communication, and the content presented on social media. On social media, not only messages generated by organizations, but also those generated by other social media users, are presented in front of the general public online. Consumer-generated brand stories can add to a firm's pursued brand meaning, but they can also add new meanings that may contest the brand's aspired identity (Gensler et al., 2013). Therefore, it is reasonable to argue that organizational image as presented on social media is not only constructed by organizations themselves, but is also affected by the

activities of social media users who participate in discussions about the organization or reflect on the organization's reputation. Social media users' positive discussion and reflection on organizations can help to strengthen the organizational image most organizations attempt to build; however, negative comments might damage, sometimes in very substantial ways, an organizational image.

Thus, organizational image and reputation on social media are usefully viewed as being co-constructed among stakeholders, rather than solely constructed by organizations. For example, on its Facebook page, Chevron posted a message explaining how it can meet the world's increasing demand for energy by developing energy in all forms. There are some positive comments such as "chevron Exxon shell keep up the good work", but there are also negative comments like "Chevron, CRIMINALS, get out of my country Bulgaria, and also take your protégé Warlick!!!" Users participating in the discussion might also raise other issues the company faces. For example, a user commented: "I'm not sure how I 'liked' this but wasn't Chevron the company that tried to sell the rain water back to the people of Bolivia & was only stopped by a peoples army?" This person also posted the link of the whole event in the comment. This kind of comment also received additional comments and the topic of the interactions turned away from the topic Chevron originally set.

In addition to sites supported by the company, there are also other sites supported by independent stakeholders that can affect the organizational image construction process. A type of particular interest is counterinstitutional Web sites, as defined by Gossett and Kilker (2006). In their terms, counterinstitutional Web sites provide a place for disgruntled employees and customers to express their concerns and frustrations with particular institutions. For readability, the word "counter-organizational" is used instead of "counterinstitutional" in this study. Through

the analysis of an online community—RadioShackSucks.com, Gossett and Kilker portrayed how both internal and external stakeholders utilized the online platform to show their resistance efforts outside formal organizational boundaries. Similarly, in Chevron's case, in addition to maintaining a website, activist groups also created accounts named "We Can Change Chevron" on Facebook and Twitter, and uploaded many videos on YouTube.

The Chevron example demonstrates some of the complexity in an organization's effort to build positive images by sending positive messages about itself. As Aula (2010) argued, Chevron cannot control in advance all the content presented on social media (e.g., the negative comments and the issues brought up by users), and how users interact with each other on this platform. In traditional media such as newspapers and TV advertisements, organizations cannot control the audiences' response to the messages, either. But the difference between social media and the traditional media is that on social media the audience's responses and comments themselves are much more easily presented in a public space, as messages sent by organizations are. The counter-organizational sites show that social media also provide an effective platform for users to communicate with each other, and their interactions also form a part of messages about the organization. Therefore, messages sent by the organization and messages posted by social media users both play very significant roles in the organizational image construction process.

The role of social media in corporate reputation management has been discussed by scholars from many fields. A number of studies focus on the negative effect social media might exert on organizations in their corporate reputation management. Arguing that organizations have less control on stakeholder relationships, stakeholder communication, and online content on social media, Aula (2010) contended that social media bring reputation risks to organizations by expanding the spectrum of reputation risks, boosting risk dynamics, fueling new expectations or

beliefs about organizations to which organizations should respond, and spreading opinions about what organizations should focus on in the future.

McCorkindale and DiStaso (2013) expressed similar opinions by stating that a company's reputation can be damaged by the public nature of social media after only one individual's post goes viral. They argued that if not managed properly, social media may pose a constant threat to a company's reputation. They also pointed out two distinctive features of social media that make it unique for corporate reputation management. First, social media communications are usually viewed outside the time and place in which they occurred; and second, conversations and comments are recorded and preserved permanently on the Internet. They highlighted these features for the purpose of illuminating the negative effects social media might exert on corporate reputation. Compared with those negative effects, fewer researchers discussed the possible positive influence social media might exert on corporate reputation, which seems ironic considering the popularity of using social media to enhance reputation.

The organizational image and reputation construction process on social media demonstrates distinct characteristics that are different from the construction process via traditional media or Web 1.0 technologies (e.g., a company website). The communication patterns between organizations and their stakeholders and the role played by external stakeholders in image and reputation building are both under ongoing shifts. One of the aims of this study is to explore how organizational image and reputation are constructed by organizational members and external stakeholders through the use of social media by examining whether and how new dynamics emerge in the construction process.

The Affordances and Appropriation of Social Media

The reason why external stakeholders play a more significant role in organizational image and reputation construction on social media relates to a variety of affordances relevant to the features found in social media. Social media provide many functions that various users can actively employ to participate in the image and reputation construction process. As Hutchby (2001a) pointed out, every communication tool has specific communicative affordances, which not only allow people to use it in a certain way, but also constrain how it can be used. As a new type of communication tool, social media also provide many affordances that may affect how organizational members present the organization and how external stakeholders interact with them and with one another on various social media platforms. For example, the intermediary role of mass media is lessened since social media provide the affordance that can allow direct communication between organizational members and external stakeholders. Other affordances may be seen as constraining, such as the 140-word-limit of Twitter that can limit the depth of interactions between stakeholders. By discussing the affordances of social media and the influences of these affordances, an affordance approach can be utilized to analyze the organizational image and reputation construction process on social media.

The way people use a type of technology is not solely defined by the technological features that characterize it. People can strategically utilize technologies in specific ways. For example, they may choose to use some functions much more frequently than other functions the technology provides. They may use the technology for some purposes that are distinct from the purposes for which the technology was originally designed. They may explore some features much more deeply than other features. In other words, people can appropriate technologies differently and this appropriation process largely affects how technology exerts influence on their

lives. Both organizational members and stakeholders can appropriate social media in a variety of ways based on the affordances social media provide. For example, confined by resources and time, organizational members might not be able to explore the interactivity feature provided by social media, even if social media offer a large number of ways for them to interact with external stakeholders.

Based on the aforementioned discussion on the concepts of affordances and appropriation, it is reasonable to argue that organizational image and reputation construction on social media is not only affected by the technological affordances social media provide, but also influenced by the appropriation patterns of various organizational members and external stakeholders. Hence, the image and reputation construction process cannot be delved into without examining the affordances social media provide and how they are actually appropriated by organizations and their stakeholders.

Research Questions

The main objective of this study is to examine how organizational image and reputation are constructed and shaped through the use of social media by organizations and a variety of organizational stakeholders. The social media sites used by these internal and external stakeholders can include both organizationally-sanctioned social media and counter-organizational social media. An affordance approach is adopted in this study to examine the role of communicative affordances of social media in the image and reputation construction process. More specifically, the following research questions are examined. This study also tests several hypotheses, which are not listed here, but will be proposed in Chapter 2 and Chapter 3 later.

RQ1: What organizational image is communicatively constructed by organizations and key stakeholders using social media?

RQ1a: What organizational image is communicatively constructed through the use of organizationally-sanctioned social media?

RQ1b: What organizational image is communicatively constructed through the use of counter-organizational social media?

RQ2: How does stakeholders' social media use affect the perceived organizational image and perceived organizational reputation?

Organization of Study

This dissertation is organized as follows. In Chapter 2, the related literature from multiple disciplines will be reviewed as background for RQ1. In Chapter 3, a detailed description of the affordance approach to organizational image and reputation construction on social media will be presented, and a set of specific research questions and hypotheses for this research will be proposed. Discussions of case selection, method of data collection, and procedures of data analyses will be covered in Chapter 4. Chapters 5 and 6 will primarily display descriptive analyses and results for the two cases examined here. In Chapter 7, discussions, conclusions, and implications of this study will be given.

Chapter 2

Stakeholders, Organizations' Image and Reputation, and Their Social Media Use

In this chapter, literature regarding stakeholder theory, conceptualization of public in the field of public relations, organizational impression management, organizational identity, image, and reputation, and social media use by organizations and stakeholders are reviewed. First, since a stakeholder approach is adopted throughout this study, literature on stakeholder theory, stakeholder communication, and conceptualization of "the public" in the public relations field is discussed. Second, conceptualizations, theories, perspectives and empirical studies concerning organizational impression management, and organizational identity, image, and reputation are reviewed to illuminate how established theories and perspectives and the existing literature in the field can shed light on the current study. The relationships among organizational image, organizational identity, corporate communication and organizational reputation are discussed— and a stakeholder approach to organizational identity, image, and reputation is also presented in this section. Third, definitions, forms, and history of social media are introduced. Fourth, literature regarding the use of social media by organizations and stakeholders is reviewed. A brief discussion of counter-organizational social media sites is also presented in this section. Based on the literature review, RQ1 is proposed at the end of this Chapter.

A Stakeholder Approach

Stakeholder Theory

Since the publication of Freeman's (1984) landmark book, Strategic Management: A Stakeholder Approach in 1984, the stakeholder approach has become commonplace in the academic and professional management literature (Donaldson & Preston, 1995). Freeman (2010) proposed a stakeholder approach to strategic management and defined a stakeholder as "any

group or individual who can affect or is affected by the achievement of a firm's objectives" (p. 25). He listed some possible stakeholders of a company, which include employees, customers, suppliers, stockholders, banks, environmentalists, government, etc. He argued that the major strategic shifts in the business environment urge the company to realize the importance of various stakeholders. An organization should know who its stakeholders are and what stakes they have. The same stakeholder can play different roles. For example, an employee can be the owner and customer of the company at the same time and a government official can be the regulator and customer of the company at the same time.

Freeman (2010) emphasized that when facing challenges in a turbulent business environment, it is important for an organization to develop its stakeholder management capability. He put forward several propositions to explicate specific ways for an organization to foster its stakeholder management capability. He proposed that organizations with high stakeholder management capability design and implement communication processes with different stakeholders, explicitly negotiate with them on critical issues and seek voluntary agreements, design and implement various marketing strategies to serve them, integrate boundary spanners into their strategy formulation processes, keep proactive by anticipating stakeholders' concerns and trying to influence the stakeholder environment, allocate resources in a manner that is consistent with stakeholders' needs and concerns, and "think in 'stakeholder-serving' terms" (p. 80).

Obviously, social media provide a chance to enhance stakeholder management capabilities identified by Freeman (2010) in several ways. First, social media offer more means for organizations to directly communicate with different stakeholders and get quicker feedback from them. Second, in situations when critical issues emerge or voluntary agreements need to be

obtained, organizations can express their voices and explicitly negotiate with their stakeholders more quickly on social media. Third, through more frequent and direct communication with diverse stakeholders on social media, organizations are more likely to better figure out the specific composition of some stakeholder groups and gain a better understanding of their individual needs and preferences, based on which, they can develop a general marketing approach to serve them. Moreover, built on their knowledge on stakeholders gained through their interactions with stakeholders and constant monitoring of stakeholders' activities on social media, organizations can sometimes anticipate stakeholders' concerns and thus be more proactive to take actions to influence stakeholder environment and meet their needs in a better way.

However, organizations cannot be totally optimistic about social media's effects on their stakeholder management capability. Social media bring huge challenges for them to maintain a high level of stakeholder management capability. As discussed before, on social media platforms, organizations lose much control on how organization-generated messages flow. The bigger challenge is they have little control on the reaction stakeholders may have towards their messages and the content stakeholders may create to describe the products, services, or other aspects of the organization. Therefore, the emergence and popularity of social media require organizations to hire more savvy communication professionals with advanced skills to design and implement effective communication programs to meet the needs emerging in the more turbulent communication environment.

Stakeholder Theory and Communication

The stakeholder theory has implications on the communication process within and around an organization. Freeman (2010) pointed out that companies should design and implement

communication programs to communicate with different stakeholders. He argued that the stakeholder approach requires a redefinition of public relations and PR professionals should take into account multiple stakeholders when designing strategic programs. They should not only participate in the strategic management process, but also actively scan the environment for new issues and new stakeholders and bring them to the attention of decision makers and managers.

Donaldson and Preston (1995) argued that there were three types of uses of the stakeholder theory in the literature. First, the theory is descriptive in that it had been used to describe and explain specific corporate characteristics and behaviors such as the nature of the company, how firms were managed, how managers thought about managing, and the way the board members thought about the interests of corporate constituencies. Second, the theory is instrumental in that it was used to identify the connections or lack of connections between stakeholder management and the achievement of conventional corporate objectives such as profitability and growth. Empirical studies following this line usually generated implications suggesting that adherence to stakeholder principles and practices was equally or more effective than other approaches to achieve traditional corporate objectives. Third, the theory is normative in that it was used to explain the function of the firm. For example, it was used to identify moral and philosophical guidelines for the firm's operation and management. Donaldson and Preston pointed out that these three theoretical approaches had been combined without acknowledgement in the stakeholder literature, which resulted in "less rigorous thinking and analysis than the stakeholder concept requires" (p. 73).

Friedman and Miles (2004) discussed the relationship between stakeholder theory and communication practice. They mentioned that the principle as proposed in stakeholder theory is that, in order to reduce risks to their reputation and long-term profitability, organizations should

care about stakeholders' needs beyond fiduciary duties, as described in the instrumental approach to stakeholder theory. Moreover, as portrayed in the normative approach to stakeholder theory, organizations have social responsibility to attend to stakeholder groups. Lastly, the descriptive approach to stakeholder theory describes and explains how organizations actually act towards their stakeholders. Friedman and Miles pointed out that these three approaches all concentrate on the organization, with emphasis on the organization's needs, its perception of who its stakeholders are and who are important or legitimate, and what kind of communication policies should be made and executed towards them.

Friedman and Miles (2004) argued that effective communication between an organization and its stakeholders requires a "decentred" (p. 95) view of the organization, which attends to both sides of stakeholder/organization relationship. Effective stakeholder communication cannot be achieved if the organization only attends to its own internal view of who its stakeholders are and who are important. They also emphasized the role media play in this process. They argued that effective stakeholder communication is also dependent on how well the messages fit with the media's needs and aims. They called upon a need for stakeholder theory that is to be approached from the perspective of stakeholder/organization relations, rather than purely from the perspective of organizations. They built a model that takes this approach (Friedman & Miles, 2002), in which stakeholder/organization relations are categorized into four types based on whether the relationship is compatible or incompatible and whether it is necessary or contingent. These four types are *necessary compatible relations*, *contingent incompatible relations*, *necessary incompatible relations*, and *contingent compatible relations*.

Clearly, Friedman and Miles' (2004) call for a decentered view of organization and a stakeholder theory from the perspective of stakeholder/organization relations sounds very

compelling in the social media environment. As discussed before, the previously disadvantaged stakeholders are greatly empowered by social media. They are no longer as marginalized as before in organization-stakeholder relationships. Organizations should pay much more attention to monitor stakeholders' activities on social media, gain more understanding of their needs and preferences, and implement communication programs based on these needs.

The role of stakeholder management in corporate communication has also been emphasized (Cornelissen, 2008). Cornelissen synthesized three communication strategies in stakeholder communication, including *an information strategy* (a one-way symmetrical model of communication), *a persuasive strategy* (a two-way asymmetrical model of communication), and *a dialogue strategy* (a two-way symmetrical model of communication). *The information strategy* involves one-way communication from the organization to its stakeholders and no stakeholder feedback is gathered. In this process, the relationship between the organization and its stakeholders are "symmetrical" in that little persuasive content is involved and the organization aims to provide objective information about itself. *The persuasive strategy* involves two-way communication between the organization and its stakeholders. However, the communication is "asymmetrical" in that persuasive content is largely involved and "the effects of communication are unbalanced in favor of the organization" (p. 55). The *dialogue strategy* involves "dialogue rather than a monologue" (p. 56) and its goal "is to exchange views and to reach mutual understanding between both parties" (p. 56). In this two-way symmetrical communication, the organization and its stakeholders recognize each other in the communication process and try to provide equal opportunities for each other to express their opinions and freely exchange information.

In the model of stakeholder communication proposed by Cornelissen (2008), the information strategy is used in the awareness process and the tactics include newsletters, reports, memos, and free publicity; the combination of information and persuasive strategies is used in the understanding process and the tactics include discussions, meetings, advertising and educational campaigns; the dialogue strategy is used in the involvement process and the commitment process, and the tactics adopted in the involvement process include consultation and debate whereas the tactics involved in the commitment process include early incorporation and collective problem-solving. Cornelissen also pointed out efforts had been made to "focus on changing the relationship between the organization and its stakeholder from 'management' to 'collaboration' and from 'exchange' to 'long-term relationships'" (p. 57).

All three types of strategies have been adopted by organizations in their communication with stakeholders on social media. The news release, reports, and advertisements sent by organizations on their blog, Facebook, and Twitter pages are utilization of information strategy. The interactive marketing campaigns and advertisements, and some discussions and meetings initiated and dominated by organizations to achieve a result that favors the organization on their Facebook and Twitter pages are examples of persuasive strategy. Social media provide platforms on which dialogue strategy can be much more frequently used. The dialogic communication can be initiated by organizations through their social media accounts to gain stakeholders' feedback on their products and services. It can also be launched by stakeholders either through making comments on organizational social media platforms or through posting on their own social media accounts when they want to express their appeals and complaints.

The Power Dynamics Between Organizations and Stakeholders

The power dynamics between organizations and their stakeholders and their influence on organization-stakeholder relationship has been examined (Frooman, 1999). The stakeholder's *power* to influence the firm, along with the *legitimacy* of its relationship with the firm, and the *urgency* of its claim on the firm, were used to determine stakeholder identification and salience (Mitchell et al., 1997). In their stakeholder salience model, Mitchell et al. identified seven types of stakeholders based on these three attributes (i.e., power, legitimacy, and urgency), including dormant, discretionary, demanding, dominant, dangerous, dependent, and definitive stakeholders. Frooman made an attempt to model the type of influence strategies stakeholders choose to deal with the target organization by merging stakeholder theory with resource dependence theory. An *indirect withholding strategy* would be adopted when the organization-stakeholder relationship is low interdependence; when the firm power is superior to the stakeholder, an *indirect usage strategy* would be chosen; when the stakeholder power is superior, a *direct withholding strategy* would be selected; a *direct usage strategy* would be adopted when the relationship is highly interdependent. Overall, the balance of power implied by organization-stakeholder relationship determines which type of strategy a stakeholder would use to influence the organization.

Social network theories were also employed to theorize stakeholder power and its influence on organization-stakeholder relationship (Rowley, 1997; Sedereviciute & Valentini, 2011). Rowley called upon moving beyond the dyadic relationship between individual stakeholders and a focal organization. He attempted to build a theory of stakeholder influence using social network concepts, arguing that the structure of an organization's stakeholder relationships exerts effects on how it would respond to stakeholder pressures. The density of the stakeholder network surrounding an organization and the centrality of the organization in the

network affects its degree of resistance to stakeholder demands. Stakeholder relationship, as argued by Rowley, does not "occur in a vacuum of dyadic ties" (p. 890) between a stakeholder and an organization. A firm's stakeholders are likely to have direct relationships with one another "in a network of influences" (p. 890). Consequently, the organization is no longer necessarily at the center of the network composed by itself and its stakeholders, similar firms, and a variety of stakeholders of each firm.

Unlike Frooman (1999), whose focus is the power balance's influence on stakeholder influence strategies, Rowley (1997) examined the influence of structure of the stakeholder network on the focal organization's response strategies to stakeholder pressures. He argued that the dense stakeholder networks, which were characterized by "the combination of shared expectations, the ease of information exchange between stakeholders, and the potential for coalition formation" (p. 898) tended to result in "strong unified stakeholder pressures" (p. 898) and the conformity of organizations. Namely, as network density increases, stakeholders would gain more ability to constrain the organization's actions. However, if the organization's centrality in the network increased, its ability to resist stakeholder pressures increased. In a word, different types of network structures produced by the interaction of network density and focal firm centrality influenced the relative power balance between a focal firm and its stakeholders.

Rowley's (1997) discussion of how the structure of stakeholder networks affected the power balance between an organization and its stakeholder was echoed in Sedereviciute and Valentini's (2011) attempt to propose a holistic stakeholder mapping model to map known and undiscovered stakeholders from social media. Sedereviciute and Valentini's starting point was Mitchell et al.'s (1997) stakeholder salience model in which power, legitimacy, and urgency are three fundamental attributes that are used to identify types of stakeholders. They criticized that

the stakeholder salience model is primarily suitable for identifying stakeholders that organizations are aware of, but it would fail to identify potential stakeholders organizations are not aware of, especially those emerging in social media contexts. Their solution was combining social network analysis with stakeholder salience model to determine the power, urgency, and legitimacy of stakeholder groups. Greater power is gained by gaining better position within the network as measured by density, degree, closeness, and betweenness centralities, prestige, etc.; greater urgency is acquired by propagating certain content online; legitimacy is gained when the content shared is perceived to be relevant to known stakeholders. They thus identified three types of stakeholders including unconcerned influencers (dormant stakeholders), concerned influencers (definitive stakeholders), and concerned lurkers (dependent stakeholders), and a non-stakeholder type (i.e., unconcerned lurkers).

The incorporation of social network theories to examine the power balance between organizations and stakeholders is especially useful in studying organization-stakeholder relationships in social media environment. As argued by Rowley (1997), a dense stakeholder network comes along with fast information flow and strong ability to monitor the focal organization. Social media promote faster information exchange and more frequent communication among stakeholders, which help form denser stakeholder networks. The denser stakeholder network empowers stakeholders when facing the organization on social media and the nature of organization-stakeholder relationship moves beyond the dyadic relationship between the organization and any individual stakeholder, but a network composed by many stakeholders. Organizations are gradually losing the central and more powerful position they previously hold in traditional media environment.

In a word, the emergence and popularity of social media bring both opportunities and challenges to organizations to maintain a high level of stakeholder management capability. The changes brought about by social media in organization-stakeholder communication call upon a stakeholder theory that is not organization-centered and realizes the power stakeholders obtain in the new media environment. Effective stakeholder communication can only be achieved when organizations gain enough understanding of how the new media work and how their stakeholders use them.

"The Public" in Public Relations Research

The "public" is clearly a relevant and widely-used construct in public relations research. Vasquez and Taylor (2001) discussed different research perspectives on the public in the literature. *The mass perspective* viewed a public as aggregate individuals with some enduring characteristics. *The situational perspective* regarded a public as a collection of individuals that emerges to respond to some problematic situation. *The agenda-building perspective* conceived a public as "an enduring state of political involvement" (p. 140). *The homo narrans perspective* considered a public as individuals who act to solve some problematic situation and develop a group consciousness around it. A public viewed from *the situational perspective* simply respond to the problematic situation, whereas a public perceived from *the homo narrans perspective* develop group consciousness, and thus shape a group identity, based on which, they take active actions together to try to solve the problems.

Public relations theories are overwhelmed with the organizational perspective and publics are marginalized in public relations research (Leitch & Neilson, 2001). Leitch and Neilson (2001) contended that public relations theories view publics solely from the perspective of the organization, rather than the perspective of publics themselves. They identified two streams of

approaches to conceptualize publics: strategic and dialogic. *The strategic approaches* depict publics as consumers of targeted organizational messages, while *the dialogic approaches* delineate publics as participants who are actively and equally engaged in dialogues with the organization. Leitch and Neilson argued that both approaches stress the organizational perspective by focusing on the nature of organization-public relations that solely meet organizations' needs and totally ignore the publics' demand. In both approaches, the organization always takes a "'subject position' from which publics are understood" (p. 128). In the second approach particularly, publics are considered as organizational artifacts or constructs in that publics emerge only when an organization identifies them as publics. In both approaches, the conceptualization of publics does not involve the discussion about the active construction of publics' own identities, strategies, and goals by themselves. Namely, in public relations theory, publics are subordinate to organizations and they are treated as publics only when organizations identify them to be.

Leitch and Neilson (2001) concluded this marginalization of publics in public relations theory can result in serious conceptual flaws. They redefined publics and viewed the publics as group of individuals who develop their own identities, represent their own collective interests, and actively participate in the public sphere. They called for a public-centered approach to public relations in which publics are no longer fixed categories waiting to be identified by organizations, but rather are constructed and reconstructed by themselves through the discourses they participate in. In the public-centered approach, publics maintain group consciousness of a distinctive identity constructed by themselves and hold their own views of the organization they communicate with or about. Their perception of themselves and the organization does not rely on the organization's definition.

Leitch and Neilson's (2001) re-conceptualization of publics has some similarities with *the homo narrans perspective* of publics as discussed by Vasquez and Taylor (2001). They both emphasized the communicative nature inherent in the shaping process of a public, which exhibits a communication-centered view in the conceptualization of publics. Additionally, they both accentuated the important role played by group consciousness of self-identities in the construction of publics. It is only through continuous communication and interactions that publics' identities can be shaped and constructed, which can then be consciously sensed by them.

How communication technologies affect the construction and reconstruction of publics has been discussed in the field of public relations (Cozier & Witmer, 2001). Cozier and Witmer (2001) attempted to apply structuration theory to reconceptualize publics in an electronic environment. They stated that the traditional situational theory adopts *a normative approach* to public relations, which distinguishes between stakeholders and publics. According to the normative approach, there is a stakeholder stage where a group is identified as a stakeholder when it affects or is affected by an organization's activities. The next stage is an issue stage where the stakeholders become a public when they recognize a problem and its consequences, and organize to react to the problem. Thus, recognizing an issue or problems is an essential element for stakeholders to form a public.

Cozier and Witmer (2001) pointed out that *the normative approach* is the dominant approach to conceptualize publics in the literature of public relations. They criticized that this approach overemphasizes that a public should be centered around an issue or problems, while neglecting that publics can be shaped by themselves based on a sense of shared experiences and re-creation of these experiences, either positive or negative. In these experiences, human communication process plays a central role in "the development of the public's ideological

stance" (p. 617). Their core argument here is a public is communicative in nature, which is quite similar with the perspective Leitch and Neilson (2001) adopted in their re-conceptualization of publics. Cozier and Witmer contended that online social organizations can constitute active publics and stakeholders through shared or re-created experiences in constant communication. These online collectivities were viewed as *new publics,* which are continually emerging through new communication technologies. They argued that traditional public relations research treats publics as passive information receivers, rather than "collectivities of reflexive individuals" (p. 619). In order to identify the emergence of new publics in the electronic environment, the public relations researchers should move beyond the systems approach which overemphasizes that publics will emerge only when issues/problems appear.

Overall, there is a trend to re-conceptualize the publics in public relations theory and public relations research. In this trend, the publics are no longer treated as marginalized entities which can only be identified by organizations in situations when their activities have some influence on organizations. In the new conceptualization, the publics can be constructed by themselves through continuous interactions among themselves, in which they can develop their own identities and own perceptions of related organizations. New communication technologies can foster and speed up the construction process owing to the possibilities they provide for the publics to conduct more active interactions and participation.

This trend in public relations theory and public relations research is consistent with the stakeholder theory with a decentered view of organization (Friedman & Miles, 2004). In the new communication and information environment enabled by new communication technologies, publics and stakeholders gain the opportunity to conduct more frequent and direct communication among themselves, which creates the condition for them to develop shared

identities. The emergence and popularity of various social media platforms further speed up this process. The shift to the new conceptualization of the publics and the new stakeholder theory in the two fields is especially meaningful to be applied to examine the organization-stakeholder communication and relationships in this study.

The discussions of different perspectives of conceptualizing publics demonstrate that there are some relationships between the concepts of stakeholders and publics. The normative approach discussed by Cozier and Witmer (2001) indicates that publics can be evolved from stakeholders when problems emerge and stakeholders are organized to react to these problems to become a public. In this paper, the concept of stakeholders, rather than publics is used to describe those who affect or can be affected by the organization. This decision is made based on the following consideration. Compared to the concept of publics, the concept of stakeholder defines a much broader population. Publics can emerge only when they realize some problems or issues and have common petitions, but stakeholders can exist regardless of the emergence and existence of problems and issues. The activist groups who construct social media sites to influence the organization can be considered as a public and influential stakeholders of the organization. The ordinary social media users who follow an organization's social media sites and sporadically post some comments on these sites might not be considered as a public, but they are definitely stakeholders or potential stakeholders. As Cozier and Witmer noted, new publics can emerge in the electronic environment; new stakeholders can also emerge in their interactions on social media. As publics can develop and shape their identities through constant communication (Leitch & Neilson, 2001; Vasquez & Taylor, 2001), identities of stakeholders can be developed in the same way and social media promote the identity development process (Men & Tsai, 2013). Since

the problem-oriented publics are not the only group of interest here, the concept of stakeholder is adopted throughout the study.

Organizational Impression Management

Impression management generally considers how people use interpersonal communication and other tactics to manage how others see them (Carter, 2006). The objective of impression management is to create a good and favorable image (Mohamed & Gardner, 2004), which can be defined as "a mental picture or categorization of an individual" (Schlenker, 1980, p. 95). According to Schlenker (1980), the study of impression management involves a wide variety of areas such as self-concept, social identity, and social roles. The self-concept concerns how people construct themselves; the term social identity defines the way how a person is socially defined and regarded in social interactions; and social roles define and shape individuals' behavior patterns and their expectations of how they should behave. Leary and Kowalski (1990) conducted a substantial literature review on impression management and proposed a two-component model which conceptualizes impression management as being composed of two discrete processes: *impression motivation* and *impression construction*. Their model provides an effective tool to delve into the impression management and image building process at the individual level.

Organizations are also bestowed with psychological attributes and considered as an entity that can conduct impression management (Bromley, 1993). They may be engaged in impression management to deliver a favorable image and build a prestigious corporate reputation to attract quality employees, investors and customers, and/or to gain support from the local community. Although the notion that organizations are involved in impression management activities is now widely accepted, it was not until the mid-1980s that the organizational impression management

perspective began to gain a theoretical identity distinct from its origin in the organizational politics literature (Rosenfeld & Giacalone, 1991). *Organizational impression management theory* (Giacalone & Rosenfeld, 1989; Giacalone & Rosenfeld, 1991) assumes that a basic motive of impression management inside or outside organizational settings is to gain favorable view from others and avoid negative image (Rosenfeld & Booth-Kewley, 1996).

Bolino et al. (2008) conducted an extensive literature review on impression management behaviors in organizational settings. According to their review, studies in this area can be categorized into two types. The first type of study investigated impression management behaviors at the individual level in organizational settings. This line of research generally borrowed the concepts, theories, and perspectives from the impression management literature in the field of social psychology and applied them to study individual behaviors in organizational settings. New organizational variables have been introduced and integrated to the original model; however, the most fundamental concepts such as the self-concept, social identity and social roles have not been modified or replaced.

The other type of studies that Bolino et al. (2008) reviewed investigated impression management at the organizational level. Just as individuals use impression management to influence how others perceive them, organizational members also use impression management to influence how others perceive the organization as a whole. The term "*organizational impression management*" has been defined as any action that is purposefully designed and carried out to influence audiences' perceptions of the organization (Elsbach et al., 1998). It means managing customers and other stakeholders' impression of a firm (Schniederjans et al., 2013). Bolino et al. argued that research on organizational impression management has focused on five areas: use of defensive impression management tactics to respond to image-threatening events (e.g., Elsbach,

1994); use of impression management tactics assertively to avoid controversies, complaints, and objections (e.g., Arndt & Bigelow, 2000); use of impression management tactics to create a specific image or accomplish a specific goal (e.g., Bansal & Kistruck, 2006); the important role played by the audience in organizational impression management processes (e.g., Carter, 2006); and finally the organizational impression management to respond to defamation (e.g. Mohamed & Gardner, 2004). Work in this area at the organizational level draws heavily on research related to organizational identity, organizational image, and corporate reputation, which are examined next. Social media are considered as an important impression management platform and social media usage in different types of impression management strategies was found to positively improve a firm's financial performance (Schniederjans et al., 2013).

Organizational Identity, Image, and Reputation

The concepts of organizational identity, organizational image, and reputation have been widely used by researchers from a variety of fields such as corporate communication, marketing, organization studies, human resource, and business administration (Dutton et al., 1994; Gioia et al., 2000). Brown et al. (2006) proposed four questions as the four key organizational viewpoints to synthesize existing research and theory on key concepts related to identity, image, and reputation: who we are as an organization? what does the organization want others to think of the organization? what does the organization believe others think of the organization? and what do stakeholders actually think of the organization? Definitions of the three concepts mostly address one or more of these four questions.

Organizational Identity

The classical definition of organizational identity comes from Albert and Whetten (1985), who defined it as what organizational members believe to be its central, enduring, and distinctive

characteristics. This definition suggests that organizational identity is an internal perception

about the organization. Although this definition has been prevalent in the field over decades,

researchers have pointed out its deficiencies. For example, organizational identity is not always

enduring; it is also flexible and can be changed, strengthened, and reconstructed (Dhalla, 2007;

Gioia et al., 2000). Gioia et al. (2000) contended that the instability of organizational identity

arises mainly from its ongoing interrelationships with organizational image, which itself is fluid.

Today, scholars generally agree that the concept addresses the question: who we are as an

organization?

Organizational Image

Whetten and Mackey (2002) summarized three principle definitions of organizational

image: (a) "what members think outsiders think about their organization" (p. 400), (b) "what

outsiders think about the organization" (p. 400), and (c) "what members present or project about

their organization to influence how others think about the organization" (p. 400). "What

members think outsiders think about their organization" is often referred to as *construed external*

image (Dutton & Dukerich, 1991), which answers what an organization believes others think of

the organization. "What members present or project about their organization to influence how

others think about the organization" can be labeled *intended organizational image* (Bromley,

2000; Brown et al., 2006; Gilpin, 2008), which answers what an organization wants others to

think of the organization.

Some scholars also define organizational image as people's mental states when hearing

the name of an organization. For example, Cornelissen (2008) defined corporate image as

stakeholders' immediate impression of an organization in relation to specific messages or signals

from or about the organization. Similarly, Gray and Balmer (1998) also perceived corporate

image as the immediate mental picture the audiences formed about the organization. Therefore, corporate image is not stable and can vary based on different perceptions. This definition is more general, since it addresses the mental picture of both organizational members and other stakeholders, while the subjects of both construed and intended external image only include organizations.

In this study, the term *conveyed organizational image* is adopted, which refers to the image that is actually conveyed through messages created either by organizations or stakeholders. The concepts of *conveyed organizational image* and *intended organizational image* (Bromley, 2000; Brown et al., 2006; Gilpin, 2008) both imply that communication messages created by organization play an important role in image construction. However, what is actually conveyed through messages and what is intended to be conveyed through messages are different. *Intended organizational image* reflects the subjective wish and goals of an organization, but the organization may fail to achieve its goals in the communication programs it implements. The *conveyed organizational image* may only partly reflect the *intended organizational image*. Moreover, since *intended organizational image* was conceptualized from an organization-centered perspective, the image as defined in this concept then is conveyed only through messages created by organizations. However, in the conceptualization of *conveyed organizational image* in this study, messages created by both organizations and stakeholders receive equal attention. Namely, organizational image can be intentionally constructed by both organizations and stakeholders to influence their own target audiences. Since this study focuses on the actually constructed image on social media through examining social media messages from both organizations and stakeholders, *conveyed organizational image*, the more objective

term that emphasizes both sides of organizations and stakeholders, is preferred over the more subjective term *intended organizational image* that put emphasis only on organizations.

Organizational Reputation

Lange et al. (2011) categorized the diverse definitions of organizational reputation in the management literature. They summarized three themes that they thought described three different conceptualizations of organizational reputation: *being known*, *being known for something*, and *generalized favorability*. *Being known* represents definitions conceptualizing organizational reputation as generalized awareness or visibility or prominence of a firm in the collective perception, irrespective of judgment or evaluation. In this line of definitions, organizational reputation is considered as familiarity with or knowledge of a firm, regardless of outsiders' judgement of it. *Being known for something* describes definitions with a focus on particular attributes or characteristics of a firm that are of interest or value to the perceiver. For example, a company has a reputation for something, such as high-quality products and good customer service. In this line of definitions, judgment is a central feature and organizational reputation consists of subjective perceptions and evaluations held by particular audiences. *Generalized favorability* portrays definitions conceptualizing organizational reputation as "an overall, generalized assessment of the organization's favorability" (p. 159). Although both of them involves subjective judgement and evaluation, the difference between *being known for something* and *generalized favorability* lies in that, in the former conceptualization, reputation is based on judgement of specific attributes, whereas in the latter conceptualization, reputation involves judgement of aggregated multiple organizational attributes. In the *generalized favorability* conceptualization, the organization is judged overall as good or attractive. There is a strong and emerging trend in the management literature that researchers have explicitly defined

organizational reputation as a multidimensional construct, drawing on divergent

conceptualizations and Lange et al. called upon embracing the multidimensional perspective.

The most widely accepted definition of corporate reputation is from Fombrun and Van

Riel (1998), who define it as follows:

A corporate reputation is a collective representation of a firm's past actions and results

that describes the firm's ability to deliver valued outcomes to multiple stakeholders. It

gauges a firm's relative standing both internally with employees and externally with its

stakeholders, in both its competitive and institutional environments. (p. 10)

The definition of corporate reputation basically answers the fourth viewpoint Brown et al.

(2006) proposed: "what do stakeholders actually think of the organization (p. 100)?" Fombrun

and Van Riel's (1998) definition falls into the *generalized favorability* conceptualization (Lange

et al., 2011), because it involves collective representation and multiple stakeholders, which

implies that reputation is based on overall judgement of aggregated multiple attributes. Lange et

al. (2011) also argued that the generalized favorability conceptualization is built on Fombrun's

(1996) seminal definition of corporate reputation as "a perceptual representation of a company's

past actions and future prospects that describes the firm's overall appeal to all of its key

constituents when compared with other leading rivals" (p. 72). Dutot and Castellano (2015)

summarized some attributes of reputation based on Fombrun's (1996) seminal work: reputation

is based on perceptions and thus it is outside of the control of the corporation to some extent; it

represents the overall aggregate perception of all of a firm's constituents, including internal and

external stakeholders; it is comparative and different firms' reputation can be compared; it can be

positive or negative; and it is stable and enduring.

In this study, the definition of corporate reputation proposed by Fombrun and his colleagues (Fombrun, 1996; Fombrun & Van Riel, 1998) are adopted based on following considerations. First, the researcher is interested in stakeholders' overall judgement and evaluation of organizations, rather than diverse types of specific attributes that different stakeholders may feel concerned over. Therefore, the reputation examined in this study is based on aggregated attributes. Second, this study does not explicitly specify any particular type of stakeholder groups, but rather view stakeholders using social media as an aggregated group. Stakeholders participating in organizational-sanctioned and counter-organizational social media sites may be employees, customers, activist groups, journalists, investors, etc., with each group interested in different attributes of an organization. This study does not attempt to delve into these specific attributes and each stakeholder group's specific needs. An aggregated view of stakeholders in this study calls for a generalized conceptualization of organizational reputation.

It is also worthwhile to note that both organizational image and reputation addresses stakeholders' mental perceptions of an organization. However, reputation describes the relatively stable perceptions over time, while image tends to portray the immediate impression at a single point of time (Cornelissen, 2008). Accordingly, organizational image and organizational reputation can complement each other to depict stakeholders' perceptions of the organization both at single time points and in a longer time period.

Relationships among Organizational Image, Reputation, and Communication

Organizational identity is commonly viewed as the fundamental basis of organizational image and reputation (Cornelissen, 2008; Fombrun, 1996). Reputation and image can in turn exert influence on identity as it is refined based on reputational feedback (Cornelissen, 2008). Reputation can affect organizational identity construction by propelling organizational members

to feel that their identity is being threatened and needs to be changed and reconstructed (Price & Gioia, 2008). Organizational identity also can be threatened if there are discrepancies between internal and external images, which can motivate organizational members to revisit and reconstruct organizational identity (Gioia et al., 2000). If the way others see the organization (construed external image) and the way organizational members see the organization (identity) are consistent, the existing organizational identity would be affirmed and strengthened. However, if there are discrepancies between them, the need to re-examine and possibly reformulate organization identity might emerge (Gioia et al., 2000).

Organizational image and reputation are primarily constructed through communication. Balmer and Gray (1999) adopted an expanded view of corporate communication and proposed a model articulating corporate identity and corporate communication process. In this model, corporate identity is communicated through primary and secondary communication to stakeholders, who can also communicate with each other through tertiary communication. Based on these three types of corporate communication processes, corporate image emerges from organizational identity and reputation are built from those projected images; that emerging reputation can in turn influence identity by conveying feedback to organizations.

Based on previous discussions, organizational image and reputation construction therefore can be defined as a process of building and maintaining a particular set of perceptions among stakeholders regarding the organization's identity (Gilpin, 2010) through communication. Notably, any kind of communication can influence stakeholders' perceptions about the organization and may be considered as a part of the image and reputation construction process— whether the activity is initiated by the organization or not. This view allows for social media and

its key affordances to potentially play an important role in the image and reputation construction process, which will be discussed later.

A Stakeholder Approach to Organizational Identity, Image, and Reputation

The stakeholder approach has been applied to conceptualize organizational identity (Illia & Lurati, 2006). Illia and Lurati (2006) adopted a relationship approach and proposed a stakeholder perspective on organizational identity. According to them, the relational nature of organizational identity involves "how organizations define themselves in terms of what they share in common with other organizations and how they are different from all other organizations" (Whetten & Mackey, 2002, p. 397). Illia and Lurati also argued that the relational nature of organizational identity is also used to refer to the looking-glass social construction process of identity formation. An organization constantly monitors its perceived external image, compares itself with the perceived external image, and attempts to reduce the perceived discrepancy between what it is and how it is perceived externally. This process is a looking-glass process and the self of the organization is built through the interactions between an organization and its stakeholders. Illia and Lurati pointed out that researches discussing the relational nature of identity in terms of how to decrease the gap between identity, image, and/or reputation all took into account external stakeholders' relationships in the identity-formation mirroring process, though researchers conceptualized image and reputation differently. The relational nature of organizational identity explains the multilevel features and multiple classifications of organizational identity based on its relationships with different constituencies/stakeholders.

Illia and Lurati's (2006) discussion demonstrates that the conceptualization of organizational identity, image, and reputation cannot avoid discussing the role of various stakeholders. Since different stakeholders have different perceptions and interpretations of

organizational image, in order to revise its identity and build a good image, it is important for the organization to identify who these stakeholders are and how they perceive the organization. Subsequent communication programs can be designed towards different stakeholders based on feedback from them. An organization can create some kinds of organizational image through messages, but this image is built through internal stakeholders' interpretation of organizational identity, which is built and revised through reducing the discrepancy between internal and external stakeholders' perception of the organization. Moreover, organizational reputation is essentially a perceptual concept which can only exist in various stakeholders' mind. Therefore, it is necessary to adopt a stakeholder approach to investigate organizational image and reputation construction in this study.

Social Media: Definitions, Forms and History

Social media have been defined as Internet-based applications that encourage social interactions between participants (Page, 2012); links from people to other people, groups or information objects (White, 2012); forms of electronic communication through which users can create online communities to share information, ideas, personal messages and other contents (White, 2012); and sites driven by user-participation and user-generated content (Tredinnick, 2006). The word "social media" is also frequently linked to the term "Web 2.0," which was defined as an upgraded computer-programming model on which some participatory websites can be built on the basis of lightweight server-based applications that enable the movement of rich data across platforms (Mandiberg, 2012). The main difference between Web 1.0 and Web 2.0 sites is that on Web 1.0 site users are passive in viewing the content presented to them, but on Web 2.0 sites users can create their own content through interactions and collaboration with others. Publishing, content management systems, directories, and stickiness are concepts

describing the characteristics of Web 1.0, while participation, wikis, tagging, and syndication portray the functions of Web 2.0 (O'Reilly, 2012).

Barefoot and Szabo (2010) pointed out that there is an ongoing shift to a *conversation web*. They compared the difference between Web 1.0 and Web 2.0 in terms of several aspects. They argued Web 1.0 was about reading, advertising, lectures, websites, professionals, companies, and owning, whereas Web 2.0 was about writing, word of mouth, conversations, web services, amateurs, communities, and sharing. Although this cannot be regarded as a scientific demarcation of Web 1.0 and Web 2.0, their discussion demonstrates some essential characteristics of Web 2.0: interactivity, connection, collaboration, user-generated messages, content-sharing, participation, and community building. Social media are typical applications of the Web 2.0 movement. Berthon et al. (2012) discussed the difference between Web 2.0 and social media. They argued that Web 2.0 refers to the technical infrastructure based on which the creation and distribution of consumer-generated content become possible, while social media is "the product of Internet-based applications" (p. 263) that are constructed on the technological foundations provided by Web 2.0. Various types of social media tools incorporate the characteristics of Web 2.0 and enhance users' interaction, participation, information and knowledge sharing, and online community building by allowing them to actively create, design and transfer their own messages on the platform.

There are many forms of social media. The basic forms include social networking sites (e.g., Facebook), blogs, wikis (e.g., Wikipedia), podcasts (e.g., Apple iTunes), online forums, content communities (e.g., Flickr, YouTube and bookmarked links such as del.icio.us), and microblogging (e.g., Twitter) (Mayfield, 2008). Social networking sites allow users to create their personal web pages and share content through communication and connecting with their

friends (Mayfield, 2008). Page (2012) provided a chronological timeline of the development of social media. He pointed out the dialogical potential of social media also exists in early forms of computer-mediated communication (CMC) such as the e-mail lists, bulletin boards, and the text messages in the 1980s. However, it was not until the mid-1990s that a decisive shift happened. It was during this period that the terms "web log" and "wiki" were coined. This decisive shift emphasized participants' interactions in public, rather than private or semi-private contexts. As argued by Page, blogs and wikis extended the range of CMC's interactive possibilities. At the end of 1990s and as the world stepped into the new millennium, sites such as Live Journal, Blogger.com, Google groups, Wikipedia, and Friendster were created. In the years 2003-2006, social network sites rapidly expanded. Many now widely known websites such as LinkedIn, Second Life, Flickr, Facebook, YouTube and Twitter were launched during this time period. The popularity of mobile communication devices such as smart phones allows social network sites to be untethered from static computer terminals, which accelerates the popularity of social media.

Social Media Use by Organizations and Stakeholders

Social media have been used at different levels (national, state, and local) by various types of organizations (NGOs, volunteer groups, companies, etc.) across a variety of industries (Barnes et al., 2012; White, 2012). They have been used as effective communication tools for emergency management and crisis communication (White, 2012), customer engagement (Long, 2012), marketing and branding (Guo, 2012), public relations, lead generation, customer service, human resources, and business intelligence (Blanchard, 2011). Based on the functions social media serve, it is not surprising that studies examining social media use in organizational settings are mainly from fields such as advertising, marketing and public relations (Khang et al., 2012).

Khang et al. (2012) conducted an exhaustive literature review on social media research in advertising, communication, marketing, and public relations from 1997 to 2010. They content analyzed 436 articles from leading journals in the four disciplines. In order to trace the evolution of social media research over the years, they adopted a broader definition of social media and utilized loosened criteria to incorporate earlier forms (e.g., discussion boards, personal home pages, and instant messaging) that did not allow for as much space for social interactions as the current social media types provide. Their findings demonstrated that except for the marketing field, the most researched topic in social media research across the other three disciplines is "social media usage and attitude toward social media," followed by "social media as mass or personal communication tools" and "social or political issues regarding social media."

The following sections present a review of literature in relevant fields, with an emphasis on the adoption and use of social media by organizations and stakeholders, and the influence of organizations' and stakeholders' social media use on organizations. More specifically, the author reviews literature regarding the influence of social media use on the communication process between organizations and stakeholders, the organization-stakeholder relationship, and organizational image and reputation.

The Adoption and Use of Social Media by Organizations

A large amount of research investigated how various types of social media are adopted and used in organizations. Social media have been adopted and used by public relations professionals from both for-profit (Bonsón & Flores, 2011) and non-profit organizations (Avery et al., 2010; Curtis et al., 2010; Kelleher & Sweetser, 2012) within and outside the U.S. (Alikilic & Atabek, 2012; Avidar, 2009; Men & Tsai, 2013; Verhoeven et al., 2012). Types of social media used by PR professionals include social networking sites, blogs, podcasting, Twitter, online

forums, photo sharing sites such as Flickr, etc. (Avery et al., 2010; Macnamara & Zerfass , 2012). Organizations' tactics of using social media can include creating and posting on corporate blogs, stimulating online discussions on social media, sharing company news on social media, and using social media to promote campaigns, etc. (Blanchard, 2011).

The social media use pattern of different organizations may vary and some types of social media may be used more frequently than others for different purposes. For example, Avidar (2009) conducted a web-based survey on Israeli public relations professionals to examine their adoption and use of social media. Findings suggested that 78% of practitioners used at least one type of social media in at least one PR campaign and 44% of them wrote or had written a blog in the name of their organizations or clients. The most popular social media types used by these professionals were blogs (56%), followed by social networks (53%) and forums (49%). Curtis et al. (2010) explored how nonprofit public relations practitioners adopted social media tools and whether they consider social media tools as credible or not. Findings based on an online survey demonstrated that nearly all the respondents expressed use of some form of social media. The most frequently used social media type was social network working sites (54.5%), followed by video sharing (51.1%), and blogs (48.4%). Other forms of social media used by the respondents included instant messaging (13.4%), photo sharing (27.1%), text messaging (12.5%), and wikis (18.1%). They found social media were becoming methods of communication for public relations practitioners in nonprofit organizations. By analyzing the social media usage pattern of 317 for-profit and nonprofit organizations, Go and You (2016) categorized those organizations into blogs preferred group, social networking preferred group, content aggregation strategy group, visual content group, virtual strategy group, and collaborative strategy group, with each group showing specific preference of different social media types.

Though it seems that adopting social media within organizations has recently become a professional trend in the fields of public relations, marketing and advertising, not all practitioners have positive view on their influence or have enough confidence to use them effectively. For example, Kelleher and Sweetser (2012) studied how and why university communicators adopted social media in their communication programs. They interviewed 26 university communicators across the United States in 2008 and 2009. All of the participants in their study more or less adopted some form of social media and they categorized these social media users into two groups: believers and non-believers. Believers found social media easy to use and were intrinsically driven by social media's characteristics including two-way communication, interactivity, dialogue and engagement. In their mind, the advantages of social media outweighed their risks and social media could help creating meaningful connections between them and their publics. On the contrary, non-believers tended to be much more concerned about the risks brought about by the adoption of social media and their adoption was mostly extrinsically driven to keep up with other universities and units. Practitioners also expressed loss of control over messages and image building was the major obstacle and risk in using social media (Macnamara & Zerfass, 2012).

Organizations' motivations for adopting and using social media are complex. One motivation might be to react to the challenges brought by the changing information environment as affected by the emergence and rapid development of social media. Communication and public relations executives expressed that the driving force of using social media in organizations was the way current society consumes news and information on social media (DiStaso et al., 2011). Organizations took great risk if they ignored social media and allowed conversations to happen among stakeholders without organizational awareness or participation (DiStaso et al., 2011).

Another motivation might be to promote effective two-way communication with organizational stakeholders in order to develop and maintain good organization-stakeholder relationship. As some professionals believed, social media are great tools to enhance two-way communication and relationship development (Kelleher & Sweetser, 2012). Organizations also want to enhance their organizational visibility on social media. It was found that the amount of mainstream media coverage of an organization positively correlated to its social media visibility (Yang & Kent, 2014).

The challenges of using social media in organizational settings have also been discussed in the research literature. DiStaso et al. (2011) interviewed 25 communication and public relations executives to identify their opinions on the driving forces of using social media in organizations, the challenges their organizations faced when using social media, and the questions they had about social media. Executives identified that the most common challenge their organizations faced in using social media was accepting the lack of control associated with social media, which was manifested by the fact that organizations would not know in advance what their stakeholders might say or do on social media. They also mentioned that organizations' participation in social media could expose them to internal and external crisis. Possible internal problems that could emerge due to the use of social media included leakages of intellectual property, criticisms of management or the company, and embarrassing employee behavior on social media which might be detrimental to the company's brand. The biggest external concerns included criticisms, false information, and activist groups. Other challenges of using social media included employees' lack of understanding of how to strategically use social media tools, the difficulties employees faced to stay current with the rapidly changing social media

environment, establishing relevant policies and confidentiality, measurement issues such as linking social media to sales, systematic monitoring the use of social media, etc.

Participants in DiStaso et al.'s (2011) study also mentioned that regulated businesses such as pharmaceutical and healthcare companies found the use of social media especially challenging. Some of them mentioned that the stringent regulatory environment of these companies limited their abilities to freely engage in patient communities. Internal controls like legal might require approval even though these departments did not fully understand the social media environment. Executives also expressed their need for specific social media measurements such as measurements of actual behavioral outcomes, measurements of how social media uses strengthen corporate brand and measurement of credibility.

Other factors that might influence practitioners' adoption and use of social media in their professional work include age and total years of profession (Alikilic & Atabek, 2012), the perceived credibility of social media (Curtis et al., 2010), whether the organizations have defined PR departments (Curtis et al., 2010), etc. All the above studies demonstrate that organizations have actively adopted social media to communicate with stakeholders and have realized that social media are a double-edged sword which can exert both positive and negative effects on them. Literature also suggests stakeholders are also actively using social media in their interactions with each other and their communication with organizations, which is discussed next.

The Use of Social Media by Stakeholders

Studies found that stakeholders can use social media to receive messages from the organization and engage in possible interactions with the organization. For example, Men and Tsai (2013) investigated in what ways and to what extent Chinese users were engaged with

corporate social networking site pages and their motivations for using them. They found Chinese social networking site users engaged in message-consuming activities such as reading posts and watching videos on corporate social networking sites (SNS), as well as contributing activities such as asking or answering questions and recommending the page to friends. The three most common types of engagement activities were viewing pictures on companies' social networking websites, reading companies' posts, user comments and product views, and sharing companies' posts on their own social networking site pages. Users' main motivation for visiting or liking a company's social networking site page was gaining information, followed by entertainment seeking. Some users regarded corporate social networking site pages as "a place where they could escape or relax, pass time, experience esthetic enjoyment, or distract themselves from daily routines" (p. 18).

Social media have also been utilized by stakeholders to promote interactions among themselves. Schwarz (2012) found publics actively used social media to discuss questions about who should take responsibility in a crisis situation. In their interactions, publics spontaneously and intensively engaged in attributing causes and responsibility for the crisis. Furthermore, in their interactions on social media, it is possible for stakeholders to develop some common interests among themselves, form into special groups, identify with these groups, and thus build some kind of collective identities. Before social media appeared, the traditional computer-mediated communication can also foster such online communities. However, social media help accelerate the shaping speed of online communities. Brogi (2014) argued that the importance of online brand communities is enhanced and reinforced, owing to much more frequent participation and interactions among consumers on platforms based on the Web 2.0 technology. Also, in Men and Tsai's (2013) study, the third most common motivation for users to access

corporate social networking site pages was social integration, namely, users tended to engage in corporate social networking site pages to "connect with other like-minded users, build interpersonal connections, and develop a sense of belongingness to the 'social' group" (p. 18). Factors that positively influenced users' engagement level included their group identification with the community surrounding the corporate social networking site pages, and their perceived intimate relationship with a company's social networking site representative. Men and Tsai suggested "companies and organizations consciously and strategically forge interpersonal relationships among their stakeholders to create a strong sense of community" (p. 20) that can in turn help them to cultivate meaningful organization-public relationship.

An extreme type of community organizational stakeholder is the activist group. In addition to viewing and posting on the social media sites maintained by organizations, stakeholders themselves sometimes also systematically design and create their own social media sites to resist or support an organization, and develop into activist groups with high level of identification. Examples illustrating stakeholders' resistance to the organization on social media include the social networking sites created by some environmental advocacy organizations (Bortree & Seltzer, 2009), for example, "We Can Change Chevron" on Facebook, which is created by the non-profit organization Chevron Guilty, whose slogan is "Energy shouldn't cost lives."

In addition to using social media to resist an organization, stakeholders also use them to support and endorse the organizations they like. An example shows how fans of University of Miami became the surrogate of the university during a crisis situation (Brown & Billings, 2013). Brown and Billings examined the reputation repair strategies employed by the fans of University of Miami on Twitter when the university was investigated by the National Collegiate Athletic

Association (NCAA) due to the fact that it provided athletes with impermissible benefits. They conducted a content analysis on Tweets posted by University of Miami fans that commented on this crisis event over five weeks. Findings suggested that the most frequently used reputation strategy by University of Miami fans on Twitter was ingratiation (34.6%), followed by reminder (23.1%), and attack of the accuser (15.1%). Additional communication techniques used by fans in their Tweets included sending links to articles that supported the university, creating organized hashtags such as #IStandWithTheU to support the university, and diverting attention from the Miami crisis to other schools' problems. These findings suggested that Twitter provided a convenient platform for the fans to defend for the teams and the university during crisis.

The above discussions show that stakeholders' activities on social media can exert both positive and negative influences on an organization. Studies have demonstrated that organizations attempted to monitor and/or respond to the social media activities conducted by their stakeholders. Constantly monitoring and measuring the online mentions of a company and its products allow the company to respond to negative attitudes, clarify its position on possible issues, and invalidate false rumors (Blanchard, 2011). In Avidar's (2009) study, 73% of the interviewed PR practitioners read blogs relevant to their clients, 95% of the professionals tracked online mentions of their clients on the Internet and 59% responded to these online opinions or criticisms on their organizations or clients. Based on their interview with 40 employees who were responsible for delivering and managing the social media communication of the American Red Cross, Liu et al. (2012) found that the importance of positively monitoring social media before, during and after crises occurred was emphasized by the participants, who stated that it was useful to monitor and engage with Twitter to foster media relations.

These studies show that both organizations and stakeholders are actively using social media to achieve their purposes. On one hand, organizations can send messages on their social media sites and directly interact with their stakeholders on these platforms. On the other hand, stakeholders can also create their own sites to communicate with the target organization and other stakeholders. Both organizations and stakeholders can be important sources of information regarding the organization. Organizations cannot control what messages stakeholders post and how they interact with other stakeholders on social media. To avoid negative influences and risks that are unable to be controlled beforehand, organizations choose to constantly monitor stakeholders' activities. In addition to these challenges, social media also provide opportunities for an organization to implement effective communication programs and sometimes social media can also become effective tools for stakeholders to support the organization. Findings as reviewed support the argument that social media are a double-edged sword to an organization. For stakeholders, social media provide good platforms for them to express their voices, largely shorten the distance between stakeholders and organizations, accelerate the speed of message flow and feedback transferring from stakeholders to an organization. All these processes empower the stakeholder to some extent.

Counter-Organizational Social Media Sites and Resistance

The term "counterinstitutional Web sites" (p. 64) was created by Gossett and Kilker (2006) to describe the "gripe" or "sucks" sites that "provide a space outside the control of the target organization to oppose official institutional messages, policies, and practices" (p. 64). Counterinstitutional Web sites publicized the outbursts of organizational stakeholders such as disgruntled employees and customers, and enabled discontented stakeholder groups who were previously isolated and fragmented to express their voices, connect with each other, and

collectively organize. Gossett and Kilker argued that the existence of counterinstitutional Web sites blurs the boundaries between organizational insiders and outsiders. Counterinstitutional Web sites can provide a mechanism for organizational members to overcome discursive barriers within the organization and enable them to participate in discussions that are usually discouraged within the organization. Thus, counterinstitutional Web sites, as argued by Gosset and Kilker, "represents a unique and potentially powerful tool for member dissent and resistance" (p. 68). Their analysis of postings by Radio Shack's current and former employees on RadioShackSucks.com, a Web site that was initially created by a disgruntled Radio Shack customer as a place for consumers to express their frustrations with the company and also later used by employees to discuss issues concerning company policies and practices, indicated that the Web site served as an upward-focused channel for employees to convey articulated dissent and allowed them to reinterpret the power dynamics of the organization through empowering narratives.

Organizations tend to hold a superior position through managerial control over their employees in situations where organizational resistance happens. Even self-managing teams can develop a kind of concertive control (Barker, 1993) to discipline themselves, which can tighten the iron cage, the rationalized bureaucratic control in Weber's (1958) terms. Mumby (2005) pointed out that much research on employee resistance examined organizational members' routine practices as they engage with the everyday control mechanisms and disciplinary practices of organizational life, and resistance was often framed as "an interstitial, covert practice that frequently operates 'below the radar' of formal organizational life" (p. 29). Employees' resistance to managerial frames were constrained by institutional discourses (Chreim, 2006). Forms of employee resistance include gossip (Hafen, 2004), resignation (Tucker, 1993), sabotage

(Tucker, 1993), confrontation (Lutgen-Sandvik, 2006), and noncooperation (Tucker, 1993). A duality of unobtrusive control and resistance within an organization has been described by scholars (Bisel et al., 2007).

The subjects initiating resistance to organizations are not confined to internal organizational stakeholders such as employees. Spicer and Böhm (2007) pointed out that most accounts of resistance in organization and management studies had focused on resistance within the workplace; but they contended that only focusing on struggles within the boundary of the organization could enable researchers to ignore how a wider range of groups in civil society are actively engaged in struggles with discourses of management. They developed a multi-modal theory of resistance to the discourse of management. In their model, resistance movements can differ in terms of their *location* (workplace or civil society) and *strategy* (political or infra-political). Four types of resistance movement were identified based on these two dimensions: *organized workplace resistance* represents resistance organized within the workplace through formally organized political processes, and an example of this type of resistance is union movement; *organizational misbehaviour* indicates resistance initiated through more informal and disorganized networks, and an exemplary type is workplace cynicism; the third type of resistance refers to resistance initiated by formally organized civic movement organizations (CMOs) such as environmental NGOs; as the third type, the last type of resistance also takes place in civil society, but "more ad hoc or loosely organized forms" (p. 1680) to express discontent are adopted. The boundaries between these four types of resistance are often blurred. Day-to-day acts of informal resistance within the workplace can provide foundations of antagonistic attitudes and actions which might stimulate organized and systematic expression by unions. Workplace resistance could become de-institutionalized and take the form of more uncontrolled attacks such

as wildcat strikes. Links and alliances between unions and CMOs can possibly and frequently happen. Organizational misbehaviour might connect with and spill over into civil society, especially when resistance within the organization hits upon issues of concern outside the organization. For example, a process of "*escalation*" (p. 1687), which refers to the process in which workplace movements seek to "escalate its struggle into civil society" (p. 1687), occurs when the connections between workplace-based movements and civil society-based movements are forged through common issue frames that span the boundaries of two spheres. An example of the common issues could be minimum living wage issue that attracts attention from both employees seeking for higher salary and activist groups aiming to promote labor rights.

Spicer and Böhm (2007) expanded the boundary of the organizational resistance concept. Though not explicitly stated in their arguments, their perspective reflects a multiple-stakeholder approach to organizational resistance. Resistance can be initiated by informally unorganized or formally organized internal and external stakeholders such as ordinary employees, consumers, worker unions, civic movement organizations, activist groups, or general publics that are affected by the behavior of the organization. Based on their typology, the conceptualization of organizational resistance is no longer confined to individual resistance within the organization. Ganesh et al. (2005) also criticized that organizational communication research had displayed a bias towards studying resistance at the individual level and characterized resistance as an element of micro-politics located within organizational boundaries, and thus they called upon more attention from scholars to study collective resistance to power.

Social media provide consumers and employees more direct communication channels to express their complaints, demonstrate resistance, and seek for more power. Consumers can directly post negative comments and complaints on corporate social media sites to seek for direct

responses from companies (Einwiller & Steilen, 2015; Javornik et al., 2020; Lappeman et al., 2018; Mei et al., 2019). They can also build their own social media sites such as Facebook accounts "I hate bank of America" (https://www.facebook.com/I-HATE-Bank-of-America-335801912634/?ref=br_rs) and "IBM sucks" (https://www.facebook.com/this.company.should.bankrupt/?fref=ts). On these sites, customers shared with each other their negative experiences with the companies and expressed their dissatisfaction. Disgruntled employees can also become internal activists (McCown, 2007) and build social media sites to formally publicize their needs, form alliances, and express their voices to pursue better treatment from the organization. For example, workers working in Walmart united and formed an organization called "OURWalmart: Organization United for Respect" to defend their labor rights and build popular Facebook and Twitter accounts to convey their ideas.

Nonprofit advocacy organizations' use of Facebook, Twitter, and YouTube was found to foster democracy by contributing to the democratic marketplace of ideas (Auger, 2013). A well-known example of resistance from the general public to big financial conglomerates is the Occupy Movements. Participants of Occupy Movements expressed their anger towards the unequal global financial systems that only benefit a minority and undermine democracy. Social media were actively used by Occupy groups to express their voices, provide information (Adi, 2015), and mobilize protest actions (Theocharis et al., 2015). In addition to political advocacy groups, environmental advocacy groups were also trying to adopt more dialogic strategies to promote greater dialogic communication on their social media sites (Bortree & Seltzer, 2009).

In this study, a broader view of organizational resistance proposed by Spicer and Böhm (2007) that puts equal emphasis on inside and outside stakeholders is adopted. The concept of "counterinstitutional Web sites" (p. 64) described by Gosset and Kilker (2006) is used; and for

readability, the term "counter-organizational" is used instead of "counterinstitutional". Counter-organizational social media sites in this study refers to social media sites that provide platforms for a wide range of internal and external stakeholders to oppose organizational messages, policies, and practices. A variety of resistance activities can be initiated by stakeholder groups such as consumers, employees, activist groups on these sites and the target organization maintains no or very little control of these sites. This study is among the first to study organizational image and reputation construction by stakeholders on counter-organizational social media sites.

The Influence of Social Media Use by Organizations and Stakeholders

Literature shows that social media use of both organizations and stakeholders exerts substantial influence on the communication process between organizations and stakeholders, organization-stakeholder relationship development, and organizational image and reputation construction process, which is reviewed as follows.

Communication Process. As to the influence of social media use on the communication process between organizations and stakeholders, many practitioners believed that social media would speed up information flow and promote two-way and symmetrical communication (Kelleher & Sweetser, 2012; White, 2012) and that the open two-way communication was an essential component to build relationships with publics on social media (Briones et al., 2011). Consumers also expressed their need of specific two-way interactions with brands and social media might be the only way to meet those needs (Davis et al., 2014).

However, though social media being effective tools to enhance two-way communication is a widely accepted notion among practitioners, empirical evidence shows that the dialogic nature of social media has not been sufficiently explored by organizations. Bortree and Seltzer

(2009) studied how advocacy organizations utilized dialogic strategies on their social networking profiles and how the use of these strategies was related to the actual dialogic outcomes between the organization and its stakeholders. More specifically, they examined two types of dialogic outcomes including on-site posts by the organization and users and the extent of the social network linked to organization profiles. Their findings indicated that in their use of social media, most advocacy organizations in their study failed to effectively utilize all dialogic strategies as afforded by social media. As a result, they did not fully use social media to build mutually beneficial relationships with stakeholders. Similarly, a content analysis of 1,130 tweets from 113 colleges and universities (Linvill et al., 2012) revealed these institutions mainly used Twitter as an institutional news feed to a general audience and failed to use it in a dialogic way. Lovejoy et al. (2012) analyzed 4,655 tweets sent by 73 nonprofit organizations through their Twitter accounts in 2009. They found that nonprofit organizations were mainly involved in one-way information dissemination (e.g., hyperlinks and retweeted messages) on social media. They used social media as a traditional information subsidy, rather than a communication tool to promote effective two-way communication. In their exploration of social media use of 50 organizations selected from *Fortune* Magazine's list of *Fortune* 500 companies and 50 nonprofit organizations selected from Craig Vankorlaar's Top Nonprofits websites, Yang and Kent (2014) also found social media were used as one-way messaging tools, rather than as relationship building tools.

Results from empirical studies cannot deny social media's potential to enhance two-way communication and actually this potential has been recognized by many practitioners. But these results indeed indicate that in practitioners' real professional practice, the dialogic potential of social media has not been explored extensively. Another good example is from Rybalko and Seltzer's (2010) study of how *Fortune* 500 companies used Twitter to facilitate dialogic

communication with stakeholders. They content analyzed 93 *Fortune* 500 companies' Twitter profiles and 10 posts on each profile and found that these companies were involved in some kind of two-way communication. For example, 60.2% of them responded to other users' comments, 30.1% asked unprompted questions to stimulate discussion with other users, and 26.9% asked follow-up questions. However, they also found these companies failed to explore the dialogic features provided by Twitter to its full potential. Similarly, Waters and Jamal (2011) content analyzed tweets sent by some nonprofit organizations. Their findings revealed that organizations were more likely to engage in asymmetrical communication than symmetrical dialogue on Twitter. They did not explore the full potential of the interactive nature and dialogic capabilities of social media.

All these studies demonstrate that there exists a gap between the perceived dialogical potential of social media and practitioners' real capabilities to explore and realize this potential. Based on the technological features inherent in their design, social media provide the potential to boost two-way communication between an organization and its stakeholders. This potential has also been recognized and perceived by practitioners from different organizations. However, due to limited time and human resources (Liu et al., 2012), failing to gain support from the board members (Briones et al., 2011), and other possible factors, organizations failed to deeply delve into the possibilities provided by these technologies.

Researches also show that social media use promotes direct communication between organizations and stakeholders. Social media provided a platform for organizational spokespeople to be engaged in direct communication with stakeholders and publics, without reliance on their relationships with media gatekeepers (Kent, 2013). PR professionals expressed they did less traditional media relations and were concerned about the unfiltered messages in

social media (Bajkiewicz et al., 2011). Social media changed the interplay between journalists and public relations practitioners and journalists also actively used social media to request news sources (Waters et al., 2010). The direct communication can be both beneficial and detrimental for organizations (Cabiddu et al., 2014).

Since traditional media play a less important role in the communication process between organizations and stakeholders, the role played by some opinion leaders on social media becomes more significant. Social media influencer (SMIs) is defined as "a new type of independent third party endorser who shape audience attitudes through blogs, tweets, and the use of other social media" (Freberg et al., 2011, p. 90). Freberg et al. (2011) argued that public relations practitioners need to identify particular SMIs of their organizations and brands and they need tools to evaluate the quality and relevance of these SMIs and compare audience impressions of them. Some PR professionals created and sent messages to these opinion leaders on social media, as they did for journalists (Steyn et al., 2010). Steyn et al. (2010) identified that public relations professionals were trying to use the Social Media Release (SMR) to target influential bloggers in a world of social network media. SMR was defined as "a digital press release that includes the additional elements a reporter or consumer would want to see before they create their own content to broadcast or transmit further" (p. 87). The importance of the influential external blog in crisis management was also mentioned by scholars (Jin & Liu, 2010; Liu et al., 2012). Jin and Liu (2010) proposed a Blog-Mediated Crisis Communication Model (BMCC). Their model focuses on external blogs created and maintained by individuals and groups outside of the organization, and the related crisis information on them. In this model, an influential external blog is defined as "any blog that initiates and/or amplifies a crisis for an organization" (p. 434). Influential external blogs can create a large amount of user-generated content (UGC) or

public-generated content (PGC), and organizations generally lack control of these messages. These influential external blogs play an important role in an organizations' crisis management process.

In a word, social media change the communication process between organizations and stakeholders in different ways. They provide the potential of two-way and symmetrical communication, promote direct communication between organizations and stakeholders, reduce an organizations' reliance on media gatekeepers, and emphasize the role played by various types of opinion leaders on social media. When reflecting on how organizational image and reputation are built on social media by stakeholders, it is important to pay attention to how the communication process has been shifted by these communication technologies.

Organization-Stakeholder Relationship. The popularity of social media is often related to three constructs: relationship, trust, and conversations (Blanchard, 2011). These three words, as argued by Blanchard (2011), describe the lifeblood of social media as it relates to business. It is widely believed that social media can be utilized as effective tools to promote organization-stakeholder relationship. Kent (2013) argued that PR professionals should no longer view new technologies as simply a sales tool; they should think about how technologies can be used in more robust activities such as relationship building. Practitioners from the American Red Cross who were interviewed by Briones et al. (2011) mentioned that social media were useful for basic notification in terms of volunteer engagement and relationship building. They realized that social media could be effective and important tools for them to build stronger relationships with a variety of stakeholders such as young volunteers, the media, and the community. Similarly, in an analysis of social media websites of 119 Italian municipalities, social media were found to make

a contribution to the establishment of relationships between citizens and local public administrations (Agostino, 2013).

When studying organization-stakeholder relationship, researchers have paid special attention to elements such as satisfaction (Avery et al., 2010), trust (Yang & Lim, 2009) and commitment (Saffer et al., 2013). These elements are all considered as dimensions of organization-public relationships (Huang, 2001). Huang (2001) proposed that the dimensions of organization-public relationships include control mutuality, trust, relational satisfaction, and relational commitment. Applying the measurement proposed by Huang, Saffer et al. (2013) studied the relationship between levels of organizational Twitter interactivity and the quality of organization-public relationships. They selected a convenience sample of 127 students and asked them to follow and receive mobile Twitter updates from an assigned organization in the fall of 2010. In their study, the high-interactivity account is the Twitter account of Starbucks, and the low-interactivity accounts were the Twitter accounts of Gatorade and Target. They found that all dimensions of organization-public relationships (i.e., trust, control mutuality, satisfaction, and commitment) were perceived to be of better quality by the participants who were assigned to follow a more interactive corporate Twitter account. These findings suggested that organizations' use of Twitter as a two-way communication tool resulted in better organization-public relationship. The positive relationship between public engagement with organizations on corporate SNS pages and the quality of organization-public relationship was also found in study of corporate Facebook users (Men & Tsai, 2015).

However, as discussed before, not all organizations successfully used social media to promote two-way communication, which may negatively affect the quality of organization-stakeholder relationship. For example, in Waters and Jamal's (2011) study, nonprofit

organizations tended to engage in asymmetrical communication and mainly used Twitter for information sharing, rather than relationship building, which resulted in a lopsided relationship between organizations and stakeholders.

A common assumption of these studies is that social media provide potential for two-way communication and the quality of organization-stakeholder relationship will be improved through both sides' active involvement in the symmetrical exchange. Findings seem to support the argument that two-way communication mediates the effect of organizational social media use on organization-stakeholder relationship development. It is the widely accepted assumption among public relation researchers that social media is absolutely good for public relations profession because they allow two-way communication, which is essential to building mutual and beneficial relationships (Valentini, 2015). Review above generally shows this assumption is also accepted by most of the PR practitioners. Valentini (2015) criticized this assumption and pointed out that empirical findings gave scant confirmation of positive social media effects. As reviewed above, though social media provide the opportunities for organizations to promote relationship development, some organizations failed to do so by not fully exploring the potential of two-way communication as provided by social media. The technological features inherent in social media do provide some possibilities of actions to foster and develop organization-stakeholder relationship, and these possibilities are also recognized by organizations, but some organizations still failed to enable these possibilities in their appropriation of social media. Organizations may develop different approaches to delving into these possibilities and in some cases they might fail to explore social media's potential for relationship development due to various obstacles such as financial constraints and limited personnel with social media expertise.

Organizational Image and Reputation. Scholars have investigated how organizational image and reputation are affected by social media use of organizations and stakeholders. The intensity of customers and non-customers' social media use was found to be positively related to their engagement in the company's social media activities, which in turn positively affected corporate reputation (Dijkmans, et al., 2015). How brand is affected by customers' social media use has also been widely discussed and studied by scholars from the field of marketing (Abzari et al., 2014; Brogi, 2014; Davis et al., 2014). There is an ongoing shift from marketer led brand to customer ownership and co-creation of meaning in brand communities in social media (Davis et al., 2014).

Researchers have pointed out that social media can bring both opportunities and challenges for organizations to construct a good image and reputation (Vecchio et al., 2011). Vecchio et al. (2011) argued that the emergence of the blogosphere created new challenges for large companies to manage their corporate reputation, because the negative perceptions about a firm can be easily generated on grass roots blogs and these negative perceptions have a longer life than in the mass media and can be spread widely and rapidly. Their analysis of blog posts about Dell Computer in a reputation crisis provided strong evidence for this phenomenon. However, they also argued that several characteristics of blogs can provide potential opportunities for firms to seek better reputation. Their case study of Dell demonstrated that the informal and personal communication style of blogging, the independent standing of bloggers and the 'Internet word of mouth' of positive comments about a company were all positive elements that can help enhance a firm's reputation. In response to the reputational crisis that was widely discussed in the blogsphere, Dell took actions including spending more money to improve its customer service and launching an external blog called *Direct2Dell*. These new

initiatives significantly improved Dell's reputation. Based on these results, Vecchio et al. suggested that companies need to listen to the emergent voice of their customers by monitoring the blogosphere.

Companies' activities on social media can produce specific images for themselves. Men and Tsai (2015) surveyed some American Facebook users who liked or followed at least one company's Facebook page. The perceived corporate character of the studied company, whose Facebook page was visited by users during the survey, was reported as being agreeable, enterprising, competent, and less ruthless. Agreeableness and ruthlessness were found to positively affect the level of public engagement. Different communication channels provided by different social media tools exert different effects on organizational image construction (Gilpin, 2010). Gilpin (2010) studied the role of various online and social media channels in the construction of organizational image of the natural food retail chain *Whole Foods*. She collected data from the news release, blog posts, and Twitter messages issued by Whole Foods for a six-month period in 2008. Results of bimodal semantic network analysis showed a high level of message differentiation among different communication channels, which indicated that different communication channels played different roles in building the organizational image of Whole Foods. Gilpin found Whole Foods had a strong central organizational identity and conveyed this identity to its stakeholders across different communication channels. However, different facets of its organizational identity were developed and emphasized in different communication channels, which made its online organizational image look somewhat distinctive in different media.

Gilpin (2010) analyzed Twitter's communicative characteristics and argued that Twitter is the most intrinsically dialogic tool among the three media channels examined in her study. She argued that, compared to the other two communication channels (i.e., new release and blog

posts), Twitter can enhance dialogic public relations to the largest extent, but the immediacy, mutuality, and public nature of Twitter can also bring risks to organizations in their direct communication with stakeholders. Stakeholders can easily exert influence on what messages a company would post on its social media account. Even though she only examined the Tweets posted by Whole Foods, Gilpin found the content of these Tweets were strongly influenced by questions and topics posted by stakeholders who were engaged in direct conversations with Whole Foods.

Gilpin (2010) also argued that blogs are inherently more asymmetrical than Twitter, with the blog author maintaining a privileged position in shaping the ensuing discussion. Findings of her study supported this difference in content control between blogs and Twitter. Findings also demonstrated messages on the news releases emphasized newsworthy issues concerning federal and state standards for food safety and organic certification, and messages on corporate blogs of Whole Foods were mainly recipes and product-based information. Messages on Twitter suggested a high level of dialogic communication, with the overall tone being more informal and content being more oriented to dialogues between Whole Foods and individual stakeholders.

Complaints expressed and attacks launched by various types of stakeholders on social media can harm the target organizations' reputation, and in some situations organizations are forced to take effective actions to rebuild their reputation. Ott and Theunissen (2015) described three cases illustrating how stakeholders' actions on social media brought reputation crisis to each organization. The first case was the activist organization Greenpeace's attack of Facebook in its "Unfriend coal" campaign from February 2010 to October 2011 via blog posts, user messages on their Facebook pages, and direct messages to Facebook's CEO Mark Zuckerberg, criticizing Facebook's selection of an energy provider that relied mainly on coal for its data

centers. Facebook took corrective actions in response to the attack. Another case was the social media crisis of Applebee's. In January 2013, a patron at a local Applebee's franchise crossed out the mandatory gratuity of 18% and wrote on the receipt "I give God 10%, why do you get 18?" A co-worker of the affected waitress posted the receipt online with the patron's name visible. She was fired next day for violating the privacy policy of Applebee's, though she later in her defense stated she had believed the patron's signature to be illegible. This news spread rapidly and angry customers and online users attacked Applebee's on its Facebook and Twitter accounts, arguing that the crime did not justify the punishment. The criticism became worse when users discovered the franchise themselves had previously posted a picture on Facebook with a visible customer signature. When this fact was revealed, the picture was quickly deleted and Applebee's was accused of hypocrisy. In response to these criticisms, Applebee's published a statement that it valued customers' privacy on its Facebook, which attracted more than 10,000 comments. Applebee's failed to deal with a large number of negative comments in its communication effort. The last case was from the low-budget airline Jetstar. In November 2012, an imposter created a fake Jetstar Facebook account and replied rudely to customer enquiries. Jetstar published a general apology and contacted the affected customers. The affected users seemed amused and were grateful for Jetstar's quick response.

As Khang et al. (2012) reviewed, organizational image and reputation building on social media is an important research topic, as illustrated by the fact that "social media as advertising tools," "social media as marketing tools," and "social media's power of building brand image" were the prevalent topics in the fields of advertising, marketing, and public relations. However, though the studies reviewed in this section revealed that some researchers investigated how organizational image and reputation were affected by social media, Khang et al.'s examination of

the most frequently applied theories indicates that the process of organizational image and reputation building in social media may have not been extensively examined in existing research. The most frequently applied theory in the current social media research across disciplines of public relations, communication, marketing, and advertising was Social Information Processing Theory, followed by Uses and Gratification Theory, Relationship Management Theory, Agenda Setting or Framing Theory and Diffusion or Adoption of New Technology Theory. This observation shows that theories regarding technology adoption and relationship management, rather than image and reputation building, have been the prevalent frameworks utilized in recent studies.

In summary, when it comes to organizations, the limited number of studies investigating the effect of social media use on organizational image and reputation revealed that social media bring both opportunities and challenges for organizations to build good image and reputation via organizationally-sanctioned social media sites. Organizations are actively and strategically using various social media tools to communicate with stakeholders, cultivate relationships with them, and convey carefully designed messages about the organization to build positive image and reputation. They realize there are challenges and risks brought by social media and are thinking about how to cope with them. For example, they are constantly monitoring the social media environment to discover earlier the activities that are potentially detrimental to their image and reputation. However, various stakeholders can also build and establish some non-organizationally-sanctioned social media sites to support or resist an organization to participate in the image and reputation construction process. Therefore, unlike in the traditional Web 1.0 environment, where organizational image is mainly designed and framed by organizations via organizationally-sanctioned websites and organizational reputation is primarily constructed and

shaped through communication activities primarily initiated by organizations, in the current social media environment, organizational image can also be systematically designed and conveyed by stakeholders via non-organizationally-sanctioned social media sites and organizational reputation no longer solely relies on the centralized organizational information source, but also depends on the various distributed information sources created by stakeholders. Moreover, even on the platform of organizationally-sanctioned social media sites, the way messages should be designed and the communication patterns between organizations and stakeholders may be different based on the communicative characteristics of social media. For example, the real-time communication process between an organization and its stakeholders on its social media sites can be automatically kept on the sites and be open to all users to view. Therefore, based on the above discussion, it is reasonable to conclude that the organizational image conveyed on organizationally-sanctioned social media can only partially be controlled by organizations; moreover, the image communicated through non-organizationally-sanctioned social media sites such as counter-organizational social media sites is difficult if not impossible for organizations to control. Therefore, it is important to ask specifically what organizational images are constructed on both types of sites and whether and how these images are different, which generates the first set of research questions.

RQ1: What organizational image is communicatively constructed by organizations and key stakeholders using social media?

 RQ1a: What organizational image is communicatively constructed through the use of organizationally-sanctioned social media?

 RQ1b: What organizational image is communicatively constructed through the use of counter-organizational social media?

To summarize, in this chapter, literature regarding stakeholder theory, stakeholder communication, organizational impression management, organizational identity, image, and reputation, and social media use by organizations and stakeholders are reviewed. There exists a trend to shift to a decentered view of organization in the fields of stakeholder management and public relations. The difference and relation between concepts of stakeholder and the public are discussed and the concept of stakeholder is adopted throughout this study. Organizations and stakeholders' social media use was found to influence the communication process between organizations and stakeholders, organization-stakeholder relationship, and organizational image and reputation construction. Social media provide platforms and opportunities for organizations to conduct dialogic communication with stakeholders; however, most organizations used social media as a one-way communication tool and failed to explore its full potential. Social media bring both opportunities and challenges for organizations to build favorable image and reputation. Various kinds of stakeholders can establish counter-organizational social media sites to resist the target organizations and harm their image and reputation. Based on the literature view, RQ1 is proposed at the end of this chapter. In next chapter, a detailed description of an affordance approach to organizational image and reputation construction on social media is presented, and other research questions and hypotheses are proposed.

Chapter 3

An Affordance Approach to Organizational Image and

Reputation Construction on Social Media

In this Chapter, an affordance approach to organizational image and reputation construction on social media is discussed; several research questions and hypotheses are then proposed based on this approach. First, literature regarding the technological affordance approach is reviewed; the concepts of affordances and appropriation are introduced; and the affordances of social media in organizational settings are discussed. Second, social media affordances for organizational image and reputation construction are discussed, and eight affordances of social media are presented. Third, the influence of social media affordances on organizational image and reputation are explored. Fourth, a series of research questions and hypotheses are proposed based on the discussion of the affordance approach.

As discussed in Chapter 2, the specific features (e.g., interactivity, immediacy, mutuality) of social media are emphasized in research regarding social media use of organizations and stakeholders. The influence of different social media tools may differ according to what features they can provide for the organizations and stakeholders. Organizational images conveyed through different media may differ and the communication processes on different social media platforms may vary. For example, Gilpin (2010) found different facets of organizational identity for *Whole Foods* were emphasized and different organizational images were subsequently built on different social media. According to Gilpin, Twitter is the most dialogic medium, followed by blogs and news release, and thus the content and way of communication between *Whole Foods* and its stakeholders on these three media types were different. Schultz et al. (2011) also investigated the influence of different crisis

communication strategies via twitter, blogs and traditional media on organizational reputation. Results showed the effect of the medium largely exceeded the message's influence. Twitter users were more likely to share messages than blog users and non-users of social media. The highest score on post-crisis organizational reputation was given by individuals in the "twitter+blog" conditions, and effects of communication strategies were especially strong when short tweets were used.

Studies regarding social media use of organizations and stakeholders demonstrate that the technological features provided by social media do exert influence on the communication process between an organization and its stakeholders, the relationship development between them, the interactions among stakeholders themselves, and how stakeholders judge the reputation of the organization. These processes are all important elements in the process of organizational image and reputation construction. Moreover, though the objective features of social media are influential, the process of exerting influence also depends on how these features are actually perceived and appropriated by organizations and stakeholders. Both human agency and technological features play important roles in the process and technological determinism is not an appropriate perspective here. The features cannot exert effect if users do not realize them and know how to use them. Therefore, to better understand the organizational image and reputation building process on social media platforms, it is necessary to systematically analyze the features that can be provided by social media, how these features are perceived and comprehended by organizations and stakeholders, and how they actually use and appropriate the technologies. An affordance approach (Gibson, 1979; Hutchby, 2001a; Hutchby, 2001b; Treem & Leonardi, 2012), which emphasizes the role of both technological features and human agency in the adoption and use of technology, is relevant and appropriate here.

A Technological Affordance Approach

The Concept of Affordances

The concept of affordances was originally introduced in the work of Gibson (1979) in the psychology of perception. Affordances, in Gibson's term, refer to the possibilities an object can offer for actions to different actors including humans, animals, insects, birds, etc. For example, a rock may have the affordances of being a shelter from the heat of the sun for a reptile, and a place to hide from a hunter for an insect; a river might have the affordance of being a place to drink for a buffalo, and the affordance of providing a place for a hippopotamus to wallow. Therefore, affordances of a same object may vary based on the types of actors and contexts, but they are not totally free and are constrained by the inherent materiality of the object itself. For example, trees can always possess some affordances that a river cannot ever afford such as being a type of material for architecture construction. Although the affordances of an object depend on different types of actors, the affordances do not change as the need of the actor changes. The river's affordance of being a place to drink does not depend on the extent the buffalo feels thirsty. Affordance represents a material aspect of the object as it is encountered in the course of action (Hutchby, 2001b). Affordances can be considered as the properties of an object, but they are not determinate and finite since they only emerge in the situational context of material encounters between actors and objects (Hutchby, 2001b). Therefore, affordances are neither objective properties nor subject properties of an object. The concept addresses both sides of the object and the actor (Gibson, 1979).

The concept has been applied to examine the affordances of technological artefacts (i.e., manufactured objects) (Hutchby, 2001a; Hutchby, 2001b). Hutchby (2001b) attempted to propose an approach to study the relationship between technological artefacts and human

practices. He stated that technologies possess different affordances, which not only offer possibilities of actions, but also constrain how they can be used. The affordance approach, as argued by Hutchby, offers a reconciliation between the opposing poles of constructivism, which argues that the reality of an object "is itself an outcome of the discursive practices in relation to the object" (p. 443), and realism, which refers to "the view that worldly objects have inherent properties that act as constraints on observational accounts" (p. 443). According to Hutchby, an object's affordances are its functional and relational aspects that frame, but do not determine, the possibilities for agents' action in relation to the object.

In this approach, technologies are considered as artefacts that may both shape and be shaped by human use of them. In people's interactions "through, around, and with technologies" (Hutchby, 2001b, p. 450), they can explore a variety of combinations of these possibilities, but they should also realize their actions are also constrained by these possibilities, namely, they cannot conduct actions that are beyond the scope of these possibilities. The affordance approach not only stresses the constraining effects of the affordances, but also emphasizes the importance of users' perceptions and interpretations of these affordances, and how users actually appropriate the artefacts. Thus, Hutchby (2001b) argued that the affordance approach is the "third way" (p. 444) between constructivism, which accentuates the shaping power of human agency, and realism, which emphasizes the constraining power of technologies.

Hutchby (2001a) argued different technologies possess different communicative affordances, which may also constrain the ways they can be read. For example, the telephone can afford a form of interaction that would otherwise not be possible (i.e., a possibility for interpersonal co-presence without physical co-presence). Technological artifacts may promote certain forms of interaction and constrain the possibilities for other forms of interaction. The

concept of affordances can be used to delve into how technologies are situated in specific contexts of actions, how these artefacts are knowingly constituted by social actors, and how actors' actions are related to the artefacts (Hutchby, 2001a).

Hutchby (2001b) highlighted four aspects that he argued sometimes were lost in the Gibsonian account of affordances. First, there are various types of affordances such as affordances of artefacts, affordances of the natural environment, etc., which could be interrelated or compounded on any given incidence of action. Second, affordances are not only functional, but also relational aspects of "an object's material presence in the world" (p. 448). Affordances are functional in that they could not only enable, but also constrain the actors' capabilities of conducting some activity. Affordances are relational in that the affordances of an object may vary depending on different types of species/actors. Third, affordances of an object might not be available to immediate perception, but it can be learned about by the actors and these "affordances can be laminated or compounded" (p. 449). Finally, the affordances of an artefact do not necessarily emanate from its natural features. Affordances can be designed into the artefact, but the affordances as perceived by the actors may not be consistent with the affordances as perceived by the designer. Namely, the perceived affordances can be different from the affordances that are designed into the technological artefact.

This analysis demonstrates that affordances as described by Gibson (1979) only deal with possibilities of actions. These possibilities may, or may not, be perceived by the actors. If actors realize and perceive there are some kinds of possibilities, they can learn how to enable these possibilities in their actions. However, if the possibilities are not even perceived by the actors in the first place, these possibilities will not be explored and enabled in their actions. Therefore, the concept of perceived affordances is important. The importance of the user's perception of

affordance should be emphasized and affordances only emerge from the interaction between the user and the device based on the user's perception of the properties of the device (Still & Dark, 2013). Still and Dark (2013) pointed out that it was Norman (1988) who introduced the term affordances to the design community and popularized the concept of perceived affordance in a design context.

Norman (1998, 2008) stressed the importance of perceived affordances, differentiated them from real affordances, and claimed that the perceived affordances are what determine usability (Zhao et al., 2013). Norman introduced the concept of affordance to the HCI community through his book *The Psychology of Everyday Things* (Norman, 1988). Zhao et al. (2013) discussed the fundamental difference between the definitions of affordances proposed by Gibson and Norman. They argued that for Gibson an affordance is the action possibility itself, while for Norman, both the action possibility and how this possibility is conveyed or made visible to the actor are important. Zhao et al. thus concluded that Gibson's main interest was how actors perceive the environment while Norman was more interested in manipulating or designing the environment to promote easy perception of utility.

Lu and Cheng (2013) reviewed the definitions and discussion of the concept of affordance in three dimensions: perception dependency, susceptibility to change, and action dependency. Different conceptualizations of affordance indicate that affordance can be dependent on perception and physical limitations (Warren, 1984), perception and culture (Norman, 1988, 1998), and sensing mechanism. Affordance is mutable and it may change according to a user's ability (Warren, 1984), background (Norman, 1998), and design purposes. Actions that can be taken depend on users' abilities (Warren, 1984), cultural issues (Norman, 1998), and users' perception of usefulness.

Thus, in order to enable the possible actions provided by an artefact, it is important and necessary that the artefact's affordances are perceived by the actors. However, successfully perceiving the affordances alone cannot ensure the implementation of actions. Other factors that may affect the successful implementation of actions include users' actual physical and mental capabilities to conduct actions (Warren, 1984), users' cultural background (Norman, 1998), and available time, money, and other resources. In short, the affordance approach emphasized the importance of affordances inherent in an object, the users' perceived affordances of the object, and the individual, situational, cultural, and environmental factors that may affect the actual appropriation of the object. The affordances of an object depend on the perception of the actors in specific situations, and the affordances can both enable and constrain how the object can be appropriated in particular settings for various purposes.

The Concept of Appropriation

The concept of affordances mainly concerns the possibilities of actions provided by an artefact, whereas the concept of appropriation primarily discusses how to realize these possibilities in actual actions. Appropriation has been discussed most comprehensively in Adaptive Structuration Theory, or AST (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990; Poole & DeSanctis, 1992). AST argues that adaptation of technology structures by organizational actors is a key factor in organizational change. It discusses the duality between types of structures inherent in technologies and the other structures emerging as they interact with people's action, interaction or use of these tools. There are two aspects of technological structures: spirit (the general goals the technology aims to achieve), and the structural features built into the system. In addition to technological structure, the adoption of technology in organization is also shaped by some alternative social structures. Technological structures

constrain how the technology is used. However, technology designs cannot automatically determine the appropriation of a specific type of technology. Rather, people can actively choose how to use technology structures and their adoption practices may vary.

In their discussion of how group members appropriate group decision support systems (GDSS), DeSanctis and Poole (1994) identified four aspects of appropriation. First, groups may select to appropriate a given structural features in different ways such as directly using the technology structure, relating the structure to other structure, constraining or interpreting the structures as they are used, and making judgment about the structure. Second, group members can choose to appropriate technology features faithfully or unfaithfully. Faithful appropriation means that users use technology in ways that are consistent with the spirit of technology. Otherwise, ironic appropriation will occur. Third, they can choose to appropriate the features for different purposes, and the appropriation concept involves the intended purposes or meanings assigned to technology. Fourth, appropriation is also related to the attitudes group members display when they appropriate the technology structures. These attitudes include the group's level of confidence and comfort of using technology, the value of the technology as perceived by group members, and their willingness to explore the features of the system to excel in using it. The concept of appropriation is a very important concept in AST and appropriations are considered as the "deep structure" (p. 130) in group decision making on GDSS. DeSanctis and Poole also admitted that appropriation is not always conscious or deliberate. A given technology structure may be appropriated quite differently depending in part on the internal system of the group, which is the nature of group members and their relationships. Factors influencing the appropriation process include the interacting style of group members, their degree of knowledge and experience with the technological structures, the degree to which they believe other members

know and accept the use of the structures, and the degree to which they agree on which structures should be appropriated.

DeSanctis and Poole's (1994) discussion of technology appropriation shares some similarities with Hutchby's (2001a, 2001b) discussion of communicative affordances of technology. They both discarded technological determinism and attempted to seek a balance between technological determinism and social constructivism of technology. Technological structures discussed in AST are similar with the affordances that are designed into the technological tool by designers. Group members' faithful and unfaithful appropriation of technological structures is similar with the argument that affordances are shaped by actors' goals in specific contexts. As the enactment of affordances is shaped by individual and contextual factors, in AST the appropriation of a technology is also affected by these factors such as actors' confidence and capabilities of using the technology.

Though the concept of appropriation in AST is primarily proposed to address the use of GDSS in group settings, it can also be applied to explain how technology is used more generally. For example, applying this framework to social media use of organizational members, it can be argued that organizational members can faithfully appropriate social media in ways that are consistent with the spirit of social media or ironically appropriate these tools in ways that run at least partially counter to intended use.

The concept of appropriation and the concept of affordances are closely interrelated. Appropriation shows how affordances of an object are perceived by actors and to what extent these perceived affordances are explored and realized. It seems clear that affordances of a single object can vary when it is appropriated by different actors for different purposes. Even though they have the same purposes, different actors can also interpret the affordances of an object

differently. Moreover, when an object is appropriated by the same actor for different purposes, the actor may perceive the affordances of the object differently. Leonardi (2013) presented a nice discussion of all this in his introduction of "multiplicity of affordances" (p. 751). *Multiplicity of affordances* suggests that a technology can support multiple affordances due to multiple goals of users and individuals' different perceptions and appropriations of the features of the exact same technology. Therefore, when it comes to the use of technology in a group or organizational setting, due to the diversity of members and technological features available for use, "the possible number of affordances that may be enacted" (p. 752) becomes very large.

The concept of appropriation and the concept of affordances can be used to analyze how organizations and stakeholders utilize social media to construct organizational image and reputation. As discussed, current literature shows that there was a gap between practitioners' perceptions of the affordances of social media and their actual appropriation of social media in their professional activities to promote effective stakeholder communication, organization-stakeholder relationship development, and organizational image and reputation construction. For example, evidence shows companies attempted to facilitate dialogic communication and build relationships with stakeholders through social media, but the dialogic potential of social media was not fully realized by them (Rybalko & Seltzer, 2010). Though social media such as Twitter provide the affordance of interactivity, some nonprofit organizations were more involved in unidirectional and asymmetrical, rather than symmetrical communication on Twitter; namely, the interactive nature of social media and dialogic capabilities provided by social media were not explored in full by these nonprofit organizations (Waters & Jamal, 2011). These organizations' lack of exploring the interactive potential also represents the ironic use of social media in their corporate communication activities.

Therefore, in order to explore how organizational image and reputation are constructed by organizations and stakeholders on social media, it is important to examine what affordances are provided by different social media tools, how these affordances are perceived by organizations and stakeholders, and how organizations and stakeholders actually enact these affordances in their appropriation of social media in various types of activities. Affordances of any type of technology cannot be considered as totally independent from the appropriation of the technology, and vice versa. In this study, affordances of social media cannot be explained and explored without considering how they are actually appropriated by organizations and stakeholders. Similarly, organizations and stakeholders' appropriation of social media cannot be discussed without paying attention to the affordances social media can provide. In a word, both affordances provided by the technologies and the actual appropriation process should receive equal emphases in this study.

The Affordances of Social Media in Organizational Settings

Researchers have explored the affordances of different types of social media such as mobile messaging (Reid & Reid, 2010), smartphones (Tsai & Ho, 2013), blogs (Graves, 2007), Facebook and YouTube (Halpern & Gibbs, 2013) used in different contexts. For example, Halpern and Gibbs (2013) explored the affordances of Facebook and YouTube for political expression. They identified two affordances as provided by Facebook and YouTube: identifiability and networked information access. They argued that in terms of level of identifiability, YouTube is more anonymous than Facebook; and in terms of networked information access, compared to YouTube, the network structure enables the information flow and the extension of discussion on Facebook to users and groups in a wider social network. The affordance approach has been utilized to study how social media have been utilized in

organizational settings for knowledge sharing (Gibbs et al., 2013; Majchrzak et al., 2013). Gibbs et al. (2013) explored the affordances of social media for knowledge sharing among distributed workers. They criticized an "ideology of openness" (p. 102) existing in the social media literature, which assumes the open communication provided by social media is always desirable. They argued that this "ideology of openness" overestimates the positive influence of social media. They conducted a case study of a high-technology start-up organization and interviewed 12 engineers in 2012 and specifically identified three dialectical tensions of visibility vs. invisibility, engagement vs. disengagement, and sharing vs. control. Their findings showed that collaborative technologies provided engineers with increased visibility and accessibility of their remote coworkers and remote equipment. Majchrzak et al. (2013) also theorized four affordances of social media that foster employee engagement in online communal knowledge conversations in the workplace: metavoicing, triggered attending, network-informed associating, and generative role-taking. They proposed that these affordances exert contradictory effect on productive knowledge conversations in that they can either hinder or foster knowledge sharing. Cabiddu et al. (2014) examined the affordances of social media to enable customer engagement from an organizational perspective. They identified three affordances of social media as they are used by business and leisure hotels in the tourism industry: persistent engagement, customized engagement, and triggered engagement. *Persistent engagement* refers to the characteristic that social media can provide for hotels to maintain an ongoing dialogue with their customers even without their presence on social media. *Customized engagement* refers to the fact that, with social media, hotels can gain the possibility to interact with their customers based on their prior knowledge of individual-level information of some customers. *Triggered engagement* represents the possibility of responding to customers when some customer-initiated content is distributed

and customer-initiated event happens on social media. All three affordances have mixed effects, namely, they can be both beneficial and detrimental to the hotels.

The affordances of social media in organizational settings were extensively and systematically discussed by Treem and Leonardi (2012). They reviewed research that mentioned "social media," "Web 2.0," "enterprise 2.0," or "social software" to explore the affordances of social media use for organizational communication. Based on the extensive literature review, they concluded social media provide four types of affordances: visibility, persistence, editability, and association. *Visibility* refers to social media affording users the ability to make their once invisible information visible to other organizational members. The affordance of *persistence* primarily addresses the fact that on the platform of social media, messages can be accessible in the same form as the original display even if the users have finished presentation. *Editability* represents that users can either craft and recraft messages before it is viewed by others or modify content they have already posted. *Association* refers to social media's ability to promote the development of social ties between individuals and the establishment of the link between an individual and the content (e.g., a piece of information that the individual created or encountered). They admitted that other technology types might also have these affordances, but social media are the ones incorporating the four simultaneously and consistently in organizational settings.

Treem and Leonardi's (2012) analysis of the affordances of social media in organizational settings is systematic. The four affordances identified by them have been directly applied to study how organizations actually perceive and respond to employee use of social media, as shown in the established employee policies in these organizations (Vaast & Kaganer, 2013). Vaast and Kaganer (2013) analyzed 74 corporate policy documents regarding employees' use of

public social media sites such as Facebook and Twitter and interpreted the policies in relation to those four social media affordances. Their findings revealed that the four affordances of social media were acknowledged in the employee policies and organizations set forth some governance principles in response to these affordances. Policy elements related to the affordances of *visibility* and *persistence* included misrepresentation and disclosure of information, what to post, and what not to post. Elements relevant to the affordance of *editability* included editorial style recommendations. Elements related to *association* included blurring of personal/professional boundary and fostering community.

Although researchers have analyzed the affordances of social media that are utilized in organizational contexts, none of them explored what affordances can be provided by various social media tools when they are used to build organizational image and reputation. Treem and Leonardi (2012) presented a comprehensive analysis of the affordances of social media in a generalized organizational setting. But, directly applying their approach to explain social media's affordances in organizational image and reputation construction processes might not be appropriate since the contexts of using social media and who would use social media are different. As discussed, the affordances of an object not only depend on types of actors, but also rely on the situational context of actions (Hutchby, 2001b). Treem and Leonardi's analysis primarily focuses on organizational members' use of social media within organizational boundaries. However, in the image and reputation building processes, social media are used not only within but also outside the organizations. Actors involved in the process include both organizational members and various types of external stakeholders. Social media possess different affordances when they are used by different actors such as organizational members and stakeholders. Even when they are used by the same type of actors such as organizational

members, if the contexts of technology use are different, the affordances provided by social media are potentially different. For example, it is highly possible that social media affordances as shown in external communication programs and internal communication activities initiated by the same PR practitioners are quite different, even though the actors and objects involved in the actions do not change.

Therefore, in order to examine organizational image and reputation construction on social media, it is necessary to first analyze what affordances different social media tools can provide to organizations and stakeholders. Incorporating Treem and Leonardi's (2012) useful observations, one can further theorize about the affordances social media may possess in terms of organizational members and stakeholders specifically in the context of organizational image and reputation construction. Doing so suggests eight affordances including connectivity, interactivity, openness, personalization, visibility, infiniteness, persistence, and searchability. These eight affordances are discussed in detail in the next section; their connection to organizational image and reputation construction are discussed later in this chapter.

Social Media Affordances for Organizational Image/Reputation Construction

Connectivity

The affordance of connectivity here is similar with the affordance of association as proposed by Treem and Leonardi (2012). Compared with other media types this affordance allows for connections and links between different people, between people and contents, and between different contents to occur much more easily on social media. The affordance of connectivity is one of the essential characteristics of social media. As Mayfield (2008) contended, it is through linking to other resources, sites and people that social media thrive.

Social media provide extensive opportunity for people to be connected with each other to form, maintain, and expand their social networks. For example, on LinkedIn, as long as a person is linked to the other individual, this person may gain access to the professional network of that individual. LinkedIn is established on this basic idea that a person's professional network can be expanded through linking to the professional networks of their current social networks. The connectivity nature of social media is also reflected in boyd and Ellison's (2007) definition of social network sites. They defined social media in terms of three functions. First, on the platform of social network sites, individuals should be able to construct public or semi-public profiles within a circumscribed system. Second, users can use social network site to associate with other users who share a connection with them. Third, they can view and cross connections made by other users within the system.

Social media also provide unlimited chances for people to link themselves with various content. For Treem and Leonardi (2012), association means that social media can promote not only the development of social ties between individuals, but also the establishment of links between an individual and content. The content here refers to a piece of information that the individual created or encountered. For example, a user is linked to the content when he or she receives the subscribed topic from a social tagging site. Various types of content themselves can also be connected in social media. For example, in Twitter, under the same hashtag there may be many messages posted by different people. In this case, these messages themselves are connected by the hashtag.

Interactivity

The affordance of interactivity is closely linked to the affordance of connectivity; but interactivity emphasizes the interaction and communication process itself (more than just the

relationships). Interactivity refers to the provision of features that can enable convenient and emergent two-way interactions among participants. As Page (2012) pointed out, social media provide an idealized environment for dialogue, which has many novel formats. For example, technological settings such as comments on blog entries, tags and "@" on Twitter, and the walls on Facebook all provide useful platforms for users to interact with each other easily.

Interactions on social media can also be emergent (Page, 2012). On the platform of social media, it is quite normal that users unintentionally encounter some textual messages such as Tweets, updates from LinkedIn or Facebook, and discussion threads from others connected to them. Based on their psychological states at the specific moment, they might feel interested or uninterested in that content. If they feel like reading or even responding, they become involved in some emergent interactions they did not originally plan. The emergent nature of interactions on social media tends to make these interactions appear in episodic forms (Page, 2012) and emergent connections can be easily formed in the process (Treem & Leonardi, 2012).

Openness

Openness portrays social media's characteristic of providing an open platform on which users can create, design, and edit their own messages. Most social media tools are free with few barriers to entry and ample access to content (Barefoot & Szabo, 2010). The affordance of openness allows social media to be a place with a large number of user-generated messages. It is through freely generating messages that users actively participate in various conversations in social media. User-generated content refers to the material products (Mandiberg, 2012) created by people in their interactions, while user participation reflects the more active role individuals choose to play in the process as compared to the Web 1.0 context. User participation and message generation on social media blur the lines of media and audience (Mayfield, 2008).

Due to the inherent nature of openness, the participatory aspect of social media has been reiterated in the related literature. For example, Guo (2012) pointed out the essential characteristic that makes social media distinct from traditional mass media is their participatory nature. The emergence of citizen journalism also reflects this democratic nature. People now can post news about local events in the surrounding community or broader issues happening around them. Citizen journalism can refer to participatory news sites such as OhmyNews and NowPublic, collaborative and contributory news sites like Digg, reddit, and Newsvine, blogs and forums, as well as independent news and information websites like *The Huffington Post* and *The Drudge Report* (Barefoot & Szabo, 2010). The participatory nature of social media has shifted the relationship between media and audience. Ordinary people are no longer passive consumers of top-down forms of information products such as profit-driven centralized news, corporate advertising, and government edicts. They are actively producing news themselves from the bottom up (O'Connor, 2012).

Personalization

The affordance of personalization describes social media's characteristics of providing many features for users to personalize (e.g., profiles, messages, the style and tone of communication). For example, when creating their Facebook and Twitter profiles, users can choose personalized photos to represent themselves and write a short paragraph of their personal interests. Organizations and social groups can also personalize their profiles on social media in the same way. For example, companies can choose background and organizing structures of their corporate blogs. Moreover, users can control their style and tone of communication by using various nonverbal signs and cues provided by social media. Furthermore, since many messages in social media can be easily redistributed with comments, the process of consuming and

producing social media messages is personalized, rather than homogenized (Page, 2012). For example, a person can retweet Tweets with comments in his/her personalized style, and the next person receiving the personalized messages can again add comments in their own personalized style. In this way, messages transferred can be constantly changed with new personalized elements.

Visibility

The affordance of visibility is proposed by Treem and Leonardi (2012) and refers to the ability users have to make their once invisible (or at least very hard to see) information visible to other organizational members. This concept delineates social media's capability to enable people to easily and effortlessly see information about someone else (Treem & Leonardi, 2012). Almost all social networking sites reflect the affordance of visibility. On Facebook, it is easy for users to see the updates from others connected to them. These updates include the new relationships an individual's Facebook friends build with someone else. Updates about changes on the descriptions of work experience and skills made by people in one's professional networks are often automatically sent to this person's email inbox. As long as users are online and update their Twitter frequently, they will not avoid seeing messages posted by people they are following. By the same token, their communication behaviors can also be easily observed by others on social media.

Admittedly, users can control the level of their visibility through privacy settings. For example, Facebook provides settings in which users can choose who (e.g., none, only me, only friends, and public) can view their future updates. They can also set who can send friend request to them, who can use the email address or phone number they provide to search them. These

settings, however, do not erase the affordances of visibility and openness of Facebook. Rather, they are more like the tactics to protect users' privacy by constraining these affordances.

Infiniteness

The affordance of infiniteness depicts a key communication scope condition of social media. It seems social media have functionally infinite space on which people can post unlimited messages and keep on expanding their social networks as far as they desire. After a person has been approved by others as their friends on Facebook or as a member of their professional network on LinkedIn, this person can explore new networking possibilities by searching through their networks as long as their friends do not constrain their activities through privacy settings. This process can continue without any meaningful technological limits. A topic can attract attention from millions of people on Twitter. Those who wish to do so can express their attitudes simultaneously and there is no limit in terms of time, geological space and the maximum capacity of social media (even though limits on message length may exist).

Persistence

Treem and Leonardi (2012) used the term persistence to describe the characteristic that messages posted on social media can be recorded in the same form as the original display. Hence conversations can be initiated past the time when the posts were initiated. Content on social media can be reused and reanalyzed over time, which helps to result in robust forms of communication. The persistence of content can also result in constantly growing content on social media. This affordance also makes it very difficult to ever completely remove messages on social media.

Searchability

Searchability is complementary to persistence and infiniteness. Both the unlimited content accumulated in social media space due to persistence and infiniteness as well as the episodic communicative forms resulting from emergent interactions necessitate the need for help in identifying specific content amid an otherwise largely unsorted collection of messages. Searchability refers to this capability of searching desired results amid the large amount of information in order to enhance effective communication in various situations. Most social media tools are equipped with search engines. Users can search not only textual messages on sites such as Facebook, Twitter, and LinkedIn, but also search pictures and videos on Flickr and YouTube. Without searchability, messages can be easily submerged in the information sea on social media; it is through searchability that the relevant information can be extracted.

The eight affordances cannot be considered as affordances exclusively possessed by social media. Other media type can also possess one or more affordances as listed above. However, social media are the type integrating all these characteristics. As Treem and Leonardi (2012) argued, other technology types might also have the four affordances they proposed, but social media incorporates the four simultaneously and consistently in organizational settings. The aforementioned eight affordances are all potentially relevant as we next examine how organizations and stakeholders construct image and reputation in general—and how they can use social media specifically in constructing an organization's image and reputation.

The Influences of Social Media Affordances on Organizational Image and Reputation Construction

Organizations' activities on social media are communication activities conducted to build favorable organizational image and reputation. The affordances of social media allow

organizations and their stakeholders to communicate with one another in various ways. The aforementioned eight affordances of social media all impact the organizational image and reputation construction process in several aspects as described next.

Higher Frequency and Intensity of Organization-Stakeholder Conversations

Social media provide new communication channels for corporate communication professionals to convey messages to both internal and external audiences. Traditional media are limited in terms of time and space. However, the affordance of infiniteness of social media allows organizations to post a large number of messages about themselves, which forms the basis of more frequent communication.

Social media have also diminished the mediating role played by traditional media between companies and publics (Khang et al., 2012). Communication through traditional media and Web 1.0 services is usually one-way, and stakeholders in the process are considered as audiences. However, the affordances of openness and interactivity of social media promote multi-way conversations between organizations and stakeholders. On the platform of social media, organizations can easily get feedback from stakeholders. Social media can be used by organizations to engage in direct communication with their stakeholders to develop relationships with them (Alikilic & Atabek, 2012; Waters et al., 2009). One of the larger changes facilitated through these affordances is that stakeholders can also directly express their thoughts to an organization, to one another, and to the general public. The intensity of organization-stakeholder conversations and their communication with others is heightened this way.

Outside Stakeholders as Significant Information Sources

In traditional organizational image and reputation construction, organizational members, especially those from departments of public relations, advertising, and marketing, are primary

sources of information about the organization. However, the affordances of interactivity and openness of social media allow outside stakeholders to create and convey messages about products, services, and news about the organization, or post their comments on the organization. These stakeholder-generated messages about the organization can be comments on corporate blogs, complaints about products/services of an organization on a Twitter account, and/or photos about an organization posted on Facebook or Flickr. Admittedly, these episodic stakeholder-generated messages might be easily flooded by the rapid updates of information on social media. However, the affordance of persistence allows social media to constantly retain those messages, sometimes indefinitely. The affordance of searchability allows those interested to find the messages and engage them. Moreover, though the communication effects of temporary, sporadic and episodic stakeholder-generated messages are not usually as far-reaching as messages conveyed through mass media, the word-of-mouth effect of these messages cannot be ignored (Khang et al., 2012).

Outside stakeholders can also design messages about an organization in a systematic way and convey them to a large number of others. Anderson (2010) told an interesting story about how Coca-Cola's Facebook fan page was developed. Coca-Cola's fan page is the most popular corporate fan page on Facebook with over 40 million fans in 2012. However, the site was not officially created by Coca-Cola itself, but by two unaffiliated customers, Dusty Sorg and Michael Jedrzejewski. Their motivation for creating this fan page was to build a page better than the existing pages. Coca-Cola's response to the creation of their unauthorized actions was positive. The company thanked them for their effort in brand evangelism, asked them whether they needed any kind of assistance, and encouraged them to continue their work.

The Enhanced Significance of Unintended Communication

The unintentional aspect of image communication has been discussed in the current literature. When intentional, image communication is termed as "impression management." When unintentional, the term "impression management" cannot precisely describe the image construction process. Price and Gioia (2008) have discussed and categorized images in terms of intentionality because they thought this issue highlighted an interesting issue. Namely, once messages are sent to audiences or stakeholders, images are no longer under the control of the organization. Information from external sources may also result in unintended organizational images. Additionally, images intended for a specific audience may be received by unintended audience. The image created in this situation is defined as an "intercepted image" (p. 212).

The significance of unintended organizational image construction is profoundly enhanced based on the affordances of social media. First, the openness of social media allows stakeholders to generate messages about an organization that are not intended to be designed to enhance or deteriorate the image and reputation of the organization. For example, on Facebook a Chinese visitor might just want to express his/her excitement or depict his/her exotic travelling experience by posting a photo of a company's outdoor advertisements presented on the screens of skyscrapers in Time Square. Employees may depict their stories in the workplace in their personal blogs just because their work constitutes a significant part of their lives. Although the visitor or the employees do not intend to convey some images when they post photos or write personal blogs, the audiences may form some kind of impression about the corresponding companies based on messages they receive. Second, social media's affordances also increase the possibility that unintended audiences receive some messages that are not initially designed for them. The affordances of connectivity, interactivity, openness, and visibility allow the unintended

audiences to gain access to messages through their social networks. The affordances of persistence and searchability further strengthen their capability of information acquisition.

Reduced Control of Organization

Organizations lose some control in the image and reputation construction process on social media. First, unlike what happens with conventional media and on Web 1.0 platforms, organizations cannot control in advance stakeholder generated content about them. An exception is that organizations might be able to control the content generated by ordinary employees in their personal social media accounts by drafting policies on how employees use social media appropriately (though even that can be overcome through anonymous channels, pseudonyms, or lack of policy enforcement). However, the affordance of personalization of social media deprives organizations' capability to control the tone and style of employees' social media communication, which might also exert some influence on organizational image and reputation. Second, as discussed in the last section, organizations lose some control over which specific audiences might receive their messages. The communication paths of organizationally-generated messages are not always predictable—and may be less so given the affordances of social media. Third, organizations cannot control how stakeholders interact with each other when they receive messages sent to them either by organizations or by other stakeholders. Admittedly, in traditional media and on Web 1.0 platforms, organizations cannot control how messages are interpreted and discussed by stakeholders, either; however, the affordances of connectivity, interactivity, openness, and visibility of social media all promote fast information flow and efficient stakeholder interactions. Issues requiring appropriate management might be formed much more easily and quickly in this communication environment. If some stakeholders have concerns regarding a company's decisions and operations, they may express their opinions on their social

media sites. As their opinions spread quickly and more and more stakeholders participate in the discussion on social media, the previous latent issue might become more active; the previous active issue might become more intense and even result in a crisis. The communicative effect of either positive or negative information may be enhanced in the process of stakeholder interactions. Furthermore, the effect could also be strengthened since messages can be recorded and searched on social media. The affordances of persistence and searchability also require more effort from organizations in crisis communication processes, since negative information concerning the organization may always be there and easily found by those seeking it.

Faster Alliances of Stakeholders and Easier Emergence of Publics

Owing to easier interactions, high visibility of communication processes, and quick forming of connections, stakeholders on social media can be allied much more easily than in the context of traditional media and Web 1.0 (Aula, 2010). This alliance empowers stakeholders to some extent in their negotiation with organizations when issues emerge. Moreover, publics can also be easily developed on social media. Stakeholders are defined as "any group or individual who can affect or is affected by the achievement of the firm's objectives" (Freeman, 2010, p. 25), while a public refers to "a single collection of individuals that emerges in response to some problematic situation" (Vasquez & Taylor, 2001, p. 140). Quick interactions and convenient connections of stakeholders on social media might motivate them to realize a possible problematic situation much more quickly. Their alliance based on discussions of the issues indicates the emergence of publics.

Each of the issues presented above indicates that the affordances of social media can be explored by organizations and stakeholders in ways that will influence the organizational image and reputation construction process. The eight affordances of social media—connectivity,

interactivity, openness, personalization, visibility, infiniteness, persistence, and searchability—provide possibilities for organizations to construct their organizational images in different ways. Similarly, these affordances also make it possible for stakeholders to express their voices regarding the organization, and even construct distinct images for organizations they are concerned or have trouble with on their own social media sites. RQ1 asks what organizational image is communicatively constructed by organizations and stakeholders using social media. Since social media provide a variety of affordances for stakeholders to explore, it is important to propose another research question to examine how stakeholders' social media use affects organizational image and reputation construction.

RQ2: How does stakeholders' social media use affect perceived organizational image and perceived organizational reputation?

Perceived Image and Perceived Reputation

As discussed before, in order to define organizational image, it is important to distinguish *what is presented* from *what is perceived*. The former is relatively objective, while the other is more subjective. The distinction between *the presented* and *the perceived* is important and has been widely discussed by scholars interested in organizational identity, image, and reputation. For example, the two principle definitions of organizational image— "what members think outsiders think about their organization" (p. 400) and "what outsiders think about the organization" (p. 400)—proposed by Whetten and Mackey (2002) address both internal and external stakeholders' perceptions of organizational image, while the other principle definition— "what members present or project about their organization to influence how others think about the organization" (p. 400)—addresses the organizational image that organizational members intend to actually present in front of the audience. Similarly, in his discussion of psychological

aspects of corporate identity, image, and reputation, Bromley (2000) pointed out differences between three concepts—corporate identity, corporate image, and corporate reputation. In his definitions, corporate identity refers to key members' conceptualization of their organization; corporate image describes how an organization presents itself to its publics, especially visually; and corporate reputation portrays how key outsiders actually conceptualize an organization. In Bromley's conceptualization, the difference between *the presented* and *the perceived* is demonstrated by two concepts—corporate image and corporate reputation. In his definitions, Bromley only conceptualized corporate reputation as the perceptions of a company by external stakeholders or other interested parties, while ignoring corporate image. However, in Whetten and Mackey's (2002) conceptualization of organizational image, not only can image be presented, but it also can be perceived, by both internal and external stakeholders. Bromley only conceptualized corporate image as the presented image, rather than the perceived one. On the contrary, some scholars only conceptualized organizational image as stakeholders' perceptions of an organization, while ignoring what image is actually presented or conveyed by organizational members to outsiders. For example, Price and Gioia (2008) defined organizational image as "perceptions, either sent or received, by various internal and external stakeholders about a given organization" (p. 209). They also argued that since organizational identity is all about internal members' perceptions of an organization, it can be considered as a part of organizational image.

The above discussion demonstrates that it is hard for scholars to reach an agreement on how to define the three concepts: identity, image, and reputation. As discussed in Chapter 2, the concept of *conveyed organizational image* is adopted in this study, so the organizational image addressed in RQ1 is the conveyed image. *Conveyed organizational image* only addresses *the presented* part, but not *the perceived* part of organizational image. For the purpose of this study,

it is important to answer three questions in order to gain a better and clearer understanding of organizational image and reputation as defined in this study: a) can both organizational image and reputation be conceptualized as perceptions of stakeholders? b) is it necessary to conceptualize organizational image as a combination of presented image and perceived image? and c) if both image and reputation are conceptualized as perceptions of stakeholders of an organization, what is the difference between perceived image and perceived reputation?

Conversely, most scholars seem to agree that reputation is about stakeholders' perceptions of an organization. Namely, organizational reputation purely addresses what is perceived, rather than what is presented. The difference between different definitions primarily lies on whether both internal and external stakeholders' perceptions are taken into consideration in the conceptualization of organizational reputation. Some scholars only considered reputation as external stakeholders/outsiders' perceptions and judgment of an organization (e.g., Bromley, 2000), while others took both internal and external stakeholders' perceptions into consideration in their conceptualizations (e.g., Fombrun & Van Riel, 1998). One factor that can explain why only external stakeholders were considered in some definitions of reputation can be attributed to the traditional definition of organizational identity (Albert & Whetten, 1985), in which internal stakeholders' perceptions are largely categorized as a part of organizational identity. The other factor might originate from profit-driven corporations' tendency to pay more attention to some outside stakeholder groups such as shareholders, customers, and clients to gain more profit, while neglecting the average organizational members' needs.

As discussed in Chapter 2, in this study, Fombrun and Van Riel's (1998) definition of corporate reputation is adopted, and thus both internal and external stakeholders are taken into consideration. Though internal stakeholders can figure out some central, enduring, and

distinctive characteristics of their organization to establish an identity for it, as discussed by

Albert and Whetten (1985), they can also develop a judgment of their organization as does by

external stakeholders. For example, an employee from Walmart can tell why Walmart is Walmart

and what enduring characteristics of Walmart make it distinctive from other companies; she can

also answer some questions such as "is Walmart an admirable company?" and "does Walmart's

products maintain high quality?" to make judgment on Walmart as some outsiders can do. This

example illustrates both organizational identity and organizational reputation can be internal

stakeholders' perceptions, but they are different aspects of perceptions.

The researcher also argues that organizational image can be conceptualized as

stakeholders' perceptions of an organization (Price & Gioia, 2008; Whetten & Mackey, 2002),

but it should be considered as a combination of *the presented* and *perceived* images.

Organizational image can be presented through communication campaigns, advertisements, and

PR activities, but *the presented* image and *the perceived* image can be totally different. The

messages conveyed in advertising and PR activities and the effects of those activities are

different things. How an organization is presented in these activities reflects the intended image

it wants to build in front of its stakeholders; however, it is highly possible that the conveyed

image may not be built in stakeholders' mind. Price and Gioia (2008) discussed the difference

between intended and unintended organizational images. They argued that organizations intend

to convey some images in messages they send to influence stakeholders' perceptions, but once

the messages are sent, they can no longer control what kind of images they can build in

stakeholders' mind. Neither can an organization control how stakeholders interpret the

organizational messages, nor can it control who will receive those messages, i.e., the messages

could reach some unintended audiences. They construct the concept of "intercepted images" (p.

212) to represent "images that were intended to follow one communicative path, but which inadvertently reached a different audience" (p. 212). Intercepted images can be contradictory to intended images because the unanticipated audiences might not be receptive to the intended image.

Price and Gioia's (2008) discussion of intended and unintended images really sheds light on this study. As discussed, in social media environment, organizations lose control on some part of the information flow, and stakeholders gain more power to create and distribute messages about the target organization on their own, which can largely affect how organizational image is perceived. Therefore, to study organizational image construction in social media environment, it is important to distinguish *the presented* organizational image on social media forms from the organizational image as *perceived* by stakeholders using social media. Therefore, the answers to Questions a and b are all yes.

Now since both organizational image and reputation can be conceptualized as perceptions of stakeholders, then what is the difference between perceived image and perceived reputation? To answer Question c, it is necessary to clarify the difference between two concepts: "perceptions" and "evaluations". Leister and MacLachlan (1975) (as cited in Price & Gioia, 2008) differentiated between perceptions and evaluations. According to them, "perceptions" are to be used to describe the receipt of the image by stakeholders, while "evaluations" are used to describe stakeholders' opinions and conclusions about the organization. Leister and MacLachlan's discussion implies that perceived image portrays a mental state to symbolize an organization in stakeholders' mind, while perceived reputation primarily depicts stakeholders' evaluation and judgment of an organization. Coincidentally, the similar discussion can be found in the corporate communication literature. For example, Cornelissen (2008) pointed out that

reputation deals with stakeholders' stable judgment of an organization, while image depicts stakeholders' immediate impression of an organization at a single point of time. Based on these discussions, in this study, *the perceived organizational image* refers to stakeholders' immediate impression of an organization to profile it at a specific point of time, while *perceived organizational reputation* describes stakeholders' relatively more stable evaluation and judgment of an organization in a longer time period. Since organizational reputation is a subjective term itself, it is not necessary to use *perceived organizational reputation* to represent it. However, in order to directly compare it and keep it consistent with the perceived organizational image, the researcher adds "perceived" before organizational reputation.

To summarize, in this study, organizational image is conceptualized as a combination of presented/projected organizational image (i.e., the *conveyed organizational image*), and *perceived organizational image*, while organizational reputation is conceptualized as *perceived organizational reputation*. The *conveyed organizational image* as constructed on social media by stakeholders and organizations is examined in RQ1, while *the perceived image* and *reputation* are explored in RQ2.

Predicting the Influence of Social Media Use on Organizational Image and Reputation

Based on the literature reviewed in Chapter 2, we find that social media use exerts influence on both the communication process between organizations and stakeholders as well as organization-stakeholder relationship, which subsequently affect organizational image and reputation construction. Namely, communication processes and the quality of organization-stakeholder relationship may mediate the relationship between social media use and organizational image/reputation construction. In order to answer RQ3, it is necessary to examine how the communication and relationship building processes are influenced by social media use

and how these processes mediate the relationship between social media use and image/reputation building. The hypotheses listed in this section are proposed to examine these relationships. As shown in the literature review in Chapter 2, social media is generally perceived as "good" in promoting dialogic communication and relationship building. However, there is very little empirical evidence to support this widely accepted perception. As pointed out by Valentini (2015), there is little evidence on and concrete answers to whether social media uses actually helped to build more engaged publics, strong relations with them, and/or increased brand loyalty. Therefore, this study can also add to the literature and provide empirical evidence on how social media use actually affects organization-public communication, relationship building, and image/reputation construction.

The Intensity of Social Media Use by Stakeholders

Different levels of intensity of social media use by organizations and stakeholders were found in the literature. Berthon et al. (2012) proposed a concept of consumer-generated media (CGM) to refer to social media. They argued that the different forms of content generated by consumers on social media manifest that "CGM varies across a spectrum of creativity" (p. 263). Consumers' informal discussions about the products and services of a company on different social media types such as Facebook and Twitter are located at the beginning of the spectrum. Consumers' creation of structured reviews and evaluations of the company in the form of text or video indicates the next location in the spectrum. In the next stage, consumers actively distribute their self-created advertising content to promote the brand they love. Lastly, consumers can be involved in the modification of proprietary company products and services and the distribution of these innovations.

Berthon et al.'s (2012) discussion implies consumers' intensity of social media use can range from a relatively passive point to an extremely active point. Since their discussion was mainly from the marketers' perspective, the only type of stakeholder they cared about was consumers, but their discussion is quite meaningful in that they were trying to examine the degrees of intensity of consumers' social media use, which can also be applied to study all stakeholders' social media use. In their study of public engagement with nonprofit organizations on Facebook, Cho et al. (2014) identified three functions provided by Facebook—*like*, *share*, and *comment*, as representing different levels of organization-public engagement. *Like* represents a low level of public engagement, while the latter two indicate a moderate and a high level respectively.

Previous studies of online consumers also showed consumers had different levels of participation when they conducted online brand-related activities on social media (Muntinga et al., 2011). Muntinga et al. (2011) created a construct—consumers' online brand-related activities (COBRAs)—to describe any consumer activity on social media that is related to a company's brand. Examples of COBRAs include watching brand-related videos on Absolut Vodka's YouTube channel, talking about IKEA on Twitter, and uploading pictures of their new Converse sneakers on Facebook. They argued that COBRAs include a wide range of consumer-to-consumer and consumer-to-brand behaviors on social media. They developed a COBRA typology which categorizes COBRAs into three dimensions which reveals a continuum ranging from high to low brand-related activity. The three dimensions are consuming, contributing, and creating, which indicate a path of gradual involvement with the brand-related content on social media. *The consuming COBRA type* simply describes participation without contribution or content-creating, which involves a minimum level of consumer activeness. Examples of this type

of brand-related social media use include viewing brand-related video, listening to brand-related audio, watching brand-related pictures, following threads on online brand community forums, reading comments on brand profiles on social network sites, reading product reviews, playing branded online videogames, downloading branded widgets, and sending branded virtual gifts/cards. *The contributing COBRA type* denotes both user-to-user and user-to-content interactions about brands, which represents the middle level of consumer activeness. Examples of this type of brand-related social media use include rating products and/or brands, joining a brand profile on social network site, engaging in branded conversations such as discussions on online brand community forums or social network sites, and making comments on brand-related weblogs, video, audio, picture, etc. *The creating COBRA type* represents actively producing and publishing the brand-related content for other consumers to consume and contribute to, which indicates the highest level of engagement in online brand-related activities. Examples of this type of brand-related social media use include publishing a brand-related weblog, uploading brand-related video, audio, pictures or images, writing brand-related articles, and writing product reviews. Consumers' choice of conducting which types of COBRA relies on their levels of needs for entertainment, integration and social interaction, expressing and shaping personal identity, information, remuneration, and empowerment. This COBRA typology was utilized by Men and Tsai (2013) to study the types of Chinese public's engagement with companies on popular social networking sites (i.e., Renren and Sina Weibo) and their motivations behind them. They found the Chinese publics engaged more in message-consuming activities than contributing activities.

Generally, studies identifying different levels of intensity of social media use tend to categorize social media users into two groups: passive message receivers and active communicators. The degree of passiveness and activeness can form a spectrum ranging from

extremely passive to extremely proactive. For example, if a user only reads messages posted by a company on its Facebook page, he or she is only a passive user. If he or she likes the message, he or she becomes more active. If he or she shares the message, he or she shows a higher degree of activeness. Based on all of these discussions, in this study social media use relevant to image and reputation construction is categorized into two types: *consuming social media use* and *contributing social media use*, which are based on the COBRA typology proposed by Muntinga et al. (2011). In consuming social media use, stakeholders play a relatively passive role in organization-stakeholder communication, while in contributing social media use, their role becomes more active, though contributing represents different levels of activeness.

Organization-Stakeholder Communication

The dominant discussion of organization-stakeholder communication on social media is the differentiation of the unidirectional communication from organizations to stakeholders and the two-way interactive communication between them. For example, Agostino (2013) studied how Facebook, Twitter, and YouTube contributed to public engagement by analyzing some Italian municipalities' activities on these social media tools. In this study, public engagement was considered to be implemented at two levels—public communication and public participation. *Public communication* refers to the process of unidirectional information flow from the administration to citizens, while *public participation* involves establishing a dialogue and conducting two-way communication between the two parties. Public communication as defined by Agostino involves sending messages to passive receivers, while public participation involves some active users who are engaged in interactions and dialogue with the organization.

Previous attempts were conducted to examine the nature of communication through analyses of objective features of the communication tools and users' exploration and

appropriation of these features. Activities of organizations on various types of communication platforms and the objective features of these platforms have been examined to identify the level of *dialogic communication* (Kent & Taylor, 1998) on these platforms (Bortree & Seltzer, 2009; McCorkindale & Morgoch, 2013; Reber & Kim, 2006; Rybalko & Seltzer, 2010). Kent and Taylor (1998) proposed dialogic communication as a theoretical framework to guide relationship building between organizations and publics through the World Wide Web. They defined dialogic communication as "any negotiated exchange of ideas and opinions" (p. 325), and proposed two principles of dialogic communication. First, two parties engaging in dialogic communication do not necessarily agree with each other, but are willing to "reach mutually satisfying positions" (p. 325). Namely, dialogic communication is not merely about agreement, but about "the process of open and negotiated discussion" (p. 325). Second, dialogic communication is about intersubjectivity and treats human communication as an intersubjective process, in which two parties communicate with openness and respect. Due to its nature and its emphasis on negotiated communication, dialogic communication should be considered as an especially ethical way of conducting public relations and public dialogue. They argued that dialogue is essential in relationship building between organizations and publics and they proposed five principles which could offer guidelines for successful dialogic public relations on the World Wide Web.

A *dialogic loop* refers to a feedback loop which allows publics to question or query an organization and offers the organization to respond to publics' questions, concerns, and problems. Organizations should train the organizational members on how to respond to publics through electronic communication. Furthermore, organizations should ensure the availability of individuals who would respond to publics to make the dialogic loops be complete. The *usefulness of information* refers to the information provided on the organizational websites being

"information of *general* value to all publics" (Kent & Taylor, 1998, p. 327). For example, a non-profit organization can provide some background and historical information about itself on its websites. Organizations can also provide search engines, contact information such as physical addresses, telephone numbers, and email addresses of organizational members on their websites. Other types of useful information include lists and explanation of ingredients, their known side effects if any, how products are produced and how services are delivered, etc. Kent and Taylor (1998) argued that it is very important to make information available to publics and provide information that is useful to them. Making information available to publics, they argue, is the first step in relationship development between organizations and publics. They contended that organizations can provide some means such as mailing lists and discussion groups that can distribute information to publics automatically. This is more desirable than soliciting publics to visit their websites and request information. The *generation of return visits* (RV) means that the websites maintained by an organization should contain some features that can attract publics to visit them again and again. These features can include updated information, online question and answer sessions, new commentaries, changing issues, special forums, online experts, easily downloadable or mailed information, referral services or links to local agencies or information providers, etc. The *intuitiveness/ease of interface* means that the websites should be easy to figure out and understand. It is useful to provide tables of contents, more textual content than graphical content, and well formatted/organized text. The *conservation of visitors* refers to organizational websites' capability to conserve visitors by avoiding sponsored advertising and adopting strategies that will not distract publics such as only providing essential links "with clearly marked paths for visitors" (p. 330) to return to the organizational websites. The five principles of dialogic communication have been applied to study the dialogic communication on

the mobile websites of *Fortune* 500 companies (McCorkindale & Morgoch, 2013), Facebook profiles of organizations (Bortree & Seltzer, 2009), and *Fortune* 500 companies' Twitter profiles and tweets (Linvill et al., 2012; Rybalko & Seltzer, 2010).

The four models of public relations proposed by Grunig and Hunt (1984) are frequently used to theorize the unidirectional or two-way interactive communication between organizations and stakeholders. Grunig and Hunt adopted the "four models" approach—*press agency*, *public information*, *two-way asymmetric*, and *two-way symmetric*, to explain the development of public relations from its origins at the end of the 19th and beginning of the 20th century to its modern practice. As mentioned in Chapter 2, in the stakeholder communication model proposed by Cornelissen (2008), the last three models in Grunig and Hunt's approach were utilized to identify three communication strategies adopted by organizations in their stakeholder communication: *an information strategy* (a one-way symmetrical model of communication), *a persuasive strategy* (a two-way asymmetrical model of communication), and *a dialogue strategy* (a two-way symmetrical model of communication).

The categorization of three types of communication based on Grunig and Hunt's (1984) model—a unidirectional communication, a two-way asymmetrical communication, and a two-way symmetrical communication—was employed to study the messages distributed by the non-profit organizations on Facebook (Cho et al., 2014). Publics showed a low or moderate level of engagement with public information (unidirectional) messages and two-way asymmetry communication messages distributed by the non-profit organizations on Facebook, while showing a high level of engagement with two-way symmetric communication messages. Cho et al. (2014) thus concluded that two-way symmetrical communication is most useful for non-profit organizations to build and maintain their relations with publics.

In their study of how the 100 largest charitable organizations in the United States used Twitter, Lovejoy and Saxton (2012) developed an original microblogging function categorization scheme to analyze the messages sent by these organizations on Twitter. They categorized three major functions of tweets: information, community, and action. The *information* function involves spreading information about the organization, its activities, or anything that the followers might be interested. The *community* function involves fostering relationships, creating networks, and building communities on Twitter through tweets that promote interactivity and dialogue. The *action* function involves encouraging and motivating followers to conduct some actions for the organization. Examples of actions include making a donation, buying a product, attending an event, joining a movement, or launching a protest. Based on their analysis of collected tweets using this categorization scheme, they classified the organizational users of Twitter in their study into three types: *information sources*, *community builders*, and *promoters & mobilizers*. Obviously, unidirectional communication is the primary communication strategy when an organization is only information sources, but if it becomes community builders and/or promoters & mobilizers, various levels of two-way communication happen. On the other hand, if stakeholders only consume messages sent by organizations on social media, no two-way communication happens. However, if they are involved in contributing or creating social media use, two-way communication is more likely to happen. Therefore, the level of interactivity in organization-stakeholder communication relies on the social media use by both organizations and stakeholders. Neither of them can solely decide whether and to what extent the communication is dialogic or not.

The four types of models proposed by Grunig and Hunt (1984), the three communication strategies presented by Cornelissen (2008), and the three types of organizational users of Twitter

categorized by Lovejoy and Saxton (2012) all imply the consciousness organizations retain in their design of communication programs in their public relations and stakeholder communication activities. Yet, these taxonomies are not quite appropriate to be used to conceptualize the organization-stakeholder communication on social media, because they are all built from an organization-centered point of view.

As discussed in Chapter 2, a decentered view of stakeholder management theory is adopted in this study; and stakeholder alliance shaped through stakeholder interactions on social media is essential to consider. The concept of dialogic communication (Kent & Taylor, 1998) seems to be more appropriate to utilize to conceptualize the organization-stakeholder communication on social media. Kent and Taylor's (1998) conceptualization of dialogic communication treats organizations and stakeholders as more equal parties and mutual understanding between them is to be achieved.

In Grunig and Hunt's (1984) model, the two-way symmetrical model is considered as the ideal model for public relations. In this model, the publics' views are respected and given the same importance as the organization conducting public relations activities. The four models—press agency model, public information model, two-way asymmetrical model, and two-way symmetrical model—guide public relations practitioners as they design the communication programs in a variety of ways and communicate with their publics differently. For example, if an organization adopts the two-way asymmetric model, the main goal of their public relations is to persuade publics to behave in the way it wants them to. However, if it chooses the two-way symmetric model, the primary purpose is to achieve mutual understanding between the publics and itself; and the attitudes and behavior of the management are also open to be changed. Therefore, the models proposed by Grunig and Hunt are about the guidance of organization-

stakeholder communication, rather than the communication itself. This is similar to the three communication strategies of organization-stakeholder communication, as introduced by Cornelissen (2008). Kent and Taylor (1998) also discussed the relationship between the two-way symmetrical communication and dialogic communication as they conceptualized it. They argued that two-way symmetrical communication as a model is principally about providing a procedural means to promote interactive communication between an organization and its publics, while dialogic communication refers to the interaction itself, rather than the means. Therefore, the two-way symmetrical communication in Grunig and Hunt's model can be considered as a strategy guiding an organization's communication programs, but the dialogic communication should be viewed as the product of this strategy.

Since this study focuses on organization-stakeholder communication itself, rather than the guidance and strategies of the communication programs, the concept of dialogic communication (Kent & Taylor, 1998) is utilized to conceptualize organization-stakeholder communication on social media. This does not mean all organization-stakeholder communication on social media in this study is dialogic communication; rather, the researcher attempts to examine the extent or degree to which it is dialogic. As discussed, social media provide affordances to enhance interactive and dialogic communication, but the affordance of interactivity is not fully explored (Bortree & Seltzer, 2009). Kent and Taylor (2002) attempted to clarify the concept of dialogue and put forward a dialogic public relations theory. They pointed out dialogue as an orientation includes five principles: *mutuality*, *propinquity*, *empathy*, *risk*, and *commitment*. *Mutuality* refers to the recognition and acknowledgement that organizations and publics are inextricably linked. *Propinquity* denotes temporality and spontaneity showed by organizations in their interactions with publics. *Empathy* describes organizations' supportiveness

of public interests and goals, the recognition of the community building function of public relations, and the acknowledgement of the value of the publics. *Risk* portrays the risks resulting from dialogic communication, which include participants' vulnerability to be manipulated or ridiculed by other parties involved in the dialogue, the unanticipated consequences of the spontaneous communication, and the strange otherness that may be encountered in the interactions. Kent and Taylor argued that this dialogic risk can offer opportunities for public relations practitioners to recognize the problems, and thus minimize uncertainty and misunderstandings, which can help cultivate stronger organization-public relationships. Lastly, *commitment* indicates the genuineness and authenticity of communication, commitment to conversation, and commitment to interpretation. Kent and Taylor contended that though dialogue involves much work and risks, it can help increase public support, enhance image/reputation, and decrease governmental interference. On the other hand, dialogue can bring publics increased organizational accountability, increased public satisfaction, and more power to express their voices in organizational operations.

By delving into the theoretical and philosophical discussions of dialogic communication from diverse disciplines, including Kent and Taylor (2002) and Grunig (1992, 1997, 2001, 2006), Yang et al. (2015) proposed the concept of organization-public dialogic communication (OPDC), which is defined as "the orientation of mutuality and the climate of openness that an organization and its publics hold in communication to bring about mutually beneficial relationships" (p. 176). They pointed out that their conceptualization of OPDC was heavily influenced by dialogic theory (Buber, 1958), symmetrical communication (Grunig, 1992, 1997, 2001, 2006), and communicative action theory (Habermas, 1984, 1987). They identified two dimensions of OPDC: the orientation of *mutuality* and *openness*. *Mutuality* refers to the

recognition and acknowledgement of another communication party's unique values or presence. For effective OPDC, both organizations and publics should consider the other party's opinions and values, and try to find common ground with each other. The other dimension of OPDC, *openness*, refers to a climate of open and honest communication.

Based on the existing literature, Yang et al. (2015) identified six attributes for *mutuality*: (a) grounding, (b) collaboration, (c) confirmed equality, (d) responsiveness, (e) respect, and (f) empathy. *Grounding* refers to a mutual orientation to share common ground between organizations and publics; *collaboration* depicts communicators' orientation to realize shared communicative goals; *confirmed equality* delineates the equal status of organizations and publics in their communication; *responsiveness* describes "mutual orientation of otherness" (p. 178), which requires each communicator's sensitiveness of recognizing the other parties' needs; *respect* portrays "a mutual orientation of unconditioned supportiveness of other communication parties" (p. 178), which requires respect for the legitimacy of the communication parties' opinions, no matter agreement is existent or not; and *empathy* refers to the ability to sense or predict other communication parties' needs and feelings in communication. The dimension of *openness* also has three attributes: (a) accessibility, (b) genuineness, and (c) transparency. *Accessibility* requires organizations to provide publics with open access to information and communication channels, allow them to express their opinions, respond to them and provide useful information to them in a timely manner. *Genuineness* refers to authentic and honest communication between organizations and publics. *Transparency* depicts a climate of communication in which organizations disclose information to public in a clear and transparent way.

In their conceptualization of dialogic communication, Yang et al. (2015) and Kent and Taylor (2002) sometimes used different terms to describe the same attributes. For example, the dimension of *openness* in the Yang et al.'s taxonomy is somewhat covered by the principle of *commitment*, as proposed by Kent and Taylor. The *responsiveness* attribute (Yang et al., 2015) is kind of similar to the principle of *propinquity* (Kent & Taylor, 2002). On the other hand, the same terms used in their taxonomies can imply different meanings. For example, the *mutuality* defined by Yang et al. is similar to the principle of *empathy* (Kent & Taylor, 2002), with both recognizing and acknowledging the other communication participant's values and point of views, while the *mutuality* defined by Kent and Taylor refers to the recognition of the inextricable relationship between organizations and publics.

Compared with Kent and Taylor's (2002) principles of dialogic communication, the taxonomy proposed by Yang et al. (2015) more directly addresses the elements of the communication process itself. For example, the principle of *mutuality* (Kent & Taylor, 2002) focuses on organization-public relationships, rather than the communication process; the principle of *risk* (Kent & Taylor, 2002) primarily emphasizes the outcome of dialogic communication. In this study, organization-stakeholder communication and organization-stakeholder relationship are different concepts and it is necessary to distinguish one from the other in the conceptualizations of the two. Moreover, the communication process and its outcomes are different concepts and should be detached from each other. Based on these considerations, Yang et al.'s taxonomy is more appropriate to be used to conceptualize organization-stakeholder communication in this study.

Organization-Stakeholder Dialogic Communication (OSDC)

Based on the various models and categorization schemes just described, this study adopts the concept of *organization-stakeholder dialogic communication* (OSDC) to conceptualize the communication process between organizations and stakeholder on social media. OSDC is defined as open and negotiated exchange of information and opinions between organizations and stakeholders to achieve mutual understandings. OSDC is not about communication strategy and how to design effective communication program; rather, it is about the communication process itself. It is not about the outcome of communication, either, but focuses on the participation of both parties in the communication.

It is important to discuss several aspects of OSDC to gain a deeper understanding of this concept. First, OSDC is two-way, rather than one-way communication; it is not unidirectional communication from either organizations or stakeholders. Namely, there should be interactions and exchange of ideas. Second, OSDC is not organization-centered communication as practiced in traditional corporate communication and public relations activities. In OSDC, organizations do not hold superior position to dominant the communication process. Namely, there is an equality of power between organizations and stakeholders in their conversations. Third, in OSDC, both parties should retain a sincere and genuine attitude to be engaged in interactions and conversations to seek for mutual understanding of each other. Admittedly, both organizations and stakeholders may have different communication goals based on different interests. But in OSDC, they tend to recognize and respect the other parties' values and legitimate appeals. All discussions and interactions are built on this mutual respect, in order to find some common ground. Fourth, though the objective of OSDC is to achieve mutual understanding, it does not mean there is no conflict in OSDC and the outcome of OSDC is always positive. Mutual

understanding is the goal, but this goal may not always be achieved. Organizations and publics may have conflicting goals and opinions, and in their dialogic communication, they may be involved in disputes, conflict, and disagreements. OSDC only implies each communicator should recognize and acknowledge the other party's goals and respect their values. It cannot ensure possible conflicts to be avoided and solved. Through constant interaction and negotiation between two parties, conflicts may or may not be solved and common ground may or may not be found.

Drawing from scholarly discussions of the two-way symmetrical communication (Grunig & Hunt, 1984), dialogic communication (Kent & Taylor, 1998, 2002), and organization-public dialogic communication (Yang et al., 2015), the researcher proposes two dimensions to explain OSDC: behavioral and attitudinal. The *behavioral dimension* deals with organizations and stakeholders' communication activities and the *attitudinal dimension* addresses their subjective attitudes towards the communication. For example, indicators of the behavioral dimension can include two-way communication, responsiveness to the other communication party's questions/feedback, equality of both parties in the communication process, accessible and transparent information provided by both parties, and so forth. Examples of indicators of the attitudinal dimension may include respect for others' goals and values in communication, motivation to seek common ground, being open to negotiate when conflicts emerge, etc.

Indicators of both dimensions are built based on previous discussion on the two-way symmetrical or dialogic communication literature (Grunig & Hunt, 1984; Kent & Taylor, 1998, 2002; Yang et al., 2015). Some of the attributes discussed by these scholars are kept, with others deleted. New attributes are added to represent the indicators that were not covered by them. For example, since it only addresses the outcome of communication, the principle of *risk* (Kent &

Taylor, 2002) is deleted. The attribute of *collaboration*, which was discussed by both Kent and

Taylor (2002) and Yang et al. (2015), is not considered as an appropriate term to describe OSDC.

All participants engaging in collaboration activities aim to achieve some common goals by

working together; however, in their communication, organization and stakeholders may have

conflicting goals. An example illustrating an extreme case is an activist group's resistance of a

petroleum company. The company's goal is to maximize its financial earnings while the activist

group's goal is to protect the environment. To reiterate, the OSDC process under this

circumstance is not about collaboration, but about negotiation. Some other attributes such as

openness (Yang et al., 2015), *empathy* (Kent & Taylor, 2002; Yang et al., 2015), and *genuineness*

(Kent & Taylor, 2002; Yang et al., 2015) can be kept. It is worthwhile to note here that even

though some terms are kept, how they are defined in this study may be different from how they

were defined by those scholars.

The attributes of the behavioral dimension include: (a) interactivity, (b) responsiveness,

(c) openness, (d) equality, and (e) transparency. *Interactivit*y refers to the two-way nature of

communication, which is not a one-way process from either organizations or stakeholders.

Responsiveness delineates the timely response to communication parties' questions, comments,

and feedback. It also connotes the immediate presence when the communication is not face-to-

face, but mediated by some technological tools. *Openness* describes the free access to

information provided by each communication party, the opportunities for each party to share

their opinions/feedback on different communication platforms, and the open disposition to listen

to others. *Equality* depicts the equal power organizations and stakeholder retain in their

communication. Neither organizations nor stakeholders have absolute control over the other

party or play dominant role in their conversations. *Transparency* denotes the disclosure of clear

and transparent information in the communication process. When organizations' actions can result in great social and environmental consequences or bring adverse influence on their stakeholders, they have responsibilities to communicate with them in a transparent way.

The attributes of the attitudinal dimension include: (a) empathy, (b) genuineness, (c) respect, and (d) commitment. *Empathy* means being sympathetic to other communication parties' feelings and needs. It portrays the ability to think from others' perspectives and understand others' standpoints. *Genuineness* represents communicating with others in a sincere, honest, and bona fide way. Organizations need to show their sincerity in their communication with stakeholders and do not try to pretend to be sincere and honest, as some strategic communication program implies. *Respect* indicates being respectful to other communication parties' values, their freedom and right to express their voices, and the legitimacy of their needs and goals, even if these needs and goals are in conflict with their own. Organizations should not restrain stakeholders' expression and vice versa. *Commitment* refers to the willingness to spend one's own limited resources such as attention, time, and money on constant participation in the communication process.

OSDC involves participation from both sides: organizations and stakeholders. The use of this concept to conceptualize the organization-stakeholder communication in this study does not mean all organization-stakeholder communication on social media is dialogic. As discussed before, social media provide multiple affordances which can promote dialogic communication, but cannot guarantee its occurrence. The communication on social media can show different levels of being dialogic, which can range from pure unidirectional information transfer to intense mutual sharing and understanding. The different dialogic levels can be researched by examining the attributes of these two dimensions.

Researchers argued that on social media, stakeholders should no longer be assumed to be mere receivers of information regarding an organization, but both senders and receivers (Etter et al., 2019; Zheng et al., 2018). Social media were believed to become the preferred channel of interaction and engagement for the target audiences and companies (Allagui & Breslow, 2016). It is widely believed that social media would promote two-way and symmetrical communication (Kelleher & Sweetser, 2012; White, 2012). Based on the stream of literature, the following hypothesis is proposed:

H1：*The intensity of social media use* (consuming, contributing, and creating) positively

predicts the level of *organization-stakeholder dialogic communication* (interactivity,

responsiveness, openness, equality, transparency, empathy, genuineness, respect, and

commitment).

Organization-Stakeholder Relationship

As discussed in Chapter 2, social media use by organization and stakeholders exerts influence on the relationship between them (Agostino, 2013) and social media platforms had been used by companies to build relationships with their stakeholders (Grover et al., 2019). Organization-stakeholder communication was found to be the mediator between social media use and organization-stakeholder relationship, but only two-way symmetric or dialogic communication is effective to promote the relationship (Saffer et al., 2013; Waters & Jamel, 2011). Dialogic content on social media may boost stakeholder support and encourage relationship (du Plessis, 2018). The literature suggests a positive relationship between the level of dialogic communication and organization-stakeholder relationship. It is worthwhile to mention that the content of communication is also important. Qin and Men (2019) found that publics' interactions with the company on social media indeed exerted positive effects on the quality of

organization-public relationships; however, their negative discussion of a company with peers on social media was found to be negatively associated with the quality of their relationships with the company. Stakeholders' exposure to negative Facebook posts was found to negatively affected their perceptions of organization-public relationship and corporate reputation (Haigh & Wigley, 2015).

Based on a review of relevant Western literature, Huang (2001) proposed four relationship outcomes to represent the essence of the organization-public relationship: control mutuality, trust, relational satisfaction, and relational commitment. She adopted the definition of control mutuality proposed by (Hon & Grunig, 1999). *Control mutuality* is "the degree to which parties agree on who has rightful power to influence one another" (Hon & Grunig, 1999, p. 19). Control mutuality between opposing parties is critical to interdependence and relational stability, and it is relevant when discussing organization-public relationship in public relations, especially the practice of symmetrical or ethical communication. The use of symmetrical or ethical communication and two-way communication could promote control mutuality between an organization and its public, and control mutuality could encourage "the counterpublic to search for creative and mutually beneficial solutions or to seek assistance from a third party to resolve the conflict" (Huang, 2001, p. 66). Thus, the existence of some degree of control mutuality is essential in some organization-public relationship.

The definition of *trust* introduced by Huang (2001) is also from Hon and Grunig (1999), which refers to "one party's level of confidence in and willingness to open oneself to other party" (p. 19). Huang's review of public relations literature demonstrated that trust and credibility had been critical constructs in organization-public relationship development and maintenance. *Relationship satisfaction* was defined as "the extent to which one party feels

favorably toward the other because positive expectations about the relationship are reinforced" (Hon & Grunig, 1999, p. 20). Control mutuality and trust involve cognitive dimensions, while relational satisfaction involves affection and emotion (Huang, 2001). Huang's review of public relations literature also showed that relational satisfaction is a vital element in deciding the quality of organization-public relationship.

Relational commitment was defined as "the extent to which one party believes and feels that the relationship is worth spending energy to maintain and promote" (Hon & Grunig, 1999, p. 20). There are two types of commitment: affective commitment is "an effective or emotional orientation to an entity" (Huang, 2001, p. 68); and continuance commitment is "a commitment to continue a certain line of action" (p. 68). The level of relational commitment is an important indicator of organization-public relationship (Huang, 2001). Huang (2001) also proposed a fifth dimension of organization-public relationship—renqing (favor) and mianzi (face), which she argued reflects Eastern culture. Since this study is conducted in a Western context, only the first four dimensions—control mutuality, trust, relationship satisfaction, and relational commitment— are emphasized and measured in this study. The four dimensions have been utilized to study the quality of organization-public relationships influenced by the Twitter use of Starbucks (Saffer et al., 2013). These four dimensions are used as indicators of organization-stakeholder relationship in this study, and as mentioned above, OSDC have two dimensions each of which has several attributes. As suggested by the literature cited above, dialogic communication tends to positively affect organization-stakeholder relationship; however, stakeholders' negative discussion of a company with peers on social media and their exposure to negative content on social media were negatively related to organization-stakeholder relationship. Based on these mixed findings, the following hypotheses are thus proposed.

H2a: The level of o*rganization-stakeholder dialogic communication* (interactivity,

      responsiveness, openness, equality, transparency, empathy, genuineness, respect, and

      commitment) on organizationally-sanctioned social media positively predicts the quality

      of *organization-stakeholder relationship* (control mutuality, trust, relationship

      satisfaction, and relational commitment).

H2b: The level of *organization-stakeholder dialogic communication* (interactivity,

      responsiveness, openness, equality, transparency, empathy, genuineness, respect, and

      commitment) on counter-organizational social media negatively predicts the quality of

      organization-stakeholder relationship (control mutuality, trust, relationship satisfaction,

      and relational commitment).

Perceived Organizational Image and Reputation

Literature suggests that two-way symmetrical and dialogic communication exerts a positive influence on corporate reputation. The intensity of customers and non-customers' social media use was found to be positively related to their engagement in the company's social media activities, which in turn positively affected corporate reputation (Dijkmans, et al., 2015). Ji et al. (2017) also found that active stakeholders' Facebook-based interactions as leaving positive or negative comments with a company significantly predicted the company's reputation score. Interactive management of CSR communication on Facebook was found to help increase the levels of trust, a dimension of organization-stakeholder relationship, between companies and their stakeholders, which positively influence corporate reputation (Zeler & Capriotti, 2018). Public relations researchers theorized that there is a link between organization-public relationship outcomes and organization reputation (Ji et al., 2017). Individual exposure to Facebook was also found to affect their perceptions of organizational image over time (Intindola et al., 2019).

Floreddu and Cabiddu (2016) proposed that engaging customers in online conversations and establishing a transparent online relationship with customers could enhance corporate reputation; the relationship between customers and firm will be strengthened by repeated social media interactions; and the interactions' impact on corporate reputation will be stronger. The literature suggests it is reasonable to argue that if organizations maintain a good relationship with their stakeholders, stakeholders' perception of the organizational image and reputation will be good. In this way, organization-stakeholder relationship can mediate the relationship between organization-stakeholder communication and the perceived organizational image and reputation. In summary, organization-stakeholder communication has both direct and indirect effects on organizational image and reputation as perceived by the stakeholders. The indirect effect is mediated by the quality of relationship between them. Moreover, as discussed before, stakeholders' exposure to negative content on social media has negative effects. Thus, whether the effect of the dialogic communication on organization-stakeholder relationship, organizational image, and organizational reputation is positive or negative partly depends on the messages stakeholders are exposed to. Stakeholders exposed to counter-organizational social media are more likely to view the target organization negatively. Based on these discussions, the following hypotheses are then proposed. Fombrun and Gardberg (2000) proposed six dimensions of corporate reputation: corporate appeal, products and services, financial performance, vision and leadership, workplace environment, and social responsibility. This is widely used in the literature to operationalize corporate reputation. This study considers these six dimensions as indicators of perceived corporate reputation.

H3a: The level of *organization-stakeholder dialogic communication* (interactivity,

responsiveness, openness, equality, transparency, empathy, genuineness, respect, and

commitment) on organizationally-sanctioned social media positively predicts stakeholders' *perceived organizational image*.

H3b: The level of *organization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on counter-organizational social media negatively predicts stakeholders' *perceived organizational image*.

H4a: The level of *organization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on organizationally-sanctioned social media positively predicts stakeholders' *perceived organizational reputation* (corporate appeal, products and services, financial performance, vision and leadership, workplace environment, and social responsibility).

H4b: The level of *organization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on counter-organizational social media negatively predicts stakeholders' *perceived organizational reputation* (corporate appeal, products and services, financial performance, vision and leadership, workplace environment, and social responsibility).

H5: The quality of *the organization-stakeholder relationship* (control mutuality, trust, relationship satisfaction, and relational commitment) positively predicts stakeholders' *perceived organizational image*.

H6: The quality of *the organization-stakeholder relationship* (control mutuality, trust, relationship satisfaction, and relational commitment) positively predicts stakeholders'

perceived organizational reputation (corporate appeal, products and services, financial

performance, vision and leadership, workplace environment, and social responsibility).

Furthermore, the literature suggests organizational image and reputation are related. For

example, Irfan et al. (2020) found student's perceived university image influenced university

reputation. The last hypothesis is about the relationship between the perceived organizational

image and reputation, which is stated as follows.

H7: The *organizational image* and *reputation*, as perceived by stakeholders using

organizationally-sanctioned and counter-organizational social media, are related.

In summary, all of these hypotheses are proposed to answer RQ2 in detail: how does

stakeholders' social media use affect perceived organizational image and perceived

organizational reputation? A conceptual model (see Figure 1) is drafted to illustrate the

relationship among social media use, organization-stakeholder dialogic communication,

organization-stakeholder relationship, perceived organizational image, and perceived

organizational reputation. Hypotheses 1 to 7 describe the assumed relationships in this model.

Summary

To summarize, in this chapter, literature regarding the technological affordance approach,

the concepts of affordances and appropriation, and the affordances of social media in

organizational settings are reviewed. Based on the literature review, the social media affordances

for organizational image and reputation construction are discussed, and eight affordances that are

relevant to organizational image and reputation construction process are proposed, which include

connectivity, interactivity, openness, personalization, visibility, infiniteness, persistence, and

searchability. Then the possible influence of social media affordances on organizational image

and reputation construction is discussed, and several propositions are brought forward in this

section. RQ2 is proposed based on discussions of the affordance approach to organizational

image and reputation construction on social media. In order to get detailed answer to RQ2, seven

hypotheses are proposed. The conceptualizations of the main constructs in these hypotheses

which include the intensity of social media use, organization-stakeholder dialogic

communication, organization-stakeholder relationship, perceived organizational image, and

perceived organizational reputation are explained before the hypotheses are proposed. Table 1

summarizes the research questions and the hypotheses.

Figure 1

Conceptual model
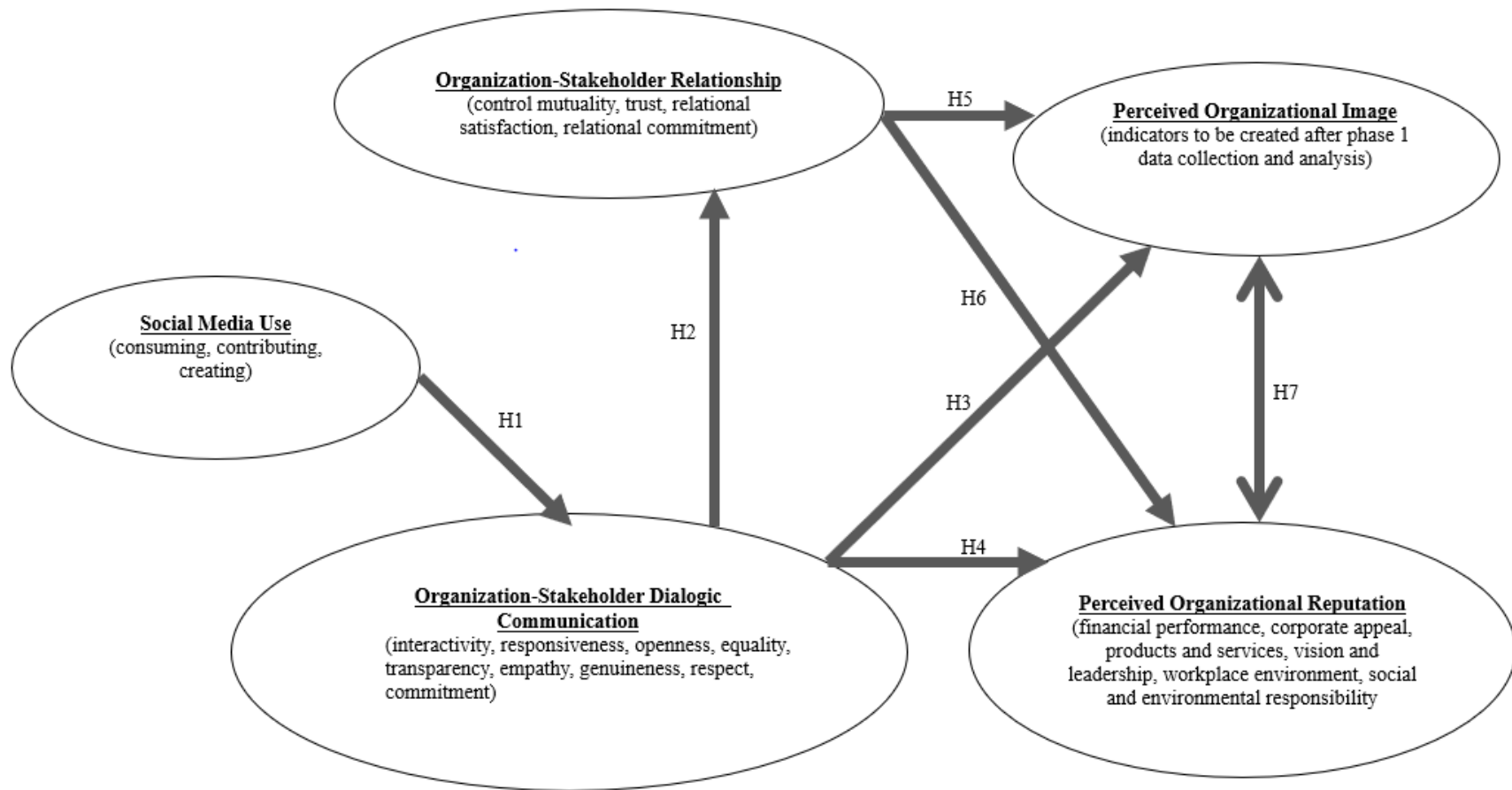
Table 1

Research Questions and Hypotheses

Research questions and hypotheses

RQ1: What organizational image is communicatively constructed by organizations and key stakeholders using social media?

    RQ1a: What organizational image is communicatively constructed through the use of organizationally-sanctioned social media?

    RQ1b: What organizational image is communicatively constructed through the use of counter-organizational social media?

RQ2: How does stakeholders' social media use affect the perceived organizational image and perceived organizational reputation?

    H1：*The intensity of social media use* (consuming, contributing, and creating) positively predicts the level of *organization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment).

    H2a: The level of o*rganization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on organizationally-sanctioned social media positively predicts the quality of *organization-stakeholder relationship* (control mutuality, trust, relationship satisfaction, and relational commitment).

    H2b: The level of o*rganization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on counter-organizational social media negatively predicts the quality of *organization-stakeholder relationship* (control mutuality, trust, relationship satisfaction, and relational commitment).

    H3a: The level of *organization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on organizationally-sanctioned social media positively predicts stakeholders' *perceived organizational image*.

Table 1 (cont'd)

Research Questions and Hypotheses

Research questions and hypotheses

H3b: The level of o*rganization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on counter-organizational social media negatively predicts stakeholders' *perceived organizational image*.

H4a: The level of *organization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on organizationally-sanctioned social media positively predicts stakeholders' *perceived organizational reputation* (corporate appeal, products and services, financial performance, vision and leadership, workplace environment, and social responsibility).

H4b: The level of o*rganization-stakeholder dialogic communication* (interactivity, responsiveness, openness, equality, transparency, empathy, genuineness, respect, and commitment) on counter-organizational social media negatively predicts stakeholders' *perceived organizational reputation* (corporate appeal, products and services, financial performance, vision and leadership, workplace environment, and social responsibility).

H5: The quality of *the organization-stakeholder relationship* (control mutuality, trust, relationship satisfaction, and relational commitment) positively predicts stakeholders' *perceived organizational image*.

H6: The quality of *the organization-stakeholder relationship* (control mutuality, trust, relationship satisfaction, and relational commitment) positively predicts stakeholders' *perceived organizational reputation* (corporate appeal, products and services, financial performance, vision and leadership, workplace environment, and social responsibility).

H7: The *organizational image* and *reputation*, as perceived by stakeholders using organizationally-sanctioned and counter-organizational social media, are related.

Chapter 4

Research Methods

This study adopts a mixed-method, multiple-case-study design, in which several research methods and techniques are combined to address more complex research questions and collect rich data across a handful of cases that cannot be collected by any single method alone (Yin, 2009). To answer the research questions, a pivotal issue to consider initially is "which organizations' image" is the focus of the study, "which organizations" are actively using social media to build their image, and "which organizations" have corresponding counter-organizational social media maintained by at least one stakeholder group. As argued in detail below, selecting several case organizations is an appropriate approach in this situation.

Mixed methods are also required to answer different research questions in this study. To answer RQ1, messages from the organizationally-sanctioned and counter-organizational social media sites were collected, from which the conveyed organizational images were examined using semantic network analysis. In this step, the primary data form was textual and the data analysis was at the organizational level. To answer RQ2 and test the seven hypotheses, data regarding individual perceptions of the dialogic affordances of social media, their actual social media use, organization-stakeholder communication and relationships, organizational image, and organizational reputation were collected and analyzed. In this step, online questionnaires were administered and the data analysis was at the individual level.

The data collection and analyses included two phases: Phase 1 consisted of semantic network analysis of messages; Phase 2 mainly consisted of the online survey in which questionnaires were administered. The decision to divide the data collection and analysis process into two phases was based on the following considerations. First, only after Phase 1 could the

researcher identify the themes of organizational image of the case companies as conveyed from the corporate and counter-organizational social media sites. The design of the questionnaires to measure stakeholders' perceived organizational image that were used in Phase 2 was based on the results of the semantic network analysis of textual data in Phase 1. Second, only after Phase 1 could the researcher collect data to study the effect of social media messages that were analyzed in Phase 1.

Case Study

Case Study Research

Selecting case organizations is an appropriate approach in this study when the issues of feasibility and practicality are considered. A further rationale for using case studies in this research is that this study asks "how" questions about a contemporary set of events and the researcher has little or no control of the events. Though there are several "what" questions, research questions in this study include "How does stakeholders' social media use affect the perceived organizational image and perceived organizational reputation?" Social media use by organizations and stakeholders are contemporary events and the researcher has no control on how social media are used by them to construct organizational image and reputation. As Yin (2009) contended, a case study is most appropriately used when a "how" or "why" question is being asked about "a contemporary set of events over which the investigator has little or no control" (p. 13). As described by Yin, in a case study, a contemporary phenomenon is investigated in depth within its real-life context and multiple sources of evidence can be identified in the process. This study selects some case organizations, examines the actual social media uses by those organizations and key stakeholders, and investigates ongoing communication and interactions in organizational contexts.

Yin (2009) pointed out that there are both single- and multiple-case studies and the case study method cannot be just considered as a form of qualitative research. Actually, some case study research includes a mix of qualitative and quantitative evidence. There are several rationales for single-case study designs. According to Yin, a single case can be used in the following situations: when the case "represents the *critical case* in testing a well-formulated theory" (p. 47), when "the case represents an *extreme* case or a *unique* case" (p. 47), when the case is "the *representative* or *typical* case" (p. 48), when the case is the *revelatory* case which was not accessible to previous social science inquiry, and when the case is the *longitudinal* case and it is studied at two or more different points of time.

For this study, however, a single-case study is not ideal, considering there are a wide range of variants of organizations, official social media sites maintained by organizations, and counter-organizational social media sites maintained by key stakeholders. Different organizations are using social media in different ways and attach different levels of importance to social media use in their endeavor to build positive organizational image and reputation. Thus, it is not easy to find a representative or typical case organization to conduct the research. Additionally, a critical case and an extreme/unique case are not of particular interest for this study. Furthermore, when it comes to the counter-organizational social media sites, the types of stakeholder groups creating and maintaining the sites might be different. Some sites might be established and maintained by outside stakeholders such as independent activists and unsatisfied customers, while other sites might be created and maintained by some inside stakeholders such as disgruntled employees. Yin (2009) argued that under most circumstances, multiple-case designs are advantageous over single-case designs. It is risky to put all the eggs in only one basket to conduct a single case study. Having multiple cases can also reveal greater insights. Yin even suggested that if a single-

case design is finally selected, the researcher should be responsible for making an extremely strong and persuasive argument to justify his/her choice. All in all, a single-case study design is not appropriate for this study and a multiple-case study design is preferred.

Yin (2009) also pointed out that for either single- or multiple-case study, there are two types: *holistic* and *embedded*. *Holistic case study* only involves one singular global unit of analysis. For example, the unit of an analysis can be a single organization (e.g., a hospital). An *embedded case study* involves more than one unit of analysis. For example, the clinical services and the employees can be the units of analysis in a case study of a hospital. Holistic case study is often used when no logical subunits can be identified and the theory underlying the case study is itself holistic in nature. However, the holistic study may be conducted at an improperly abstract level and sufficiently clear measures or data may be lacking. Another disadvantage of a holistic design is that it is very vulnerable to possible modification or adjustment of research questions at some time after the study is conducted. An embedded case study can overcome these problems, but has its own pitfalls. A typical disadvantage of embedded design is that the case study emphasizes the subunit levels so much that it cannot easily return to the larger unit of analysis.

Keeping the advantages and disadvantages of both types of case studies in mind, this study adopts an embedded multiple-case design. It is obvious that in each individual case of this study, each organization is one, but not the only, unit of analysis. In order to answer all the research questions, both individual/user and organizational/collective stakeholder level analyses are necessary.

Case study has previously been utilized to study organizational image construction in social media context (De Moya & Jain, 2013; Gilpin, 2010). Gilpin studied how organizational image was constructed by the supermarket chain *Whole Foods* through its online press room,

blog, and microblogging account. She collected the news releases, blog posts, and Twitter messages issued by Whole Foods from July 1 through December 31, 2008. Her analysis focused on texts with audio and video files being excluded from the analysis. Semantic network analysis was conducted to identify the key influential terms in *Whole Foods*' image construction documents, and bimodal social network analysis was used to study how semantic terms were linked to the specific social media channels. This is an embedded single-case design. Only one case (i.e., *Whole Foods*) was analyzed, with texts on its various social media sites as the unit of analysis. Both the global level of the whole organization and the subunit level of user messages on various sites were analyzed.

De Moya and Jain (2013) content analyzed the official Facebook pages of Mexico and Brazil to study their brand personalities as famous tourist destinations. Both countries were trying to construct a good image through their Facebook accounts to attract more tourists to visit them. The researchers collected textual data from the official Facebook page of both countries for a period of four months (October, 2009-January, 2010) and conducted a computer-aided content analysis using Diction 5.0, a dictionary-based text analysis program that can assess texts according to defined semantic features. Correspondence analysis was employed to analyze the interrelationship between brand personality dimensions and the textual data they collected. This is an embedded multiple-case design with two cases: Mexico and Brazil. Both the global level of two countries' images and the subunit level of user messages on their Facebook pages were analyzed.

In summary, an embedded multiple-case study is an appropriate research design for this study to answer all of the research questions. In this study, two case organizations are selected and the units of analysis include not only the messages posted on organizational and counter-

organizational social media sites, which are at organizational level, but also social media users'

perceptions of communication on the two types of social media, organization-stakeholder

relationships, organizational image, and organizational reputation, which are at individual level.

Both qualitative and quantitative analyses are involved in each individual case as further

described below.

Selecting Case Organizations

Since this study addresses the roles both organizations and stakeholders play in

organizational image and reputation construction process, data regarding both organizations and

stakeholders will be collected. On one hand, special attention was paid to companies that used at

least one of the two most regularly used social media tools: Facebook and Twitter (Barnes et al.,

2012). On the other hand, social media sites maintained or used by various stakeholders (e.g.,

current or former employees, customers, activist groups, the general public, etc.) to express their

voices regarding the organization and potentially show their resistance to the organization were

also examined.

The case selection process involved several criteria. First, the case companies used at

least one type of social media in their corporate communication activities when the textual data

collection process was conducted. It is desirable that companies used multiple social media

platforms, but using multiple social media was not a necessary requirement. The social media

platforms the case companies used should be active, which means that the latest post on the

social media platform should be created within the past one month of the time when the data was

collected. Namely, the frequency of updates on these social media platforms must manifest

regular and recent activity. Moreover, in addition to organizational members in charge of

regularly updating posts and tweets, there should be other active users, which could indicate

some levels of organization-audience interactions. In other words, the intensity and valence of

stakeholder interactions on official organizational social media sites were also important

selection criteria. If there were no interaction and stakeholder participation on the social media

platforms, there was no evidence that various stakeholders might play some roles in image and

reputation construction on social media.

Since this study puts a special emphasis on stakeholder participation and voice expression

on social media, it seems reasonable to select case companies based on some issues that may

attract significant attention from various types of stakeholders. Issues that stakeholders are

concerned about might trigger fierce discussions and conversations on social media, which can

generate polylogues in which many players with different positions may be involved in debates,

arguments, or dialogues. Issue-generated polylogues can reflect how the dialogic affordance of

social media is explored and the extent of organization-stakeholder dialogic communication on

specific social media platforms. For example, publics such as environmental groups or ordinary

citizens from countries where the oil companies drill for oil may pay special attention to the issue

of pollution caused by those companies' activities and create social media platforms to discuss

this issue.

Based on the above discussion, a second criterion for selecting case companies was

proposed. The criterion was whether there was at least one counter-organizational social media

site maintained by stakeholders who aimed to create platforms to primarily discuss issues they

were concerned about. If a company only had its own Facebook and Twitter profiles and there

was no corresponding independent counter-organizational social media site discussing issues

related to this company that was maintained by some groups of stakeholders, then this company

was not eligible to be selected as a case in this study. In summary, a case company was selected

based on two criteria: (1) it was officially and actively maintaining at least one type of social media sites (i.e., Facebook or Twitter) that showed activity within the prior month of data collection and regular updating activities, and clearly had active users; and (2) there existed at least one counter-organizational social media site maintained by stakeholders to primarily discuss issues related to this company that also showed activity within the prior month of data collection and regular updating activities. Compared with companies, the activist organizations or other stakeholder groups might lack sufficient money and resources to support the operation of their social media sites. Thus, even though the case selection criteria require the official corporate social media websites be maintained and updated on a regular basis, it is reasonable to apply the criteria more loosely when it comes to selecting the counter-organizational social media sites.

Based on the two criteria, two companies—BP (formerly British Petroleum) and Monsanto—were targeted for inclusion in this study. The two companies are from petroleum, and agrochemical and agricultural biotechnology industries, respectively. Both industries are environmentally sensitive and many environmental issues regarding both companies' activities become hot topics and seize wide attention from activist groups and ordinary citizens. When the Phase 1 textual data collection was conducted, BP and Monsanto both maintained active corporate social media sites, and both corresponded to at least one counter-organizational site independently maintained by stakeholders concerned about different types of issues.

Case 1: BP

BP, formerly named British Petroleum, is a British multinational oil and gas company headquartered in London, England. It is one of the world's leading oil and gas companies and has operations in more than 70 countries (BP, 2017a). The company's businesses encompass oil and

gas exploration and production, crude oil refining, petroleum products and petrochemicals

producing and trading, and wind energy production (BP, 2017b). In the US, BP explores oil in

areas including the Gulf of Mexico, Alaska, and the onshore areas of the lower 48 states

stretching from the Rocky Mountains to east Texas, which consist of Colorado, New Mexico,

Oklahoma, Wyoming, and Texas (BP, 2017c).

BP has been directly involved in several major environmental and safety incidents and

the most influential one is the 2010 *Deepwater Horizon oil spill*, also known as the BP oil spill,

the BP oil disaster, the Gulf of Mexico oil spill, and the Macondo blowout. On April 20, 2010,

the floating deep-sea oil-drilling rig *Deepwater Horizon*, a platform operated by Transocean and

leased to BP's Macondo Prospect, suddenly exploded off the coast of Louisiana, and the

explosion killed 11 workers, severely injured 17 others, and triggered a massive oil-spill in the

Gulf of Mexico (Harlow et al., 2011; Muralidharan et al., 2011; Shultz et al., 2015). It took 3

months for BP to fully stop the flow of oil from its ruptured wellhead into the Gulf (Harlow &

Harlow, 2013) and the oil spill is considered as the largest accidental oil spill in the history of the

petroleum industry in the United States (Muralidharan et al., 2011; Safford et al., 2012). Almost

5 million barrels of oil flowed into the Gulf of Mexico and the spill covered 68,000 square miles

of land and sea, which triggered a response effect involving the use of nearly 2 million gallons of

dispersant chemicals (Rung et al., 2016).

The oil spill exerted far-reaching adverse effects on the ocean ecosystems and resulted in

extensive damage to marine and wildlife habitats (Langdon et al., 2016) and fishing and tourism

industries (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling,

2011). The crisis happened approximately 5 years after Hurricane Katrina and the Gulf had yet to

fully recover from the extraordinary natural disaster (Smithson & Venette, 2013), which made

the negative consequences even worse. Adverse physical and mental health consequences were also found on workers involved in the clean-up efforts and residents living in the surrounding areas due to chemicals from the oil and dispersant (Peres et al., 2016; Rung et al., 2016). Fisheries and oyster grounds were closed; people lost jobs and businesses; the regional economy of the Gulf coast was severely influenced; wildlife animals such as birds, mammals, and turtles were oiled or negatively affected; thousands of marine fish and other species inhabiting the surrounding areas were affected by the oil and dispersants; deepwater environment was damaged by minute oil droplets and deepwater ecosystems were exposed to large volumes of oils for an extended period; and workers reported nausea and headaches after contacting dispersants (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011).

Smith et al. (2011) provided a timeline to record the major events related to the oil spill from April 20 to October, 12, 2010. On April 28, 2010, BP pledged full support for Deepwater Horizon probes and on April 30, 2010, the company CEO Tony Hayward indicated that BP would take complete responsibility, compensate all legitimate claims, and pay for cleanup. On May 28, 2010, the Obama administration issued a 6-month ban on new deepwater drilling and on June 1, 2010, The US attorney general began criminal and civil investigation into the oil spill. On June 16, 2010, BP CEO Tony Hayward and Chairman Carl-Henric Svanberg announced the establishment of $20 billion fund to pay for damage claims and announced it would pay $100 million to workers who were laid off by the six-month ban. The estimated cost to BP from the Deepwater Horizon oil spill, estimated by Smith et al. in 2011, was $36.9 billion, including the actual costs through September 29, 2010 for oil cleanup activities and grants and payment to local and federal governments, the $20 billion fund to cover damages to businesses and individuals, and possible fines under the Clean Water Act.

Owing to the massive damage caused by the oil spill to the environment, the Gulf economy, and the communities in the affected areas, BP had been facing plenty of civil and criminal charges since the explosion. In November 2012, BP and the United States Department of Justice settled federal criminal charges with BP pleading guilty to 11 felony counts of misconduct or neglect related to the deaths in the explosion, one misdemeanor violation of the Clean Water Act, one misdemeanor violation of the Migratory Bird Treaty Act, and one felony count of lying to Congress over its statements about the flow rate (Krauss & Schwartz, 2012). In this settlement, BP also agreed to 4 years of government monitoring of its safety practices and ethics and payment of $4.5 billion in fines and other penalties. In September 2014, US District Court Judge Carl J. Barbier ruled that BP was primarily responsible for the oil spill after finding BP was grossly negligent in the disaster (Robertson & Krauss, 2014). On July, 2, 2015, BP announced an $18.7 billion settlement with the US government, the five Gulf states (Alabama, Florida, Louisiana, Mississippi, and Texas) and approximately 400 local governments (Vickner, 2016). This agreement was finalized by the US Department of Justice on October 5, 2015 for $20.8 billion, of which $5.5 billion was for penalties related to the Clean Water Act, $8.1 billion was for natural resources damage and early restoration work, around $5 billion was for damages to the five gulf states, and up to $1 billion was for local governments (Vickner, 2016). It was reported that the total cost to BP, including the cleanup cost, fines, and compensations, was up to $61.6 billion (Crooks, 2016).

The negative consequences of the 2010 *Deepwater Horizon explosion* are extremely tremendous and far-reaching. Though the financial loss of the company is extraordinarily huge as discussed above, money loss is not the only loss the company faces. The explosion and oil spill also bring long-lasting damage to the image and reputation of the company. BP became the focus

of media attention and the company faced wide criticisms of its actions surrounding the crisis

(Smithson & Venette, 2013) from a variety of stakeholders including federal and state

governments, activists and environmental groups, ordinary citizens and local inhabitants of the

Gulf coast (Muralidharan et al., 2011). On September 30, 2016, a film named *Deepwater*

Horizon, directed by Peter Berg with story based on the explosion and oil spill, was theatrically

released in the United States. After 6 years, the massive explosion and harmful oil spill was

brought by the film to the front of public audiences again. It was reported that BP was scathing

about the film by stating that the film was not an accurate portrayal of the events, the company,

and its employees, and the film also ignored the conclusion reached by every official

investigation that the accident was caused by multiple errors made by a number of companies

(Ward & Crooks, 2016).

The BP crisis was considered as an analytically and theoretically rich case for crisis

communication research (Diers & Donohue, 2013). The communication messages BP

disseminated on its website after the crisis were widely studied (Arora & Lodhia, 2017; Harlow

et al., 2011; Harlow & Harlow, 2013). To study the initial/short-term image repair strategies

employed by BP after the oil spill, Harlow et al. (2011) content analyzed its press releases from

April 20, 2010 to June 15, 2010, the date President Obama demanded BP to take actions to

resolve the crisis, which was the first Oval Office address of the Obama presidency. Their

findings revealed that in the initial aftermath of the oil spill, BP primarily focused on describing

how it would correct problems and how it would compensate the victims in its press releases,

and did not admit responsibility on its own part. These initial image repair strategies were

considered as an ineffective PR strategy to respond to the crisis (Harlow & Harlow, 2013).

Harlow and Harlow (2013) claimed Harlow et al.'s study only examined BP's initial response. In

order to study the company's medium-term and long-term responses, in their content analysis they analyzed BP's press releases from April 2010 to September 2010 and three other releases from October 1, 2010, April 21, 2011, and April 25, 2011. It is not surprising that compensation and corrective action remained top strategies employed by BP in their analysis, considering data collection period was only expanded for 3 more months. Similarly, from their thematic analysis of messages posted on the BP website from April 21, 2010 and September 19, 2010, Arora and Lodhia (2017) found that in order to manage its reputation risk arising from the crisis, BP attempted to divert audiences' attention away from the severe environmental damage caused by the oil spill by disclosing extensive information about its corrective actions, highlighting its financial performance, emphasizing its management' ability and capability in dealing with the crisis, and accentuating the quality of its employees. Analysis of BP CEO Tony Hayward's congressional testimony on June 17, 2010 also demonstrated that the stonewalling strategy was frequently used by Hayward to evade the questioning, provide insufficient information, and shift the focus off the negative influences of the crisis and on the more favorable decisions made by the company (Smithson & Venette, 2013). The stonewalling strategy in fact offered little protection to BP as the evidence against the company was significant enough (Smithson & Venette, 2013), which is shown by the fact that BP pleaded guilty and was charged extremely big fines in later lawsuits (Krauss & Schwartz, 2012; Robertson & Krauss, 2014; Vickner, 2016); however, BP management's attempt to hide information from the public further damaged the company's already damaged image and reputation (Smithson & Venette, 2013).

Social media platforms such as Facebook, Twitter, YouTube and Flickr were also employed by BP to meet its crisis communication and image restoration objectives (Diers & Donohue, 2013; Muralidharan et al., 2011; Ye & Ki, 2017). Since joining Facebook in 2007, BP

had only posted four messages before the explosion, but after the oil spill crisis the volume of messages posted on its Facebook account increased sharply (Ye & Ki, 2017), which indicated that Facebook initially attracted BP's attention as a crisis communication tool. The message strategies used by the company in response to the crisis were found to be significantly different across its website, Facebook, and Twitter and social media were utilized by the company to foster relationships with stakeholders affected by the crisis or ordinary citizens who were interested in the Gulf coast (Diers & Donohue, 2013). Like on its websites, corrective action was also the most dominant image restoration strategy used by BP as shown by both visual and textual messages from Facebook, Twitter, YouTube, and Flicker, followed by compensation strategy (Muralidharan et al., 2011), but denial and diminishment strategies were used more often as time went on as shown by messages on Facebook (Ye & Ki, 2017). Dominant themes appearing in messages analyzed in Muralidharan et al.'s (2011) study included actions taken to cap the leak and prevent oil from entering the beaches and marshlands, political meetings such as congressional hearings on the oil spill, the presence of the company's upper management, and oil-spill related claims. Muralidharan et al. also investigated the dominant issue and emotion shown by the audience comments posted on BP's Facebook and YouTube sites. Their findings suggested the audience comments were filled with negative emotions including concern, anger, and anxiety towards the company and the corrective action taken by BP was not very effective in changing the public attitudes. This result is consistent with findings of Safford et al.'s (2012) telephone survey of Gulf residents' perceptions of efforts and actions taken by the government and BP in response to the oil spill. The issue of 'boycott BP' was dominant in YouTube comments and also appeared in Facebook comments (Muralidharan et al., 2011).

In addition to the Deepwater Horizon oil spill accident, BP was also responsible for several other major environmental and safety incidents such as the Texas City Refinery explosion in 2005, which killed 15 workers, and the oil spill of 200,000 gallons on Alaska's North Slope in 2006 (Mouawad, 2010). Operations of companies in petroleum industries can easily become the cause of major environmental and health issues that can attract notable attention from multiple stakeholders, such as government, consumers, residents influenced by air pollution or oil spills, or just ordinary citizens who show great concerns over general environmental problems in the globe, such as global warming. Social media obviously provide platforms for citizens and residents to express their voices on these issues and foster discussions and movements against the company. One example is the Facebook page Boycott BP (https://www.facebook.com/Boycott-BP-119101198107726/), which called on individuals to boycott BP products and services. In its description, the account stated:

> Boycott BP stations until the spill is cleaned up!...FOREVER. BP brands to boycott
> include Castrol, Arco, Aral, am/pm, Amoco, and Wild Bean
> Cafe. http://twitter.com/bayoulee.http://bayoulee.com/ HEY MEDIA WE ARE
> CALLING FOR A WORLD WIDE BOYCOTT OF BP PRODUCTS AND SERVICES.
> NOT JUST IN THE USA.

The Boycott BP Facebook page had over 600,000 people liking it. This Facebook page was active at the time of Phase 1 data collection, but is no longer available on Facebook.

BP also maintains multiple Facebook page such as BP (https://www.facebook.com/bp/), BP America (https://www.facebook.com/BPAmerica/), and BP Careers (https://www.facebook.com/bpcareers/). In this study, the Facebook page BP America was selected for case analysis, based on the consideration that the primary discussion topic of

Facebook page Boycott BP was the *Deepwater Horizon oil spill*, which exerts major effect on

Americans living in areas around the Gulf of Mexico, rather than people residing in other

countries. The Facebook page is updated by the company on a very regular basis and had more

than 880,000 people liking it. BP America also maintains a corresponding Twitter account BP

America (@BP_America, https://twitter.com/BP_America), which had over 190,000 followers

and is also regularly updated.

In a word, BP meets the selection criteria in that it maintains official corporate social

media sites and there was a counter-organizational social media site established and maintained

by stakeholders to discuss environmental, economic, and health issues resulting from the

company's activities. Both the corporate social media sites and the counter-organizational site

were regularly updated and demonstrated active participation of fans and followers. Therefore,

BP is selected as a case for analysis in this study. The social media accounts that are examined in

this case are summarized in Table 3.

Case 2: Monsanto

Monsanto is a multinational agrochemical and agricultural biotechnology corporation, a

leading producer of genetically modified seed and a leader in commercializing genetically

modified organisms (GMO) (Charlebois & Van Acker, 2016). The company's products include

conventional and biotech seeds, traits and technologies that it claimed can enable more nutritious

and durable crops, and crop protection solutions such as weed control products including

agricultural, industrial, turf, and ornamental herbicides, among which the most famous brand is

the glyphosate-based Roundup (Monsanto, 2017a, 2017b). Monsanto offered farmers a wide

range of agricultural seeds in eight row crops: alfalfa, canola, corn, cotton, sorghum, soybeans,

sugarbeets and wheat (Monsanto, 2017c). In countries where genetic modification (GM) was not

adopted, the company sold conventional seeds to farmers and in those where GM was widely

adopted by farmers, the company sold both conventional and GM seeds (Monsanto, 2017c). GM

seed refers to seed with plant characteristics including herbicide tolerance, insect tolerance and

drought tolerance, which are introduced by modifying the plant's genome (Monsanto, 2017c). In

addition to the above-mentioned agricultural seeds, Monsanto also offered conventional and

genetically modified vegetable seeds (Monsanto, 2017d). In September 2016, Monsanto agreed

to accept Bayer's offer to purchase the company for $66 billion.

Although it is at present recognized as a company focusing on agriculture and

biotechnology, Monsanto as an agricultural and life sciences company is only a recent

development and it was initially established as a chemical company with most of its history

being steeped in heavy industrial chemical production (Food & Water Watch, 2013). The

company was founded by John F. Queeney in 1901 as a small chemical start-up named as

"Monsanto Chemical Works" (Lamphere & East, 2017) and the first product was saccharin, a

sugar substitute, which was sold to Coca-Cola as an artificial sweetener (Food & Water Watch,

2013; Hanzai, 2014). In 1920s and 1930s, Monsanto's product line was expanded to include

industrial chemicals and drugs such as sedatives, laxatives, aspirin, and polychlorinated

biphenyls (PCBs) (Food & Water Watch, 2013; Hanzai, 2014). PCBs were banned by the United

States in 1976 (Lamphere & East, 2017) because of their toxicity, but they are still present in

animal and human blood and tissue cells across the globe (Hanzai, 2014). A wide variety of

products from synthetic fibers, plastics and rubber goods to industrial chemicals, fertilizers, and

pesticides and herbicides were included into the company's product line in the late 1920s (Food

& Water Watch, 2013). In the 1940s, Monsanto began to produce and sell powerful agricultural

chemicals including dioxin, dichlorodiphenyltrichloroethane (DDT), and Agent Orange

(Lamphere & East, 2017). Dioxin was revealed as a human carcinogen with strong toxicity, which could cause and activate cancers, and impair human hormonal, immune, developmental and reproductive systems. Agent Orange contained 2,3,7,8- tetrachlorodibenzodioxin (TCDD), the most toxic member of the dioxin family (Allen, 2004; Lurker et al., 2014). DDT are also poisonous and found to increase cancer risk (Cohn et al., 2007; Tang et al., 2014), kill birds, and cause mutations and birth defects (Wurster, 2015). This class of chemicals produced by Monsanto was banned due to toxicity in the 1970s, but they still pollute the environment today (Food & Water Watch, 2013); for example, the consequences of DDT still exist in the forms of residues in fat and breast milk (Dunlap, 2014).

By the 1960s, with the consideration of the cumulative negative consequences of controversial products, the cleanup costs from the relevant lawsuits, the tough environmental regulations, and the fear for bankruptcy, Monsanto attempted to distance itself from its chemical origins and renamed itself "Monsanto Company" (Lamphere & East, 2017). After the establishment of its agricultural division in 1960 (Monsanto, 2017e), the company gradually shed its chemical and industrial divisions, and acquired and merged dozens of seed and agricultural companies to shift itself exclusively into the agricultural field and build an identity as a life sciences company (Food & Water Watch, 2013). In 1964, Ramrod herbicide was introduced; Lasso herbicide and glyphosate-based Roundup herbicide were commercialized in the US in 1968 and in 1976, respectively (Monsanto, 2017e). The wildly popular herbicide Roundup guaranteed Monsanto a top spot in its transition into the agriculture market (Food & Water Watch, 2013). In 1997, Monsanto spun off its industrial chemicals and synthetic fabric divisions as a separate company, Solutia (Tokar, 1998).

During its transition, Monsanto also began to invest in researching and developing biotechnology (Lamphere & East, 2017). In 1975, a cell biology research program was established in its agricultural division; in 1981, a molecular biology group had been set up and biotechnology was firmly established as the company's strategic research focus; in 1982, scientists working for Monsanto became the first to genetically modify a plant cell; in 1984, Monsanto opened the Life Science Research Center; in 1987, the first field trials of plants with biotechnology traits in the US was conducted by Monsanto; in 1994, Monsanto's first biotechnology product—Posilac, a bovine somatotropin (Bst) for dairy cows—gained approval and went on sale in the US; and Roundup Ready soybeans, cotton, and canola with in-seed herbicide tolerance to Roundup and other glyphosate-based herbicides were introduced in 1996 and 1997 (Monsanto, 2017e). By shifting away from its chemical origin, Monsanto has been trying to build a new identity as an agriculture and biotechnology company. It describes itself as "a sustainable agriculture company" (Monsanto, 2017f) with commitments to "developing the technologies that enable farmers to produce more crops while conserving more of the natural resources" (Monsanto, 2017g).

Although Monsanto has been attempting to build a positive image as a company focusing on sustainable agriculture and providing support for farmers around the world (Monsanto, 2017e), it has been surrounded by tremendous criticisms over the years (Charlebois & Van Acker, 2016) due to its roots as a chemical company and its development of genetically engineered products and production of chemical herbicides. The company has a notorious reputation of producing poisonous products throughout its history, making it difficult to shed its toxic reputation no matter what rebranding activities it had been trying to conduct (Copping, 2015). In 1947, a French freighter carrying ammonium nitrate fertilizer exploded at a dock 270

feet from Monsanto's plant outside Galveston, Texas, which manufactured styrene and polystyrene plastics, and more than 500 people died in this disaster (Tokar, 1998). Polystyrene was listed by the US Environmental Protection Agency (EPA) as fifth in its ranking of chemicals whose production engendered the most total hazardous waste (Tokar, 1998). PCBs were also found to be potent carcinogens and bring reproductive, developmental, and immune system disorders (Tokar, 1998). The chemicals are characteristic of high rates of concentration and bioaccumulation, with wide presence within the body of humans, fishes, and animals across the Globe (Tokar, 1998). Even though the manufacturing of PCBs was banned in the US in 1976, the chemicals' toxic effects still persist because they cannot break down easily in the environment, accumulate in plants, food crops, aquatic organisms from water containing PCBs, and go into humans through food consumption (Food & Water Watch, 2013; Hanzai, 2014; Tokar, 1998). Approximately 99% of PCBs used by US industry was produced by Monsanto at its plant in Sauget, Illinois until its ban in 1976 (Food & Water Watch, 2013).

People living around Monsanto's plants are directly affected by the exposure to toxic chemicals. East St. Louis, Illinois, where Monsanto's plant was located, was reportedly to have high rates of fetal death, immature birth, and infant mortality, and childhood asthma in the US, and the nearby town of Times Beach, Missouri was found to be so thoroughly contaminated with dioxin that it was ordered evacuation by US government in 1982 (Tokar, 1998). Monsanto faced billions of dollars in lawsuits and cleanup fees for PCB pollution around its plants in Alabama (Bishop, 2005). In August 2003, Solutia Inc., the spinoff of Monsanto, and the Monsanto Company agreed to pay $700 million to settle claims over PCB contamination by more than 20,000 residents living in Anniston, Alabama, where Monsanto's plant producing PCBs for decades was located (The Associated Press, 2003).

After shifting to an agricultural company, glyphosate herbicides such as Roundup became the dominant product of Monsanto and the company promoted Roundup as a safe general-purpose herbicide for use on everything from lawns and orchards to forests; however, many scientific studies examining the effects of glyphosate and the polyoxyethelene amines used as a surfactant in Roundup found that Roundup is far less benign than Monsanto advertised (Tokar, 1998). Glyphosate and other herbicides were detected in human blood (Aris & Leblanc, 2011). Monsanto deleted the claims in its advertisements that Roundup is "biodegradable" and "environmentally friendly" in response to the 5-year complaints by the New York State Attorney General that its advertisements were misleading and paid $50,000 for the state's legal expenses (Tokar, 1998). In March 1998, the company agreed to pay a fine of $225,000 for mislabeling containers of Roundup on 75 separate occasions (Tokar, 1998). In March 2017, a judge ruled that California can require Monsanto to label Roundup as a possible cancer threat despite Monsanto stating that the herbicide is risk free (The Associated Press, 2017).

In its transition from a chemical company to an agricultural company, Monsanto was trying to use its material resources to build and promote "an image of biotechnology as developing inevitably along a particular trajectory, as immanently and universally beneficial, and as a realm appropriately assessed only by experts" (Kleinman & Kloppenburg, 1991, p. 431) and as a part of this portrayal, Monsanto suggested public opposition and government intervention could hinder the development of biotechnology, which could therefore threaten American national preeminence in this field (Kleinman & Kloppenburg, 1991). Discourse analysis of documents on live and archived websites of Monsanto over a period of 18 years demonstrated Monsanto's effort to legitimize itself, its products, and biotechnology (Lamphere & East, 2017). Biotechnology was portrayed and promoted by Monsanto as natural and genetic engineering was

described as a natural science (Kleinman & Kloppenburg, 1991). Biotechnology significantly raised Monsanto's profit rate to a level vastly exceeding its profit rate when it was a broad-based chemical company and shareholders thus approved the management proposal to concentrate solely on life sciences and spin off its chemical operations (Downs, 1997).

However, a lot of controversies emerged around biotechnology. Concerns about the safety of genetically engineering products and the long-term consequences of the alteration of the basic genetic makeup of plants and animals never disappear (Sale, 1999). Monsanto's bovine growth hormone, a product produced by Monsanto for farmers to increase the milk production of cows, was found to have dangerous health side effects in cows, increasing rates of udder infection and mastitis (Sale, 1999; Tokar, 1998). Despite the lack of scientific consensus on the negative effects of the recombinant Bovine Growth Hormone (rBGH) the milk produced using this substance was widely resisted by consumers, which stimulated the explosive growth of the organic milk industry (DuPuis, 2000).

Another controversy originates from the issue concerning whether food products from genetically-modified organisms (GMOs) should be labeled (Downs, 1997). The scientific community does not achieve a consensus on whether GMOs actually pose a threat, and since the genetic engineering of organisms is only a recent development, its health effects are generally unknown (Gray, 2016). There are a lot of concerns over the safety, environmental and ecological risks, and health hazards of GM foods and recombinant technology, and since the long-term negative effects are unknown, many people prefer to avoid consuming GM foods (Bawa & Anilakumar, 2013). However, mandatory labeling of GMOs was not required by federal laws in US until very recently when President Obama signed bill S.764 that defines a federal standard for foods made with GMOs on July 29, 2016 (Addady, 2016; Fama, 2016).

Monsanto has a history of resisting GMO labeling and lobbying governments. In 1993, Monsanto Lawyers sent letters to dairies across the US, threatening to sue them if they labeled their milk as free of rBGH (Downs, 1997). Most diaries surrendered except for two small diaries: The Pure Milk and Ice Cream Co. in Waco, Texas and Swiss Valley Farms in Davenport, Iowa. Later the FDA intervened and stood on Monsanto's side after its approval of commercial sales of Prosilac, the trade name of rBGH. Monsanto was also reportedly involved in supporting a federal law in 2015 with other biotechnology giants to create national standards for labeling foods that have been genetically modified or made with genetically modified ingredients (Raasch, 2015; Whitman, 2015). This bill did not require outright labeling and full disclosure of information, was drafted to respond to the legislation on GMO labeling in different states, and was also called the DARK Act (Raasch, 2015; Whitman, 2015), the same words as used by critics to describe bill S.764 signed by President Obama in 2016.

It is also believed that the monopoly of seeds and other technologies by Monsanto also bring economic pressures to farmers all over the world. GMOs were forcibly introduced into India and Farmers there committed suicide due to debt for costly seeds and chemicals (Shiva, 2016). In their counter-statement to Monsanto, delegates of African countries claimed that rather than helping farmers, Monsanto threatened farmers with lawsuits and jail by bringing those who saved Monsanto soybean seeds for next year's planting, and used genetic engineering to produce the so called "terminator technology" (i.e., seeds that can be planted only once and dies in the second generation) to stop farmers from replanting seeds and force them to shop Monsanto seeds every year, which destroyed the tradition of local seed saving and the sustainable agricultural systems the African farmers have developed for millennia, and would thus undermine their capacity to feed themselves (Maathai, 1998).

The above discussion of Monsanto's history and controversies regarding the company and its products indicate that the company serves an ideal case for this study. From its very beginning as a chemical company to its current version as an agricultural and biotechnology company, Monsanto has been constantly the target of attacks from a wide variety of stakeholders ranging from farmers to veterans owing to multiple issues and concerns. The general public show concerns on the residues of chemicals such as PCBs, DDT, and dioxin in waters, soils, and animal and human blood, the safety and health-related effects of genetically engineered products, and the adverse environmental consequences of chemical herbicides. Consumers resisted milk generated from cows injected with rBGH and requested labeling of GMO ingredients on food products. Residents and communities living around Monsanto's plants asked for compensation for exposure to toxic chemicals. Veterans from different countries also demanded compensation for diseases caused by Agent Orange exposure in the Vietnam War. Farmers show anxiety about the increasing cost of farming originating from the expensive seeds and chemicals. In addition to the United States, the company was also involved in controversies in other countries and areas such as Argentina (Houdemine, 2006), Brazil (Olson, 1998), India (BBC, 2003), Canada (Gibson, 2000) and the EU (Dunmore, 2013). Worldwide and local protests against Monsanto and GMOs have been constantly taking place. In Hawaii, demonstrators complained about the effects of chemical pesticides sprayed by agribusiness companies such as Monsanto and wanted these companies to stop using Hawaii as a testing ground for pesticides and GM foods (Bussewitz, 2015). In Las Vegas, people marched against the sale of GMOs and asked for proper labeling of foods (The Associated Press, 2015). In San Diego, locals joined global protests to call attention to food companies including Monsanto that produce GM seeds and crops, which they believed may threaten public health (Davis, 2014). In Thailand, Greenpeace protested to urge the

Thai government not to approve a GM maize field trial that was to be conducted by Naresuan University and Monsanto, out of concern about the possible environmental contamination (Sarnsamak, 2013). In India, thousands of farmers demonstrated against Monsanto and other biotech organizations in a very massive grassroots movement to resist GM crop farming and anti-farmer policies (Sarich, 2015). In Argentina, activists forced Monsanto to abandon their plan to build a GMO seed facility in the town of Malvinas through well-coordinated protests (Goodrich, 2016).

Obviously, Monsanto's agricultural products exert effect on nearly every individual's life through human food consumption, so it is not surprising that the company usually becomes the focus of controversies and the target of attacks from publics. It is also a company with a very wide range of resisting stakeholders including consumers, farmers, the general public, activists, veterans, regulators, and residents and communities living around its plants. Monsanto has been striving to throw away its extremely negative image as a chemical company and build a positive image as an agricultural and biotechnology company that values sustainable agriculture and social responsibility. However, its effort seems failed. The company evidently has worldwide influence and is enormously powerful in both economic and political respects, with strong negotiation and lobbying capabilities to influence governments (TendersInfo, 2010; The Associated Press, 2011). In their confrontations with Monsanto and other biotech giants, stakeholders such as farmers, veterans, and the general public usually stayed in disadvantaged positions (Downs, 1998; Haugo, 2015). Social media clearly provide platforms for these stakeholders to express their voices, communicate with each other, and organize resistance activities.

There is an activist organization operating against Monsanto named *Occupy Monsanto*, which is dedicated to resist the genetic food contamination and food with chemicals and unlabeled GMOs. Their objective is to empower "citizens of the world to take actions against Monsanto and its enablers like the FDA, USDA, EPA, GMA, BIO, and the processed food companies that use Monsanto's products" (as cited from the first page from http://occupy-monsanto.com/, January 20, 2020). The Facebook page Occupy Monsanto (https://www.facebook.com/occupymonsanto) had over 260,000 people liking it, and there were very intense interactions on this page. Occupy Monsanto also maintains a Twitter account (https://twitter.com/gmo917), with more than 19,000 followers in January 2020.

Monsanto maintained a Facebook page (https://www.facebook.com/MonsantoCo), as well as a Twitter account (@MonsantoCo) (https://twitter.com/MonsantoCo) both named *Monsanto Company*, most of which involved both positive and negative comments. The company's Facebook account used to have more than 150,000 people liking it and its Twitter account used to have over 105,000 followers. These two accounts were closed sometime after Monsanto was acquired by Bayer, but they were active at the time of Phase 1 data collection. As BP, Monsanto also meets the selection criteria. The company maintained official corporate social media sites and was involved in controversies in different countries. There exist counter-organizational social media sites maintained by activist groups to inform and mobilize the public to resist the company. The corporate social media sites and the counter-organizational sites are/were all updated on a regular basis and display(ed) active participation of fans and followers which makes Monsanto an ideal case company for this study. The social media accounts that were examined for this case are summarized in Table 2.

Data Collection and Analysis: Phase 1

Data Collection

All sites listed in Table 2 were publicly available at the time of Phase 1 data collection. Namely, they could all be accessible without logging in Facebook or Twitter with a Facebook or Twitter user account. Therefore, the messages on these sites can be considered as publicly available Internet data, with no requirement to gaining IRB permission for analysis. Considering the organizationally-sanctioned sites were updated much more frequently than their counter-organizational counterparts and nearly all posts on these sites were directly relevant to the case companies, the researcher collected data from these sites within a comparatively shorter period of time. Only textual data were analyzed. Two criteria were applied in the data collection process in this phase. First, posts that were irrelevant to the company were not collected. Examples

Table 2

Social Media Sites for Each Case Company

Social media sites for analysis	Site address
BP	
BP America's Facebook page	https://www.facebook.com/BPAmerica/
BP America's Twitter account	https://twitter.com/BP_America
Boycott BP's Facebook page	https://www.facebook.com/Boycott-BP-119101198107726/
Monsanto	
Monsanto's Facebook page	https://www.facebook.com/MonsantoCo
Monsanto's Twitter account	https://twitter.com/MonsantoCo
Occupy Monsanto's Facebook page	https://www.facebook.com/occupymonsanto

include posts discussing how to keep a healthy life style or eat healthy food that did not mention

Monsanto or products from Monsanto. Other examples include posts discussing herbal cancer

treatments or foods that help preventing cancer. However, posts discussing cancer that might be

caused by food grown with the application of Monsanto products such as glyphosate should be

included. Second, textual messages embedded in picture or video posts were collected for

analysis if they were relevant to the image of the company. For example, if a statement like

"Monsanto is the most evil company in the world" was embedded in a picture post, this textual

statement was collected because it described an image of Monsanto. Moreover, only posts

written in English, rather than in other languages, were collected and all data were formed into

plain text files and sorted by source and date. Textual messages in each of the textual files were

captured from the six social media sites listed in Table 3. The researcher manually collected the

textual messages from each of the six sites, keeping the two criteria in mind. Considering the

updating frequency of different social media sites varies significantly, data posted within

different periods of time were collected for different sites.

      For BP America's Facebook page, the textual messages posted from July 1st, 2016 to June

30th, 2017 were collected, which came to a total of 349 posts in a year; for the Twitter account of

BP America, messages posted from January 1st, 2017 to June, 30, 2017 were collected, which

were a total of 786 posts in half a year. Compared to the company's official Facebook and

Twitter accounts, the Facebook page of Boycott BP is updated much less frequently. In order to

obtain comparatively sufficient data, a much more lenient criterion was applied and messages

spanning a longer period were collected. For Boycott BP's Facebook page, textual messages

posted from January 1st, 2015 to June, 30th, 2017 were collected, which only led to a total of 119

posts in two and a half years. For the Facebook page of Monsanto, the textual messages posted

from July 1st, 2016 to June 30th, 2017 were collected, which resulted in a total of 177 posts in a

year; for Monsanto's Twitter account, messages posted from January 1st, 2017 to June, 30, 2017

were collected, which totaled 485 posts in half a year; for the Facebook page of Occupy

Monsanto, messages posted from July 1st, 2016 to June 30th, 2017 were collected, which are a

total of 245 posts in a year. Table 3 provides a summary of the data collection period and the

number of posts for each textual file.

Table 3

Data Collection Periods and Number of Posts

Social media sites for analysis	Period	Number of posts
BP America's Facebook page	July 1st, 2016 to June 30th, 2017	349
BP America's Twitter account	January 1st, 2017 to June, 30, 2017	786
Boycott BP's Facebook page	January 1st, 2015 to June, 30th, 2017	119
Monsanto's Facebook page	July 1st, 2016 to June 30th, 2017	177
Monsanto's Twitter account	January 1st, 2017 to June, 30, 2017	485
Occupy Monsanto's Facebook page	July 1st, 2016 to June 30th, 2017	245

Semantic Network Analysis

Social network analysis focuses on relationships among social entities and the patterns

and implications of these relationships (Wasserman & Faust, 1994). Social network analysis data

can be collected from the archival records of interactions (Wasserman & Faust, 1994). Semantic

network analysis applies network concepts to analyze textual data to identify influential terms

and relational patterns within texts (Gilpin, 2010). It differs from traditional network methods in

that it focuses on the structure of a system based on shared meaning, rather than on links among

communication partners (Doerfel & Barnett, 1999). Doerfel (1998) defined semantic network analysis as "the use of network analytic techniques on paired associations based on shared meaning as opposed to paired associations of behavioral or perceived communication links" (p. 16). In semantic network analysis, word associations in texts that represent the meaning inherent to the data are analyzed, and a link in a semantic network represents the extent to which two nodes share meaning, which is measured by their overlapping of language as representation of meaning (Doerfel, 1998). Semantic network analysis is an ideal method to analyze a large amount of textual data (Gilpin, 2010) and helps reduce the risk of instrumental or researcher bias compared with some traditional content analysis methods because no *a priori* categories are used (Doerfel, 1998). Semantic network analysis has been used to analyze various types of textual communication data such as titles of papers presented at the annual meeting of ICA (Doerfel & Barnett, 1999), the content of US presidential debates held from 1960 to 2004 (Doerfel & Connaughton, 2009), customer complaint letters (Fitzgerald & Doerfel, 2004), the Universal Declaration of Human Rights (Kwon et al., 2009), and others. Semantic network analysis has also been used to analyze textual data from social media. Gilpin (2010) analyzed Twitter messages, blog posts and news releases of *Whole Foods* using semantic network analysis to examine the corporate image built by *Whole Foods* on social media platforms.

Semantic network analysis is used in this study to examine the actually conveyed organizational images on both organizationally-sanctioned and counter-organizational social media sites. By using semantic network analysis, the researcher can get vivid pictures of different organizational images built by the two case companies on organizationally-sanctioned social media and their stakeholders on counter-organizational social media. A content analysis based on *a priori* categories cannot give such vivid results because the analyses would be largely

confined by the existing categories; not to mention there are no existing categories to measure

organizational image in the current literature. The use of semantic network analysis can help

reduce researcher bias (Doerfel, 1998) because no pre-existing categories are used and less

subjective interpretation of data is involved. Semantic network analysis analyzes the specific

texts and is able to generate the most salient and central terms appearing in the textual

documents, based on which central themes of organizational image can be identified. Relative

influence of the term can be calculated based on measures such as betweenness centrality of the

terms, and then the most influential terms can be identified. In this way, it is useful to effectively

explore the rich textual data collected from the social media sites of the two companies and the

corresponding counter-organizational sites. The central themes identified based on the influential

terms can clearly show the real conveyed images of the four companies through messages on

both types of social media sites.

The software used in this study for semantic network analysis include AutoMap 3 and

ORA-NetScenes. AutoMap is an advanced text mining system that can do classical content

analysis, extract semantic network, and classify the concepts into their ontological categories

such as agents and locations in meta-networks (Carley et al., 2013). ORA-NetScenes (aka ORA)

is a network analysis package that can be used to enter, analyze, visualize, and forecast changes

in networks using graph, statistical and visualization-based techniques (Carley, 2016a). In this

study, AutoMap 3 was first utilized to pre-process the textual data to prepare it for semantic

network generation and ORA was subsequently employed for analyzing the semantic network

data generated by AutoMap 3. AutoMap 3 is highly advanced in pre-processing textual data

through the creation and application of concept lists, delete lists, and thesauri. Concept lists

collect all the concepts appearing in the input textual files, based on which delete lists can be

created, which list all concepts that could be dropped in subsequent analysis. AutoMap 3 interface also provides text cleaning functions such as removing extra spaces and pronoun resolution, text preparation functions such as removing single letters, pronouns, noise verbs, prepositions, day and month words, or numbers as words, etc., and text refinement functions such as removing numbers, punctuation, user or single symbols, and converting texts to lowercase or uppercase. The tool is especially helpful in that users can create their own customized delete lists based on concept lists, which can be automatically generated by the software, including all concepts appearing in the texts.

AutoMap was primarily used in this study for text processing and refining, rather than semantic network analysis. AutoMap has some functions for extracting semantic networks, but it is not advanced in visualizing networks, and calculating and analyzing the statistical properties of networks. AutoMap can generate one DyNetML file (or XLM file) for each textual file under analysis, but this DyNetML file has to be loaded into ORA for further semantic network analysis. DyNetML is an XML based interchange language for relational data including nodes, ties, and the attributes of nodes and ties (Carley et al., 2013). Thus, a DyNetML file is still in data form that requires further analysis, which itself is not the result of analysis.

ORA is a network analysis tool that provides graphical, statistical, and visual analysis on both social networks and high dimensional meta networks that can vary by time and/or space (Carley, 2016b). It can analyze networks that vary in size (e.g., from small to large networks) and type (e.g., social, communication, semantic, task or other networks), and high-dimensional meta-network data. In this study, the DyNetML files generated in AutoMap based on textual data collected from each social media site in Table 3 were loaded into ORA for semantic network analysis. Standard network analysis on each DyNetML file can calculate node-level measures

such as degree centrality, closeness centrality, and betweenness centrality for each node in a

semantic network (i.e., each word in a textual file). ORA also provides descriptions of top ranked

concepts for each semantic network based on node-level measures. Based on these concepts, a

vivid portrait of organizational image conveyed by posts on each social media site may be

drawn. In addition to calculating network-level and node-level measures for each semantic

network, ORA is also a good tool for visualizing the semantic networks. Groups generated based

on a variety of algorithms such as Girvan-Newman, Louvain, Concor and K-Means algorithms

can be shown in the visualized network with distinct colors. These groups, along with node-level

measures of each node in the semantic network, provide rich information to delineate

organizational images that are emphasized in each social media site.

The specific procedures and steps to conduct semantic network analysis in this study are

described as follows. First of all, each of the six textual files was processed in AutoMap 3 for

further analysis. Before inputting to AutoMap, the researcher read each file and did some initial

editing to prepare the files for analysis in AutoMap. AutoMap can only recognize isolated words

and cannot identify the meanings of whole phrases. For example, for "offshore technology

conference", Automap can only recognize "offshore", "technology", and "conference", so it is

necessary to manually change it to "offshore_technology_conference" for Automap to recognize

this combination as a whole. Similar actions were taken for words with numbers. For instance,

"1,052" can only be recognized as "1" and "052", so it should be edited to "1052" before input to

AutoMap. For readability, some abbreviations were also converted to the original words.

Examples included the conversion of "MS" to "multiple_sclerosis" and the conversion of "HS"

to "high_school". AutoMap may also be confused by words such as "US", recognizing it as the

pronoun "us". Thus, in the initial editing, "US" was replaced by "United_States". After the initial

textual files were manually edited, they were input into AutoMap for further processing. Several

steps were conducted in AutoMap. First, each textual file was processed with text cleaning, text

preparation, and text refinement functions such as removing extra spaces, single letters,

pronouns, and propositions. And in this step, all letters were converted into lower cases.

Examples of words that were deleted in this step included "a", "he", "she", "it", "them", "us",

"to", "up", etc.

Second, customized generalization thesauri created by the researcher were applied to the

respective processed textual files. AutoMap can automatically generate generalization thesauri

by depluralizing nouns and detensing verbs; however, by reviewing the automatically

generalized thesauri, the researcher found some plural nouns and verbs in the past tense were not

converted for some reason. Further, AutoMap is not smart enough to detect the same meaning of

words that appear in totally different forms. As an illustration, "North_Slope", "Slope", and

"Alaska's North_Slope" all refer to the North Slope of Alaska (North_Slope_of_Alaska), which

AutoMap obviously cannot recognize. To ensure the precision and quality of analysis, the

researcher then decided to manually create customized generalization thesauri. Automap can

generate concept lists that include all words appearing in each textual file and the frequency of

each word. By checking each word in each concept list one by one, the researcher manually

created the generalization thesauri. Generally, plurals and verbs in tenses were converted to their

basic forms, but there were exceptions. For example, after a thesaurus was applied, "beehives"

was converted to "beehive"; "boosts" was converted to "boost"; and "celebrated" and

"celebrating" were both converted to "celebrate". However, when a verb in tenses appeared only

once in a file, it was not converted into its basic form because it is not necessary. To illustrate, in

the textual file that includes messages captured from the Twitter account of BP, the word

"bought" appeared only once and there were no "buying" and "buys" in the file. In this case, in order to keep words as they appear in the original files, "bought" was not replaced by "buy". In addition, some words in plural forms appeared much more frequently than their basic forms and the plural forms usually represent a group of people. For instance, in the textual file including messages from the Twitter account of BP, the word "woman" only appeared once, whereas "women" appeared 11 times. Under this circumstance, "women" was not converted to "woman", but "woman" was replaced by "women". Similar examples include "employees" and "employee", "students" and "student", "farmers" and "farmer", etc. Moreover, words such as "engineer" can be both verbs and nouns. While the verbs in tenses including "engineering" and "engineered" were converted to "engineer", the noun "engineer" was converted to its plural form "engineers" to tell the difference between verb and noun. In addition to the conversion of plurals and verb tense, the researcher also created the customized thesauri to convert words and phrases with same meanings but in different forms into same form. For instance, "America" and "USA" were both converted to "united_states"; "GoM" and "Gulf" were both converted to "gulf_of_mexico".

Third, after applying the customized generalization thesauri on each of the six updated textual files, the researcher created a customized delete list for each of them by reviewing the new concept lists generated based on the new files in AutoMap. Delete lists primarily include words whose meanings are not specific enough when detached from the contexts in which they are located. One category is composed of words related to time, with examples containing "7pm", "Friday", "sometimes", "once", "weekend", "ago", "tonight", etc. Other categories consist of adverbs, conjunctions, auxiliary verbs, pronouns, and propositions, such as "almost", "approximately", "finally", "maybe", "previously", "because", "and", "might", "what", "how",

"when", "why", "where", "will", "yes", "whether", "something", "till", and "then", and some nouns without specific meanings such as "thing". After the delete lists were created, they were applied on the textual files.

Finally, after the application of the generalization thesauri created in the second step and the delete lists created in the third step, a newly updated file for each of the six textual files was created. A new concept list was generated in AutoMap based on each of the newly updated files. The researcher reviewed words in each concept list carefully and, if necessary, created new generalization thesauri and delete lists, and applied them to the corresponding textual files again. Namely, step 2 and step 3 were conducted back and forth to ensure words with same meanings to be in the same form and words without particular meanings to be deleted. At this point, a final version was created for each of the 6 textual files and the text processing and refining was finished.

After the final version was obtained for each of the six textual files, AutoMap was used to extract semantic network data from the each of the final textual files. The semantic network data was in the form of DyNetML files. DyNetML is an XML based interchange language for relational data including nodes, ties, and the attributes of nodes and ties (Carley et al., 2013). The nodes in the DyNetML files created in this study are words from the textual files and the links represent the relations among these words. When creating the DyNetML file, the researcher chose "bidirectional", so the generated network is not unidirectional. More specifically, AutoMap searched both forward and backward in the text to identify the links among words (Carley et al., 2013). To illustrate, there was a link between "gmo" and "seeds" because the phrase "gmo seeds" appeared in the textual files, and there was also a link between "no" and "gmo" because phrase

"no gmo" existed. Here "no" was before "gmo" and "seeds" was after "gmo", and the DyNetML file incorporated both links without regard to directionality.

The DyNetML files included semantic network data extracted from the six final textual files, which were input into ORA for semantic network analysis. ORA was used to generate the visualization of each of the six semantic networks and calculate the values of centrality measures including total-degree centrality, betweenness centrality, and closeness centrality for each word in each semantic network. Grivan-Newman grouping algorithm was selected in ORA to group nodes in each network. Nodes with the same colors in one network belong to the same groups. To visualize the relatively more salient nodes, nodes were also sized based on their values of total-degree centrality. To improve the readability of each network, not all nodes were displayed in the network pictures as presented below. For network pictures of Monsanto, nodes with degree centrality less than three were hidden in the network pictures. For Network pictures of BP, nodes with degree centrality less than two were hidden, considering the Facebook page of Boycott BP was updated much less frequently than other sites and there were much fewer posts in the corresponding textual file. The researcher also dragged nodes with the same colors to the same places in each network to improve the readability of each network picture. The centrality measures were based on the networks as shown in network pictures, rather than the original networks, considering words with higher degree values are generally more salient. Node cloud pictures and frequency pictures were also generated in ORA to provide visual demonstration of salient words, which were also based on networks as shown in network pictures. Words displayed in node cloud pictures were also sized based on their value of total-degree centrality.

Data Collection and Analysis: Phase 2

Data collection

Phase 2 of data collection and analysis primarily consists of online questionnaires. Phase 1 mainly addresses the first set of research questions, while Phase 2 primarily addresses the second research question and the relevant hypotheses. Unlike the first set of research questions which are at an organizational level, the second research question and the relevant hypotheses ask questions at an individual level. Research Question 2 and the seven hypotheses examine individual stakeholders' use of social media, their perception of organization-stakeholder dialogic communication, organization-stakeholder relationship, and organizational image/reputation. An online questionnaire becomes an appropriate method to study stakeholders' individual psychological thoughts and perceptual judgment of an organization.

Participants of this study were recruited through Amazon Mechanical Turk (MTurk)[i]. MTurk is a crowdsourcing website for businesses (known as Requesters) to hire remotely located "crowdworkers" to perform on-demand tasks (https://en.wikipedia.org/wiki/Amazon_Mechanical_Turk). Two research surveys were posted online using the service of Qualtrics, with one for the case of BP and the other for the case of Monsanto. The two surveys included questions regarding respondents' social media use, organization-stakeholder dialogic communication, organization-stakeholder relationship, perceived organizational image, and perceived organizational reputation. The researcher posted a series of Human Intelligence Tasks (HITs) on MTurk to recruit subjects to fill out the two research surveys, which were on Qualtrics, rather than MTurk. Each HIT included a link to either the BP survey or the Monsanto survey on Qualtrics. Online surveys on Qualtrics and HITs on MTurk were initiated after the implementation of this study was approved by Rutgers IRB.

The recruiting activities on MTurk were conducted between September 18, 2019 and October 18, 2019. During this time, the Facebook page and the Twitter account of Monsanto were closed and the Facebook page of Boycott BP was no longer available on Facebook, either. Thus, the researcher did not have the option to let participants browse all the six sites listed in Table 3. Finally, the Facebook page of Occupy Monsanto, the only available site related to Monsanto in Table 3, and the Facebook page of BP America, one of the two organizationally-sanctioned sites of BP in Table 3, were selected for the respondents to browse.

MTurk workers interested in BP were asked to browse posts posted between July 15, 2019 and September 21, 2019 and relevant comments on the Facebook page of BP America (https://www.facebook.com/BPAmerica/) and then complete the BP survey; workers interested in Monsanto were guided to browse posts posted between July 15, 2019 and September 21, 2019 and relevant comments on the Facebook page of Occupy Monsanto (https://www.facebook.com/occupymonsanto/) and then complete the Monsanto survey. In each HIT and the instruction of each survey, guidance on how to browse the posts and comments on the corresponding Facebook page was provided to the subjects. Each participant who successfully completed a HIT and the corresponding research survey received a $4 compensation. Amazon also charged a fee for each HIT the researcher posted on MTurk. To participate in the study, all participants had to be at least 18 years old, have Internet access to browse the two selected public-facing Facebook pages, and be located in the United States during the time of data collection. There were 102 participants ($N = 102$) completing the BP survey and 100 participants ($N = 100$) completing the Monsanto survey.

Measurements

As mentioned in Chapter 3, when attempting to answer RQ2 and test the hypotheses, the researcher proposed a conceptual model (see Figure 1), which addresses the relationship among social media use, organization-stakeholder communication, organization-stakeholder relationship, perceived organizational image, and perceived organizational reputation. Dimensions and indicators of each of them were discussed in Chapter 3. The following section mainly discusses the measurements of social media use, organization-stakeholder communication, organization-stakeholder relationship, and perceived organizational reputation. Measurements of perceived organizational image are only briefly discussed here, because the indicators can be identified only after the semantic network analysis in Phase 1 is finished. The detailed measurements of perceived organizational image of BP and Monsanto are listed in Chapter 5 and Chapter 6, respectively.

Social Media Use. As discussed in Chapter 3, this study applies the COBRA typology proposed by Muntinga et al. (2011) to categorize stakeholders' social media use into two types: *consuming social media use*, and *contributing social media use*. In their study of the types of Chinese public's engagement with companies on the most popular local social networking sites in China (i.e., Renren and Sina Weibo) and their motivations behind them, Men and Tsai (2013) developed eight items to measure levels and types of public engagement based on Muntinga et al.'s typology. *The consuming activities* included four items: (1) watching videos on companies' Renren or Weibo pages; (2) viewing pictures on companies' Renren or Weibo pages; (3) reading companies' posts, user comments, or product reviews; and (4) linking/joining (e.g., becoming a fan of or following) companies' Renren or Weibo pages. *The contributing activities* also include four items: (1) engaging in conversations on companies' Renren or Weibo pages (e.g.,

commenting, asking, and answering questions); (2) sharing companies' posts on my own Renren or Weibo page (e.g., video, audio, pictures, and texts); (3) recommending companies' Renren or Weibo pages to my contacts; and (4) uploading product-related video, audio, picture or images. All of these items were measured on a 7-point Likert scale.

In this study, the measurements for *consuming* and *contributing* social media use are developed based on Men and Tsai's (2013) study. Items were created for a series of 7-point Likert scales to examine different levels of social media use. When designing these items, different communication processes involved in different types of social media use were considered. Items designed to measure social media use are listed in Table 4.

Table 4

Items Measuring Social Media Use

Dimensions	Measurement items
Consuming Social Media Use	1. I have seen information about BP/Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).
	2. I have searched for information about BP/Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).
	3. I have clicked "like" to a post about BP/Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).
Contributing Social Media Use	1. I have commented on a post about BP/Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).
	2. I have shared a post about BP/Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).
	3. I have discussed BP/Monsanto with others on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).

Organization-Stakeholder Dialogic Communication (OSDC). As discussed in Chapter

3, organization-stakeholder dialogic communication has behavioral and attitudinal dimensions.

The indicators of the behavioral dimension include: (a) interactivity, (b) responsiveness, (c)

openness, (d) equality, and (e) transparency; the indicators of the attitudinal dimension include:

(a) empathy, (b) genuineness, (c) respect, and (d) commitment. The measurement of each

indicator is based on Yang et al.'s (2015) study. Yang et al. attempted to develop and test a scale

to measure organization-public dialogic communication. In their study, organization-public

dialogic communication has two dimensions: mutuality and openness. The attributes of mutuality

include collaboration, grounding, empathy, equality, responsiveness, and respect; and the

attributes of openness include accessibility, genuineness, and transparency. The scale proposed

by Yang et al. was modified and revised to meet the purpose of this study. Some of the items in

the scale were kept, some others were deleted, and new items were added. All of these items

were measured on a 7-point Likert scale. Moreover, since this study specifically addresses two

Facebook pages, items were adjusted to fit each page examined in this study. The measurement is

summarized in Table 5. Among the three social media sites related to Monsanto, only the

Facebook page of Occupy Monsanto was available. Thus, the OSDC for the Monsanto case

refers to the communication between Occupy Monsanto and Stakeholders on Facebook. The

same measurements were used in surveys on BP and Monsanto stakeholders, so the statements

listed in Table 5 include BP/Occupy Monsanto. In the survey on BP stakeholders, only BP

appeared in these statements and in the survey on Monsanto stakeholders, only Monsanto

appeared in these statements.

Table 5

Items Measuring Organization-Stakeholder Dialogic Communication (OSDC)

Dimensions	Measurement items

Behavioral Dimension

Interactivity	1. The communication between BP/Occupy Monsanto and people on its Facebook flows both ways. 2. BP/Occupy Monsanto invites people to communicate on its Facebook. 3. BP/Occupy Monsanto welcomes people's comments on its Facebook.
Responsiveness	1. BP/Occupy Monsanto responds to people's general comments promptly on its Facebook. 2. BP/Occupy Monsanto responds to people's questions and concerns promptly on its Facebook. 3. BP/Occupy Monsanto pays attention to what people say on its Facebook.
Openness	1. BP/Occupy Monsanto is easy to talk to on its Facebook. 2. BP/Occupy Monsanto openly shares information to all on its Facebook. 3. BP/Occupy Monsanto gives people opportunities to share their opinions on its Facebook.
Equality	1. People have equal power with BP/Occupy Monsanto when communicating on its Facebook. 2. BP/Occupy Monsanto does not attempt to seek control over people on its Facebook. 3. BP/Occupy Monsanto is not arrogant in its communication with people on its Facebook.
Transparency	1. The information shared by BP/Occupy Monsanto on its Facebook is transparent. 2. The information shared by BP/Occupy Monsanto on its Facebook is clear and straightforward. 3. The information shared by BP/Occupy Monsanto on its Facebook is complete.
Empathy	1. BP/Occupy Monsanto is empathetic in understanding feelings of people on its Facebook. 2. BP/Occupy Monsanto tries to understand problems from the perspectives of people on its Facebook. 3. BP/Occupy Monsanto considers how people might feel at that moment on its Facebook.

Table 5 (cont'd)

Items Measuring Organization-Stakeholder Dialogic Communication (OSDC)

Dimensions	Measurement items
Attitudinal Dimension	
Genuineness	1. BP/Occupy Monsanto is honest in its communication with people on its Facebook. 2. BP/Occupy Monsanto is sincere in its communication with people on its Facebook. 3. The messages posted by BP/Occupy Monsanto on its Facebook are authentic.
Respect	1. BP/Occupy Monsanto recognizes the unique value of opinions from people on its Facebook. 2. BP/Occupy Monsanto acknowledges the legitimacy of the needs and goals of people on its Facebook. 3. BP/Occupy Monsanto respects people's opinions even if they are different from its own on its Facebook.
Commitment	1. BP/Occupy Monsanto is always trying to provide useful information to people on its Facebook. 2. BP/Occupy Monsanto is always there to reply to comments from people on its Facebook. 3. BP/Occupy Monsanto is always there to address concerns from people on its Facebook.

Organization-Stakeholder Relationship. As discussed in Chapter 3, the four

dimensions of organization-public relationship proposed by Huang (2001)—control mutuality,

trust, relational satisfaction, and relational commitment—have been used as indicators of

organization-stakeholder relationship in this study. In Yang's (2007) study to test a theoretical

model regarding the effect of organization-public relationships on organizational reputation, 18

items proposed by Hon and Grunig (1999) were adopted to measure the four indicators of

organization-public relational outcome. *Control mutuality* was measured by "attentive with each

other," "considering publics legitimate," "throwing its weight around (reversed)," and "genuinely

listening to publics' opinions." *Trust* was measured by "treating publics fairly," "always concerning publics' interests," "keeping its promise," "including publics in its decision-making," "confident about its competence," and "having an ability for goal attainment." *Commitment* was measured by "caring about a long-term commitment," "trying to cultivate a relationship," "establishing a long-lasting bond," and "valuing this relationship more." *Relational satisfaction* was measured by "happy with the organization," "mutually beneficial from relationship," "happy in interacting with the organization," and "satisfied with the relationship." In this study, in order to measure organization-stakeholder relationship, the measurements as used in Yang's study and the corresponding items from Hon and Grunig were adapted. Items measuring each dimension are listed in Table 6. All of these items are measured on a 7-point Likert scale. It is worthwhile to mention that the "commitment" dimension of organization-stakeholder dialogic communication (OSDC) refers to commitment to dialogic communication, while the "commitment" dimension of organization-stakeholder relationship represents commitment to relationship maintenance and development. Namely, the same words are used to measure different things. The same measurements were used in surveys on BP and Monsanto stakeholders, so the statements in Table 6 include BP/Monsanto. In the survey on BP stakeholders, only BP appeared in these statements and in the survey on Monsanto stakeholders, only Monsanto appeared in these statements.

Organizational Image. As discussed, only after data collection and analyses in Phase 1 can the measurement of organizational image be designed. After the influential terms and themes regarding each company were identified through semantic network analysis, the researcher integrated these terms and themes into several 7-point Likert scales to examine how each company is perceived by respondents. In this way, the conveyed organizational images of BP

Table 6

Items Measuring Organization-Stakeholder Relationship (OSR)

Dimensions	Measurement items
Control mutuality	1. BP/Monsanto and people like me are attentive to what each other say. 2. BP/Monsanto believes the opinions of people like me are legitimate. 3. In dealing with people like me, BP/Monsanto has a tendency to throw its weight around. 4. BP/Monsanto genuinely listens to what people like me have to say.
Trust	1. BP/Monsanto treats people like me fairly and justly. 2. Whenever BP/Monsanto makes an important decision, I know it will be concerned about people like me. 3. I feel very confident about BP/Monsanto's competence. 4. BP/Monsanto has the ability to accomplish what it says it will do.
Commitment	1. I feel that BP/Monsanto is trying to maintain a long-term commitment to people like me. 2. I can see that BP/Monsanto wants to maintain a relationship with people like me. 3. There is a long-lasting bond between BP/Monsanto and people like me. 4. Compared with other companies, I value my relationship with BP/Monsanto more.
Satisfaction	1. I am happy with BP/Monsanto. 2. Both BP/Monsanto and people like me benefit from the relationship. 3. Most people like me are happy in their interactions with BP/Monsanto. 4. Generally speaking, I am pleased with the relationship BP/Monsanto has established with people like me.

and Monsanto can be compared with the images as perceived by respondents. The influential

terms and themes identified through analyses of the corporate and counter-organizational social

media sites of a single company differed. However, since the same company—for example,

Monsanto—is the object of the examination, the researcher integrated terms and themes from

both corporate and counter-organizational social media sites into one version of the questionnaire in order to keep the measurements of the image of the same company to be the same. The detailed measurements of organizational image of BP and Monsanto are presented in Chapter 5 and Chapter 6, respectively.

Organizational Reputation. Corporate reputation has been a hot and trendy topic in both academia and industry over the past two decades. However, when it comes to the appropriate measurements of corporate reputation, issues, problems, and criticisms emerge. One of the most popular measurement of corporate reputation is the Reputation Quotient^{SM} (RQ) proposed by Fombrun and Gardberg (2000), which includes six dimensions—emotional appeal, products & services, vision & leadership, workplace environment, financial performance, and social responsibility. Fombrun (1998) summarized various types of indices of corporate reputation such as *Fortune*'s "Most Admired Corporation," *Asian Business*'s "Asian's Most Admired Companies," *Far Eastern Economic Review*'s "Review 200," *Management Today*'s "Britain's Most Admired Companies," *Financial Times*' "Europe's Most Respected Companies," *Business Ethics*' "America's 100 Best Corporate Citizens," and *Working Mother Magazine*'s "The 100 Best Companies for Working Women." He reviewed assessments of corporations in books such as *The 100 Best Companies to Work for in America*, *The Best Companies for Minorities*, *The Best Companies for Women*, and *The 100 Best Companies for Gay Men and Lesbians*. He also reviewed corporate ratings by social monitors such as the Council on Economic Priorities (CEP), Kinder, Lydenberg Domini & Company, Inc., Ethical Investment Research Service (EIRIS), Franklin Research & Development Corporation, Interfaith Center on Corporate Responsibility, and Investor Responsibility Research Center (IRRC). Based on these reviews, he summarized six criteria that dominated the construction of reputation ratings in the

abovementioned media, books, and social monitors. These six sets of criteria were: financial performance, product quality, employee treatment, community involvement, environmental performance, and organizational issues, based on which RQ was proposed (Fombrun & Gardberg, 2000).

After RQ was proposed, scholars from different countries conducted a Global RQ Project to develop a cross-national instrument of corporate reputation (Gardberg & Fombrun, 2002). For example, Groenland (2002) carried out a qualitative study in the Netherlands to ascertain the dimensions proposed in RQ and tested its power and applicability in the Netherlands. Participants in their focus groups were presented with a list of statements from the RQ scale, with each item ranging from 1 to 7 points. Findings suggested all the six dimensions of corporate reputation in the RQ scale were supported by the data. The RQ proposed by Fombrun and Gardberg (2000) has been widely used and its validity has been tested (Thevissen, 2002). Furthermore, as discussed in Chapter 2, the definitions of corporate reputation proposed by Fombrun and his colleagues (Fombrun, 1996; Fombrun & Van Riel, 1998) are adopted in this study. Thus, it is reasonable to utilize RQ in this study to measure perceived organizational reputation. A series of 7-point Likert scales are used and the items in these scales are from RQ, as shown in Table 7. The same measurements were used in surveys on BP and Monsanto stakeholders to measure how they perceive their respective organizational reputation, so the statements in Table 7 include BP/Monsanto. In the survey on BP stakeholders, only BP appeared in these statements and in the survey on Monsanto stakeholders, only Monsanto appeared in these statements.

Table 7

Items Measuring Organizational Reputation in Reputation QuotientSM (RQ)

Dimensions	Measurement items
Corporate appeal	1. BP/Monsanto is admirable and respectable. 2. BP/Monsanto is a company I have good feelings about. 3. BP/Monsanto is a company I like a great deal.
Products and Services	1. BP/Monsanto stands behind products/services. 2. BP/Monsanto offers high quality products/services. 3. BP/Monsanto develops innovative products/services. 4. BP/Monsanto offers products/services that are a good value for the money.
Vision and Leadership	1. BP/Monsanto has excellent leadership. 2. BP/Monsanto has a clear vision for the future. 3. BP/Monsanto recognizes and takes advantages of market opportunities.
Workplace Environment	1. BP/Monsanto is well managed. 2. BP/Monsanto looks like a good company to work for. 3. BP/Monsanto looks like a company that has good employees.
Financial Performance	1. BP/Monsanto is a profitable company. 2. BP/Monsanto looks like a low risk investment. 3. BP/Monsanto has strong potential for future growth. 4. BP/Monsanto tends to outperform its competitors.
Social and Environmental Responsibility	1. BP/Monsanto supports good causes. 2. BP/Monsanto is environmentally responsible. 3. BP/Monsanto maintains high standards in the way it treats people.

Other Measurements. As discussed in Chapter 2, particular types of stakeholder groups are not emphasized in this study and stakeholders using social media are viewed as an aggregated group. Although types of stakeholder groups do not receive special attention in this study, it is no harm to take a small survey on stakeholder group in online questionnaires for statistical purposes. Stakeholder group in this study for the BP case is operationalized as including customer, environmentalist, shareholder, current employee, former employee, resident

affected by the oil spill regulator, the general public, and journalist. Stakeholder group for the Monsanto case is operationalized as farmer, consumer other than farmer, activist, shareholder, current employee, former employee, regulator, veteran, resident living around Monsanto's plants, and the general public. If the participants chose "other", they were asked to specify the stakeholder group they think they belong to in the questionnaires. The questionnaires will also include questions on some demographic variables such as respondents' education, age, gender, whether they followed any social media site about BP/Monsanto, what sites they followed, whether they had ever seen BP/Monsanto in the news or seen its advertising, whether they had ever used/purchased BP products, whether they or anyone in their family ever worked for BP, whether they or anyone in their family ever worked for a different company in the energy industry, or agriculture/chemical industries, and their familiarity with BP/Monsanto prior to filling out the survey.

In summary, the five constructs in the conceptual model (see Figure 1) all include several dimensions, with each dimension having several items to measure it. Several Likert scales measuring the five constructs and other measurements mentioned above were in the online questionnaires. The measurements of perceived organizational image were built after the terms and themes of organizational image were identified in Phase 1. The detailed measurements of perceived organizational image of BP and Monsanto are presented in Chapter 5 and Chapter 6, respectively. Each online questionnaire included five parts: measurements of social media use, measurements of organization-stakeholder communication, measurements of organization-public relationship, measurements of perceived organizational image, and measurements of perceived organizational reputation.

Data Analyses

Structural equation modeling (SEM) was used to explore the relationship among social media use, organization-stakeholder communication, organization-stakeholder relationship, perceived organizational image, and perceived organizational reputation. Exploratory factor analysis (EFA) was used to test the validity of the measurements that were designed by the researcher based on existing measurements. The measurements of some variables were revised accordingly based on the results of exploratory factor analysis and the changes made are depicted in Chapter 5 and Chapter 6. In this stage, RQ2 was answered and all seven hypotheses were tested using SEM. The software used for structural equation modeling was SPSS AMOS.

Summary

To summarize, this study adopts a mixed-method and an embedded multiple-case design. Two case companies, BP and Monsanto, are selected and the organizationally-sanctioned and counter-organizational social media sites of these companies are examined. There are two phases of data collection and analysis. In Phase 1, the researcher employed AutoMap 3 and ORA to process and conduct semantic network analysis on the textual data collected from each of the social media site as listed in Table 3. Qualitative analysis of the network picture and key terms generated by ORA resulted in a portrait of organizational images conveyed from these sites, which answers RQ1. In Phase 2, participants were recruited through Amazon MTurk to fill out online questionnaires, with one for the case of BP and the other for the case of Monsanto. Participants could fill out both questionnaires, but they could not fill out either one twice. Through this survey, stakeholders' social media use, organization-stakeholder dialogic communication, organization-stakeholder relationship, perceived organizational image, perceived organizational reputation, and other measurements including some demographic

variables were measured. Measurements of some concepts were revised based on a series of

exploratory factor analysis. Structural equation modeling was used to analyze the relationships

among the five constructs in Figure 1 and test the hypotheses proposed in this study to answer

RQ2.

Chapter 5

Results: The Case of BP

Results of Phase 1

As discussed in Chapter 4, in Phase 1 of this study, semantic network analysis was used to analyze the textual messages posted in each of the three social media sites as listed in Table 2 for the case of BP: the Facebook page of BP America, the Twitter account of BP America, and the Facebook page of Boycott BP. The textual messages were analyzed to show organizational images that were actually presented and conveyed on the three sites, which answers the first set of research questions: what organizational image is communicatively constructed by organizations and key stakeholders using social media? The software employed to conduct semantic network analysis are AutoMap 3 and ORA, as introduced in Chapter 4.

The following sections present the results of semantic network analyses of the two organizational social media sites and one counter-organizational social media site of BP. The presentation of results for each of the three sites is organized as follows. First, the interpretation of major network groups in each of the three overall network pictures corresponding to the three sites is provided. The researcher interpreted the meanings of the links among nodes in those major network groups. Second, tables showing nodes ranked from the 1st to the 50th on frequency for each of the three semantic networks, the values of three centrality measures for the first 70 nodes in each semantic network, and nodes that are ranked from the 1st to the 100th on each of the three centrality measures are provided. Finally, major themes identifying the organizational images of BP as presented on each social media platform, which were summarized by the researcher through integration of the images as shown by the network groups, frequency tables, and centrality measures, are presented.

Semantic Network Analysis of the Facebook of Boycott BP

The semantic networks generated in ORA are based on the textual data collected from the Facebook page of Boycott BP, including 119 posts from January 1st, 2015 to June, 30th, 2017. The overall network picture is displayed in Figure A1 in Appendix A. Nodes in same colors belong to same groups, based on the Newman grouping algorithm. There is a total of 16 network groups as shown in the overall network picture, with each network picture displayed in Appendix B. All nodes in these pictures are sized by total-degree centrality values. In the following sections, the interpretation of 13 of the 16 network group pictures is presented. Network groups 13, 14, and 16 include much fewer nodes compared with other networks and the images of BP as demonstrated by these network groups are also demonstrated in the 13 groups interpreted below.

Network Group 1. Network group 1 is displayed in Figure B1. In Figure B1, the five biggest bubbles are nodes representing "BP", "2010 Deepwater Horizon Oil Spill", "oil", "settlement", and "well". It is not surprising that "BP" is the biggest node in this picture, as well as in the overall network picture, because this is the company name. Node "2010 Deepwater Horizon Oil Spill" is the second biggest node in this picture, and in the overall network picture, too, which indicates that the 2010 oil spill is one of the major themes that was emphasized in the messages posted on the Facebook page of Boycott BP. Nodes "settlement" and "oil", the two relatively large nodes in this picture, are also quite relevant to the oil spill.

In summary, nodes and links in Network Group 1 demonstrate the following images of BP. First, the negative impact of the 2010 Deepwater Horizon oil spill is long-lasting and catastrophic, and the oil spill not only hurt the natural environment of the Gulf of Mexico, but also harmed local businesses. The massive oil spill befouled huge stretches of the Gulf of Mexico and disintegrated Cat Island, as denoted by links among "massive", "2010 deepwater

horizon oil spill", "befouled", "huge", "disintegrated", "gone", and "island". Millions of gallons of "missing" BP oil were sitting at the bottom of the Gulf, as indicated by links among "missing", "bp", and "oil". Nearly five years after the devastating BP oil spill, local businesses and fishermen along the gulf coast still felt the lasting impact, as stated in a post where links among "2010 deepwater horizon oil spill", "local", and "business" appeared.

Second, BP suffered huge financial loss due to the settlement of the oil spill. The cost of the catastrophic Gulf of Mexico oil spill was estimated by BP as $61.6 billion, as mentioned in posts where links among "catastrophic", "cost", "estimate", and "2010 deepwater horizon oil spill" appeared. As described in posts where links among "bp", "settlement", "2010 deepwater horizon oil spill", "money", "court", "review", "lose" appeared, billions of settlement and fines resulted from the 2010 oil spill; the company requested to have full court review of oil spill settlements and lost the settlement appeal; and whether the BP oil spill settlement money was well-spent was questioned. Moreover, despite the company's $6.5 billion loss, BP CEO Bob Dudley's total compensation rose by more than 20%, as delineated in posts where links among "bp", "ceo", "boss", and "bob Dudley" appeared.

Third, BP tried to avoid admitting some of the long-lasting negative environmental impacts due to the oil spill. The company refuted a study finding oil embedded in the Gulf floor and released a report stating that the 2010 oil spill did not have a lasting impact on the Gulf environment, as described in posts where links among "bp", "refute", and "release" appeared. A former BP executive was accused of lying about how much oil was spilling and the Supreme Court rejected BP executive's appeal over the Gulf of Mexico oil spill, as portrayed in posts where the link between "bp" and "executive" in the lower left of the picture appeared. The link

between "bp" and "cherry-pick" also indicates BP cherry-picked a study to dodge blame for massive deaths of gulf dolphins.

Fourth, in addition to the 2010 oil spill, BP's more recent operations also brought negative environmental impacts and the company kept drilling new wells which might hurt local wildlife and environment. Deep-water drilling was set to resume near the site of the catastrophic BP well blowout, as delineated in a post where links among "catastrophic", "well", and "blowout" appeared. Links among "bp", "quietly", "reveal", "announce", and "Great Australian Bight" indicate BP announced start of major expansion in the Gulf of Mexico, and quietly announced and revealed the planned location of its controversial drilling in the Great Australian Bight, which might hurt animals living in the bight and bring possible spill. Additionally, faced with public outrage and congressional pressure, BP vowed to develop cutting-edge technology that could sharply reduce toxic mercury discharged into Lake Michigan, as delineated in a post where the link between "bp" and "vowed" appeared.

Lastly, BP's operations were unsafe with massive flare-ups, pipeline ruptures, and oil leaks. As described in posts where links among "bp", "pipeline", "rupture", "oil", "well", "leak", "massive", and "flare-up" appeared, a BP pipeline running along Sauls Creek in Bayfield Colorado was discovered ruptured; a BP oil and gas production well in Arctic Alaska's North Slope blew out and the well leaked out of control; the Bay Long oil leak was caused by a federal BP spill restoration contractor; and a massive flare-up lit up the sky at the BP Whiting Refinery.

Network Group 2. Network group 2 is displayed in Figure B2. The three biggest nodes in this picture, "gulf", "dolphin", and "coast", are all relevant to the disastrous environmental impact brought by the 2010 oil spill. The following images of BP are demonstrated by nodes and links in network group 2. First, the 2010 oil spill hurt the wildlife in the Gulf including birds,

dolphins, sea turtles, and corals, which continued to suffer even five years after the spill, as denoted by links among "dolphins", "sea turtles", "coral", and "pelican". As described in posts where links among "failed", "dolphin", "pregnancies", "adult", "deaths", "female", "link", "y01", "bottlenose", "dead", "gulf", and "deaths" appeared, failed dolphin pregnancies, adult deaths, and hundreds of baby dolphin deaths were found to be linked to the 2010 oil spill. A large number of adult female sea turtles were killed in the 2010 oil spill, as indicated by links among "adult", "female", and "population" at the right side of the picture. The link between "dead" and "birds" refers to tens of thousands of dead birds caused by the oil spill; and links among "800000", "birds" and "died" at the bottom of the picture denote an estimated 800,000 birds died as a result of the oil disaster.

Second, the oil spill damaged the natural environment in the Gulf. Links among "coats", "gulf", and "floor" appeared in a post describing scientists' argument that the 2010 oil spill's "marine blizzard" coated Gulf floor area seven times size of New Orleans. Third, the oil spill hurt the local economy in the Gulf area and brought huge loss to local business owners. The Gulf was characterized by debt, stress, and lost dreams for business owners long time after the oil spill, as denoted by links among "gulf", "today", and "debt". Fourth, BP dropped its legal fight against paying $1billion in oil spill damages to Gulf coast fishermen, shrimpers, oystermen and seafood processors, as described in a post where links among "gulf", "coast", "fishermen", and "shrimpers" appeared.

Network Group 3. The network picture of network group 3 is displayed in Figure B3. The primary image of BP demonstrated by nodes and links in network group 3 is BP polluted Lake Michigan through dumping mercury and industrial waste into the lake. As described in posts where links among "dump", "more", "mercury", "bp whiting refinery", "waste", "times",

"toxic", "discharged", "total", and "industrial" appeared, BP's Whiting Refinery discharged about five times more total suspended solids of industrial waste into Lake Michigan than allowed; BP dumped nearly 20 times more toxic mercury into Lake Michigan; and faced with public outrage and congressional pressure, BP vowed to develop cutting-edge technology that could sharply reduce toxic mercury discharged into Lake Michigan.

Network group 3 also demonstrates the negative environmental and ecological effects brought by the 2010 oil spill, which included dumping huge amount of oil into the Gulf, trashing shoreline, hurting sparrows, and extending toxic reach. BP dumped 3.19 million barrels of oil into the Gulf of Mexico in 2010, as denoted by links among "dump", "3.19m", and "barrels"; the 2010 oil spill trashed more shoreline than scientists thought, as indicated by the link between "trashed" and "more"; the oil disaster extended its toxic reach, as stated in a post where the link between "toxic" and "reach" appeared; and scientists analyzed the diet and feathers of sparrows collected more than a year after the spill, as shown by links among "collected", "sparrow", and "more". Additionally, the misuse of the BP spill settlement by a governor was discussed in posts where nodes "more", "misuse", "build", and "wall" appeared.

Network Group 4. Network group 4 is displayed in Figure B4. Again, this network group primarily demonstrates the damages to the Gulf of Mexico brought by the 2010 oil spill, with "oil spill", "damage", "cause", "gulf of mexico", and "environmental" being the five biggest nodes in the picture. The 2010 oil spill brought devastating and long-lasting impact on the environment, ecology, marine life, wildlife, and local businesses in the Gulf of Mexico. As portrayed in posts where links among "biggest", "offshore", "oil spill", "worst", "environmental", and "ecologic" appeared, the 2010 oil spill is the biggest offshore oil spill, the worst spill and the worst environmental disaster in US history, and the worst ecologic disaster in

North American history. As indicated by links among "lasting", "impact", "stain", "continue", "impact", and "gulf of Mexico", the 2010 oil spill brought lasting stain on bird populations and the impacts of the spill continued even six years later. As described in posts where links among "2010", "gulf of Mexico", "oil spill", "cause", "damage", "public", and "value" appeared, the 2010 oil spill caused damage to beaches, animals, fish, and coral that the public valued at $17.2 billion in a new study, and caused damages to cells in human lungs and in the gills of fish and crabs. Links among "oil spill", "compensation" and "environmental" in the left side of the picture indicate indigenous people of Louisiana lacked oil spill compensation and environmental protection.

BP was also portrayed as one of the top environmental, health, and safety violators. The link between "environmental" and "health" appeared in a post describing how think tank Good Jobs First tracked companies that had violated U.S. environmental, health and safety laws and ranked BP as No.1 in the Violation Tracker database. Moreover, BP attempted to reduce its liability and responsibility for the 2010 oil spill. The link between "gulf of mexico" and "appeal" indicates the Supreme Court declined to hear an appeal of BP's liability after the 2010 oil spill. Links among "deputy desk", "staff", "error", and "cause" indicate the 5th Circuit deputy clerk expressed it was staff error that caused an incorrect ruling on BP's requests to have full court review of the oil spill settlement. Lastly, BP's more recent exploration and drilling activities also had possible negative environmental impacts. Links among "devastating", "effect", and "impact" in the upper right of the picture represent the possible devastating impact of BP's more recent exploration and drilling activities on coasts and marine life across much of southern Australian and as far north as New South Wales.

Network Group 5. Network group 5 is displayed in Figure B5. The three biggest nodes "deepwater horizon", "oil disaster", and "disaster", and links among them demonstrate the primary image shown in network group 5 is the 2010 Deepwater Horizon oil disaster. Network group 5 provides details of the oil disaster. In the disaster, 750 million liters of oil were pumped into the Gulf of Mexico, and 11 people died on the Deepwater Horizon, including Jason Anderson, 35, Midfield, Texas, as shown by nodes "pump", "750m", "Jason anderson", "35", "midfield", and "texas". The Deepwater Horizon drilling rig spilled up to 4.6 million barrels of fossil petroleum into the Gulf in 2010, as stated in a post where the link between "drill" and "rig" appeared. A former BP rig supervisor was scheduled for trial on a misdemeanor charge connected to pollution from the 2010 oil spill, as described in a post where the link between "ex-bp" and "rig" appeared.

Network group 5 also shows that survivors and their families still suffered five years after the disaster. The link between "confront" and "deepwater horizon" indicates an artist, whose husband escaped from the oil disaster, used painting as a means of confronting Deepwater Horizon trauma five years after the spill. Despite the devastating disaster, BP resumed deepwater drilling near the site of the catastrophic well blowout and conducted exploration drilling in the most biological important part of the Great Australian Bight, as shown by nodes "deepwater", "drill", "site", "conduct", and "exploration". Lastly, BP was described as a corporate criminal and people resisted the company, as illustrated by links among "confront", "corporate", and "criminal".

Network Group 6. Network group 6 is displayed in Figure B6. The biggest node in this picture is "spill", implying the major image shown by this network group is related to various kinds of spill and the negative influence of the spills. The following images of BP are

demonstrated by nodes and links of network group 6. First, BP failed to ensure safety in its

operations. As portrayed in posts where links among "46", "miles", "coal-bed", "methane",

"produced", "water", "bayfield", and "spill" appeared, BP platform leaked 95 tons of oil into

North Sea and spilled 46 miles off Shetland; the company spilled coal-bed methane produced

water into Sauls Creek and forced the emergency construction of an earth dam to prevent

contamination downstream; and its pipeline ruptured near Bayfield, which resulted in spills into

Sauls Creek.

Second, the 2010 oil disaster seriously hurt Louisiana, with its coastline changed forever,

its economy, environment, and people hurt, and the indigenous people lacking oil spill

compensation and environmental protection, as denoted by the node "louisiana", and nodes

around it such as "face", "water", and "lack". Third, BP's more recent activities such as

exploration and drilling in the Great Australian Bight might bring devastating impact. Nodes

"official", "model", and "predicted" indicate BP's own oil spilling modeling predicted the oil

spill in the Great Australian Bight could devastatingly impact across much of southern

Australian and reach New South Wales. Lastly, nodes including "fossil", "fuel", "divestment",

and "campaigners" denote that World's largest health charity Bill and Melinda Gates

Foundation's divestment of its entire holding in BP was welcomed by fossil fuel divestment

campaigners.

Network Group 7. Network group 7 is displayed in Figure B7. The node "united states"

is the biggest node in this network picture. The following images of BP are demonstrated by

nodes and links of network group 7. First, as the worst environmental disaster in the US history,

the 2010 oil spill exerted devastating negative effect on the environment, animals, and human

health. The NASA/United States Geological Survey annual maps of the Louisiana marshlands

revealed the spill caused dramatic, widespread shoreline loss, as denoted by links among "united states", "nasa", "geological", "survey", and "annual". The oil spill caused the highest number of animal stranding and deaths between 2010 and 2011, as indicated by the link between "highest" and "number" at the top of the picture. The oil spill cleanup workers sued BP for medical problems that surfaced later in life and their trails for medical lawsuits over the spill were approved by a judge, as illustrated by nodes "workers" and "cleanup" at the right side of the picture and links among "judge", "approves", "jury", and "trial".

Second, the oil spill brought huge burden to US taxpayers and enormous financial cost to BP. The link between "united states" and "taxpayer" appeared in a post stating that the oil spill hurt US taxpayers, for they would subsidize $15.3 billion for BP's final $20 billion settlement. A judge put BP's top fine at $13.7 billion for the oil disaster and US sought $18 billion for fines, as indicated by nodes "united states", "sought", "judge", and "put"; and BP executive's appeal over the spill was rejected by the Supreme Court, as denoted by the link between "supreme court" and "rejects".

Network Group 8. Network group 8 is shown in Figure B8. As the two biggest nodes "five" and "years" demonstrate, network group 8 primarily focuses on five years after the 2010 oil spill. As nodes such as "5th" "mark", and "anniversary" represent, the anniversary of the oil spill was honored at the Facebook page of Boycott BP. Nodes such as "5", "7", and "years" also imply the negative influence of the oil spill lasted for 5 to 7 years. In addition, links among "began", "spewing", "natural", "gas", and "production" denote BP's damaged well in the Alaskan Arctic began spewing natural gas vapors and a BP oil and gas production well in Alaska North Slope blew out. In a word, the primary image of BP demonstrated by nodes and links of

network group 8 is the long-lasting negative impact of the 2010 oil spill. Network group 8 also shows BP failed to ensure safety in its operations in Alaska.

Network Group 9. Network group 9 is displayed in Figure B9. This network group mainly describes the Boycott BP movement and the Boycott BP Facebook page. Nodes in this network picture show Boycott BP called on people to never forget April 20, 2010, when the Deepwater Horizon oil disaster happened. Nodes such as "facebook", "disables", and "criticize" denote Facebook used to briefly disabled a page advocating a boycott of BP on Boycott BP's Facebook and the advocacy group Public Citizen criticized Facebook for this.

Network Group 10. Network group 10 is displayed in Figure B10. The major theme of this network group is boycotting BP and BP brands including Castrol, Arco, Aral, am pm, and Amoco. Other nodes show actors including Mark Rylance and Emma Thompson, along with some academics and politicians, urged the British Museum to drop BP as a sponsor.

Network Group 11. Network group 11 is displayed in Figure B11. Again, most nodes in this network picture demonstrate the negative influence of the 2010 oil spill. The spill wrecked the oyster industry in the Gulf and hurt the 1.1-billion-dollar seafood industry in Louisiana, as denoted by links among "wrecked", "oyster", "farming", "take", "hold", "industry", "seafood", "state", "1_1bn", "dollar", and "suffer" in the upper left of the picture. As described in posts where links among "kill", "marsh", "fouled", "beach", "widespread", "land", "shoreline", and "loss" appeared, the oil spill killed marsh plants, fouled beaches, and caused widespread land and shoreline loss. Links among "oyster", "newly", "hatched", "blue", "crab", "gills", "fish", "lung", "land", "animal" indicate the oil spill hurt animals extensively. BP oil mat and tar balls were visible on East Grand Terre Island; crews tried to clean up the largest tar mat seen in Louisiana in more than a year after the spill; and a 10 million gallon 'bath mat' of oil was found

on the floor of the Gulf of Mexico, as denoted by links among "mat", "tar", "bath", and "gallon" in the upper right of the picture. In a word, the 2010 oil spill hurt the wildlife, the environment, and local businesses in the Gulf, and resulted in long-lasting pollution in the area.

Moreover, in its more recent activities, BP polluted Lake Michigan by discharging toxic mercury into the lake, as denoted by the link between "kill" and "lake michigan". Lastly, BP received top fines for the spill and taxpayers were hurt because of the subsidies. Nodes at the bottom part of the picture primarily demonstrate the top fine BP received for the oil spill disaster was $20.8 billion, and $15.3 billion in subsidies were to be paid for by taxpayers. These nodes also show BP's CEO still got 20% pay rise despite firm loss. In addition, nodes "coastal", "restoration", "restore", and "oyster" are related to the misuse of the BP oil spill settlement money. Boycott BP questioned whether the settlement money was well used and spent on coastal restoration and restoring oyster reefs.

Network Group 12. Network group 12 is displayed in Figure B12. Network group 12 primarily demonstrates how media and researchers in different research organizations found the long-lasting negative impacts of the 2010 oil spill on environment such as oil and dispersant contamination. A study led by Florida State University Professor of Oceanography Jeff Chanton found 6 million to 10 million gallons of crude oil were buried in the sediment on the Gulf floor, as denoted by links among "florida state university", "professor of oceanography", "jeff chanton", and "find". Reporters in WWL-TV found crews trying to clean up the largest tar mat seen in Louisiana in more than a year after the spill, as indicated by the link between "wwl-tv" and "find".

The spill also hurt health of humans and wildlife. Links among "dispersant", "compound", "confirmed", "find", and "use" indicate the dispersant most often used during the

spill might cause damage to cells in human lungs and in the gills of fish and crabs and dispersant contamination was found in the eggs of pelicans. Cleanup workers launched medical lawsuits over the spill, as illustrated by links among "medical", "problems", and "lawsuits" at the lower part of the picture. Florida's oil and medical problems still evaded national attention even five years after the oil spill, as represented by links among "evade", "national", and "attention". Additionally, as described in a post where links among "faulty", "potentially", and "use" at the top of the picture appeared, BP used potentially faulty equipment to drill for oil in the great Australian bight.

Network Group 15. Network group 15 is displayed in Figure B15. Nodes and links in this network group demonstrate the negative impacts of the 2010 oil spill. The spill harmed marine life and resulted in the longest and largest marine mammal (e.g., dolphins and whales) die-off in the Gulf, as denoted by links among "marine", "life", "mammal", "whale", and "die-off". Cat Island, one of the four largest bird-nesting grounds in Louisiana, was disintegrated by the oil spill, as illustrated by nodes "bird-nesting" and "ground". In addition, BP's drilling and exploration activities in the Great Australian Bight, an internationally-recognized sanctuary for southern right whales and a whale breeding ground, might bring possible negative impact, as indicated by links among "southern", "Australian", "right", "whale", and "breeding".

Frequency Table and Centrality Measures. Table B1 lists the nodes ranked from 1st to 50th on frequency. Tables B2, B3, and B4 list the total-degree centrality, betweenness centrality, and closeness centrality of the nodes that are ranked from 1st to 70th on the three centrality measures. The values and unscaled values of the three centrality measures are also presented in the three tables. Values in each table are standardized values scaled to go between 0 and 1, in

such a way that networks of different sizes can be compared. Table B5 lists the top scoring nodes ranked from 1st to 100th side-by-side for the three centrality measures.

The 2010 Deepwater Horizon oil spill and its negative impact are major themes shown by top ranked nodes in Table B1 and top scoring nodes in Table B5. In Table B1, nodes such as "2010 deepwater horizon oil spill" (#2), "gulf" (#5), "deepwater horizon" (#6), "gulf of mexico" (#7), "dolphin" (#10), "spill" (#11), "Louisiana" (#12), "damage" (#13), "oil spill" (#15), "coast" (#16), "disaster" (#17), and "2010" (#20) all hold relatively high ranks. Similarly, in Table B5, nodes directly addressing the 2010 oil spill such as "2010 deepwater horizon oil spill", "spill", "gulf", "oil disaster", "deepwater horizon", "blowout", "disaster", and "oil spill" are ranked high on three centrality measures. Nodes such as "dolphin", "five", "years", "gulf of mexico", "damage", "catastrophic", "environmental", "kill", "marine", "business", and "deaths", which are related to the long-lasting negative environmental, ecological, and economic impacts of the 2010 oil spill, are also ranked relatively high in Table B5. Most of the nodes addressing the 2010 oil spill and its negative impacts are ranked above 25th in Table B5.

The economic burden brought by the 2010 oil spill to BP is demonstrated by nodes "pay", "settlement", "estimate", "fine", and "20bn" in Table B5. The negative environmental effect of BP's more recent activities is shown by nodes "great Australian bight" (#24), "lake michigan" (#34), and "dump" (#40) in Table B1 and "great Australian bight", "drill", "dump", "discharged", "mercury", and "methane" in Table B5. In a word, the images of BP shown by the three centrality measures are consistent with the images shown by the 16 network group pictures and the node frequency table. Results from the semantic network analysis of the messages grabbed from the Facebook page of Boycott BP demonstrate that most content on the Facebook

page focuses on the 2010 Deepwater Horizon oil spill and its negative environmental, ecological, and economic impacts.

Summary of BP's Images. To summarize, the dominant nodes listed in Tables B1, B2, B3, B4, and B5, and the 16 semantic network groups generated in ORA based on the messages collected from the Facebook account of Boycott BP show the images presented on the Facebook page of Boycott BP are primarily negative images related to the 2010 Deepwater Horizon oil spill and its negative impacts. BP's images related to the 2010 oil spill can be summarized as follows. First, the negative effect of the 2010 oil spill is massive, catastrophic, disastrous, and long lasting. The 2010 oil spill is the biggest offshore oil spill and the worst environmental and ecologic disaster in the US history. In the oil spill, 11 people died, and the Deepwater Horizon drilling rig spilled up to 4.6 million barrels of fossil petroleum into the Gulf. The oil spill trashed more shoreline than scientists thought, and the oil disaster extended its toxic reach. Second, the oil spill not only severely harmed local businesses such as oyster and sea food industry, but also brought extensive environmental damage to the Gulf of Mexico. Gulf business owners including fishermen and shrimpers suffered debt and stress and lost their dreams. Louisiana's coastline was changed forever; the state's economy and people were hurt; and the indigenous people lacked oil spill compensation and environmental protection. The oil spill killed marsh plants, fouled beaches, and caused widespread land and shoreline loss. Dolphins, sea turtles, whales, oysters, fish, blue crabs, pelican, bottlenose, and various kinds of birds were all hurt by the spill. Third, the health of many types of wildlife and local residents were seriously harmed by the oil spill. Oil spill cleanup workers sued BP for medical problems that surfaced later in life. Although the 2010 oil spill is catastrophic and seriously hurt people, wildlife, environment, and economy in the Gulf, semantic network analysis of the messages from the Facebook page of Boycott BP still

somewhat demonstrates that BP tried to avoid admitting some of the long-lasting negative environmental impacts brought by the spill. The analysis also demonstrates the huge financial cost BP suffered due to the oil spill and the company attempted to reduce its financial responsibility on the disastrous effect of the oil spill.

In addition to the dominant themes of the 2010 oil spill and its negative impacts, safety problems and the negative environmental impact of the relatively more recent operations of BP are also represented by some nodes and links. BP dumped nearly 20 times more toxic mercury into Lake Michigan and the Whiting Refinery discharged about five times more total suspended solids of industrial waste into Lake Michigan than its permit allowed. BP platform also leaked 95 tons of oil into North Sea and spilled 46 miles off Shetland. The company also spilled coal-bed methane produced water into Sauls Creek and forced the emergency construction of an earth dam to prevent contamination downstream. BP's operations were unsafe with massive flare-ups, pipeline ruptures, and oil leaks. The think tank Good Jobs First tracked companies that had violated US environmental, health and safety laws and ranked BP as No.1 among top environmental, health, and safety violators in the Violation Tracker database compiled by the organization. Some nodes and links also indicate the possible negative impact of drilling new wells in the Great Australian Bight, an internationally-recognized sanctuary for southern right whales and a breeding ground for whales. Other nodes and links also describe the Boycott BP movement, which called for boycotting BP and its brands including Castrol, Arco, Aral, am pm, and Amoco. Boycott BP also applauded Bill and Melinda Gates Foundation's divestment of its entire holding in BP and some actors, academics, and politicians' urge to drop BP as a sponsor of the British Museum.

Semantic Network Analysis of the Facebook of BP

The semantic networks generated in ORA are based on the semantic network analysis of the textual data collected from the Facebook page of BP, including 349 posts posted from July 1st, 2016 to June 30th, 2017. The overall network picture is displayed in Figure A2 in Appendix A. The overall semantic network includes 17 network groups, with nodes in same colors belonging to same groups, based on the Newman grouping algorithm. The pictures of these 17 network groups are displayed in Appendix C. All nodes in these pictures are sized by total-degree centrality values. In the following sections, the interpretation of 13 of the 17 network group pictures is presented. Network groups 11, 12, 13, and 17 include much fewer nodes compared with other networks and the images of BP as demonstrated by these network groups are also demonstrated in the 13 groups interpreted below.

Network Group 1. Network group 1 is displayed in Figure C1. It is not surprising that "BP" is the biggest node in the network picture, because this is the company name. The following images of BP are demonstrated by nodes and links in network group 1. First, safety was an essential value of BP and the company had been making great effort to develop a culture of safety. Employees in different positions all expressed safety was an essential value of BP, as indicated by nodes around "BP" including "process asset development engineer", "strategic procurement manager", "facilities engineer team lead", "crisis management leader", and "senior drilling engineer", along with nodes around them such as "explains". To protect the privacy of these employees, their names are not shown in the network picture. The BP Strategic Procurement Manager thought of safety as an attitude that she brought to work each day; a BP Facilities Engineer Team Lead described process safety—and the crucial part she played in it; a BP Crisis Management leader showed her and her co-workers' dedication to safety and each

other; a BP Senior Drilling Engineer discussed building safety into everything from design through operations; and a BP Wellsite leader explained how every task was assessed for risk to increase safety. Links among "empower", "every" and "employee" and the link between "24-hour" and "support" demonstrate BP's tactics to ensure safety in its operations by empowering every employee to stop a job if something didn't seem right and providing state of the art technology and 24-hour support. High technologies, such as underwater robots and FLIR cameras, a new thermal imaging technology, were used by BP engineers to improve safety, as denoted by links among "engineers", "use", and "flir". Node "culture" represents a culture of safety as well. In addition to safety, efficiency was also valued by BP. A BP Process Asset Development Engineer explained how efficiency and safety went hand-in-hand at BP. BP was trying to develop new technology to make operations safer and more efficient; for example, designing a new shipping fleet and exploring the technology of automation, as described in a post where the link between "more" and "efficient" appeared.

Nodes and links in network group 1 also demonstrate that BP made great contributions to the American economy. BP invested more in the US than in any other country and reinvested every dollar earned in the US back into the country, as illustrated by nodes "invest", "reinvests", "every", and "dollar". The company had made contributions to Alaska's economy through production at Prudhoe Bay oil field. Nodes "celebrate", "40years", and "mark" indicate BP celebrated 40 years of production at Prudhoe Bay oil field in Alaska and marked 40 years on Alaska's North Slope. BP also contributed to Ohio's economy through huge investment in the state. The link between "capital" and "spend" refers to the fact that the BP-Husky Toledo Refinery had a capital spend of $150 million in 2015, which helped Ohio's economy.

Another image that is demonstrated by nodes and links in network group 1 is BP maintained highly advanced infrastructures. For example, as portrayed in a post where links among "approves", "mad dog platform", and "operate" appeared, BP's Mad Dog platform operated at a water depth of 4,500 feet, which was more than seven times the height of the Seattle Space Needle. BP also completed upgrade of its South Carolina petrochemical facility, as indicated by the link between "BP" and "complete".

Network group 1 also demonstrates that BP was one of the world's leading companies, as represented by the link between "leading" and "company". The company operated the largest renewable business of any major oil and gas company, was one of the top wind energy producers in the US, and directly operated 14 wind farms onshore in eight states, as indicated by nodes "BP", "operate", "wind energy", "producer", "8", and "state". Its Lower 48 onshore business was one of America's largest natural gas producers, as denoted by links among "largest", "natural gas", and "producer"; and its Texas City Chemicals plant was a leading producer of paraxylene & metaxylene, as suggested by the link between "leading" and "producer". Furthermore, BP was an active participant of international energy conferences and published reliable and insightful report on the energy industry. Nodes "cera week", "ihs energy", and "international energy conferences" imply BP was an active participant in IHS Energy CERAWeek, and node "energy outlook" is the name of BP's report on the energy industry.

BP also made great effort to give back to the society, as implied by the second biggest node "support". The company sponsored the US Paralympics national teams, as denoted by nodes "proudly", "sponsor", and "athlete ambassador". BP also supported institutions and initiatives that strengthened the communities where its employees lived and worked and donated over a million dollars to US community programs, as implied by nodes "support" and "donate".

The BP Foundation matched employee volunteer hours and contributions with grants in 2015, as shown by links among "employee", "volunteer", "matched", and "the bp foundation". Additionally, BP and GE launched new offshore digital technology with plans to deploy globally, as indicated by nodes "launch" and "ge"; and BP celebrated International Women's Day, as suggested by node "IWD2017".

Network Group 2. Network group 2 is displayed in Figure C2. The six biggest nodes in this network group picture are "team USA", "energy within", "United States", "paralympian", "team", and "offshore", which reflect the main image demonstrated by network group 2 is BP as a sponsor of the US Paralympics national teams and a supporter of Team USA Paralympians. The network group picture is visually divided into the left and right parts. Nodes in the left part which are located around "team USA", "energy within", and "paralympian" such as "olympic", "nbc", "rio 2016 paralympic games", "road to rio", and "bp team USA" are also related to the Rio 2016 Paralympic Games where Team USA participated in the competition. Other nodes that are located around the four big nodes in the left part of the picture such as "the armless archer", "matt Stutzman", "brad synder usa", "lex gillette", "tatyana mcfadden", "melissa stockwell usa", "swimmer", and "nathan adrian" show the roles and names of athletes who achieved great success in the Rio 2016 Paralympic Games as members of Team USA. Nodes that are located in the right part of picture such as "national", "teams", and "Paralympics" are also related to BP's image as a supporter of Team USA Paralympians. In a word, as a sponsor of the US Paralympic national teams, BP was trying to create a positive link to Team USA and its spirit: discovering the energy within. In addition to supporting the US Paralympic national teams, nodes located in the upper right of the left part of the picture such as "bp ms 150", "end", "multiple sclerosis", "team bp", and "riders" demonstrate that BP also sponsored the BP MS 150, a two-day

fundraising bike ride organized by the National MS (multiple sclerosis) Society to help end multiple sclerosis. BP's sponsorship of the US Paralympics national teams and BP MS 150 reflects the company's effort to give back to the society.

BP's image of giving back to the society is also reflected by the company's actions of supporting local schools and communities. Links among "local", "community", and "program" denote BP donated millions to US community programs and made efforts to support local communities. The company's Texas City Chemicals had made significant contributions to the southeast Texas economy and local schools for over a half of a century, as stated in a post where the link between "local" and "school" appeared.

Second, BP made contributions to the American economy. Links among "economic", "impact", and "report" at the bottom of the left part represent BP worked to make America stronger as shown in a U.S. Economic Impact Report. BP's Whiting Refinery had been a key anchor of the Indiana economy since 1889, as denoted by the link between "Indiana" and "economy". And BP worked with 13,000 local businesses and no energy company had invested more in America over a decade, as stated in posts where links among "13000", "local", and "vendors" appeared.

Third, safety was considered as an essential value in BP. As portrayed in posts including "offshore" and "team", the two biggest nodes in the right part of the picture, and nodes around these two such as "drill", "safely", "keep an eye", "weather", "train", and "rig", BP took many actions such as monitoring weather conditions around the world and risks in the Gulf during hurricane season, providing 24/7 support to its offshore teams, and training and retraining teams in virtual reality simulators for safe offshore drilling to ensure safety.

Fourth, BP employed former coast guard members, hired navy service members, and celebrated the US Navy's birthday, as indicated by nodes "former", "coast guard", "navy", and "service". In Chicago and Houston, BP hired for its supply and trading Military Placement Program, as described in a post where "Houston" and "Chicago" appeared. Fifth, BP was innovative in enhancing its service such as designing a music-loving personality pump Miles, the company's first intelligent gas pump, as described in posts where links among "select", "BP station", "Chicago", "New York City", and "locations" appeared. Sixth, BP intended to convey an image that its employees enjoyed working in the company. Links among "Houston", "enjoy", "holiday", "favorite", "performed", and "music" denote BP's employees performed and enjoyed holiday music in Houston. Seventh, as delineated in a post where the link between "Huston" and "area" appeared, BP's Texas City Chemical's facility could house all 122 high-school football fields in the Houston area. Lastly, the link between "Houston" and "Chicago" indicates BP employees marched in several Pride events in Anchorage, Chicago, and Houston.

Network Group 3. Network group 3 is displayed in Figure C3. Nodes and links in network group 3 demonstrate the following images of BP. First, safety was considered as an essential value of BP and the company made big efforts to cultivate a culture of safety. The central node of the part located in the upper left of the network group picture is "safety". As stated in posts where links among safety and nodes around it in this part of the picture appeared, in BP every task was assessed for risk to increase safety—even down to the smallest procedures such as sweeping the deck; safety was built into everything from design through operations; process safety was considered as important; and BP used technology to predict, identify and prevent potential safety challenges. As described and stated in posts where links among "closely", "monitor", "24/7", "back", "risk", and "refinery" in the left of the picture appeared,

BP closely monitored weather in the gulf; its wind farms were monitored 24/7 at its Remote Operations Center; and its offshore teams were backed by 24/7 support from its Houston monitoring center.

Second, network group 3 shows that BP maintained very high production capacity. Nodes in the lower right part of the picture such as "generate", "produce", "enough", "electricity", and links among them demonstrate BP's wind farm in Colorado could generate enough electricity to power approximately 65,000 average homes for a year; a BP wind farm in West Texas could generate enough electricity each day to power 43,000 homes; its US wind farms had a gross generating capacity to provide enough electricity to power all the homes in a city the size of Philadelphia; its Whiting Refinery was the largest refinery in the Midwest, which could produce enough gasoline each day to fuel 6 million cars; and it delivered enough fuel in 2015 to run all the cars in Indiana, Ohio and Washington state for the entire year.

Third, BP was technologically advanced. As portrayed in posts where links among "big", "geophysical", and "data" at the bottom right of the picture appeared, BP considered big data analysis as a required core competency for the energy industry as a whole, and processed geophysical data at its Center for High-Performance Computing in Houston, which was home to one of the world's largest supercomputers for commercial research. The company unveiled its first intelligent gas pump Miles at US retail stations, as represented by nodes "unveils", "personality", "pump", and "meet Miles" at the upper right of the picture.

Other images displayed by network group 3 are listed as follows. BP maintained outstanding financial performance. Its US operations generated $80 billion in economic value in 2015, as denoted by the link between "operations" and "generate". Its Cooper River Chemicals infrastructure improvements could reduce its electricity consumption by about 40%, as stated in

a post where the link between "electricity" and "consumption" appeared. And its brand Castrol supplied lubricants to help wind turbines run reliably and efficiently, as indicated by links among "wind", "turbines", and "run" in the lower left part of the picture.

Network Group 4. Network group 4 is displayed in Figure C4. The biggest node in this network group picture is energy. The following images of BP are demonstrated by nodes and links in network group 4. First, BP was a leader in the renewable energy business. As delineated in posts where links among "renewable", "energy", and "asset" appeared, BP had the largest operated renewable energy business of any major international oil and gas company; and its renewable assets included 14 onshore wind farms located everywhere from the Hawaiian island of Maui to the green hills of northeast Pennsylvania. Second, BP provided insightful reports on the energy industry. The link between "world" and "energy" primarily represents BP's Statistical Review of World Energy. Links among "global", "energy", and "market" appeared in posts introducing the discussion of global energy market in BP's Statistical Review and describing BP executives provided the latest developments in the global energy landscape at the Offshore Technology Conference (OTC).

Third, BP produced reliable products and maintained great brands. Nodes "brand", "castrol", "supply", "lubricant", "keep", "engines", and "move" indicate BP's global lubricant brand Castrol supplied lubricants to help wind turbines run reliably and efficiently, provided fuels and lubricants for Renault Sport Formula One, and kept engines moving across the Americas. Fourth, BP was a leader in the industry. As stated in posts where links among "global", "aluminum", "industry", "trading" and "business" appeared, BP's Cherry Point Refinery made major contributions to the global aluminum industry; its energy trading business was keeping the world's energy moving; and its marketing and trading business was the No.1

marketer of natural gas in North America. Fifth, BP engineers used underwater robots to keep watch over safe operations from thousands of feet above, as denoted by the link between "keep" and "watch". Lastly, one of the US Paralympians BP supported Matt Stutzman was the #1 archer in the US and wanted to be the best archer in the world, as illustrated by links among "best", "archer", and "no_1".

Network Group 5. Network group 5 is displayed in Figure C5. The five biggest nodes in this network group picture are "new", "technology", "oil", "make", and "help", which demonstrate that new technology is a key theme in this picture. The following images of BP are demonstrated by nodes and links in network group 5. First, BP was technologically advanced and valued new technology as the company's culture. As delineated in posts where nodes around the big node "technology" including "new", "thermal imaging", "drone", "expands", "digital", "rocks", "identify", "additional", and "resources" appeared, BP adopted FLIR cameras to inspect difficult-to-reach pipelines in Alaska; BP was pioneering drone technology to monitor refinery operations; BP expanded digital rocks technology program; and the company took leap forward in seismic imaging technology to identify additional resources in the Gulf. Moreover, links among "love", "science", and "technology" denote BP loved science, technology, engineering, and math (STEM).

Second, safety was considered as one of the essential values of BP. Links among the four big nodes "technology", "help", "make", and "oil" indicate technology helped make oil and gas operations safer. As portrayed in posts where nodes "new", "technology", "shipping", "fleet", "32", "new", "engineer", "fuel", and "transport" appeared, BP celebrated inventors who developed new technology to make operations safer and efficient, designed a new shipping fleet to enhance safety, and engineered 32 new ships with advanced technology to transport oil and

gas safely. Third, BP was a company with a great history. For example, BP was a pioneer to explore Alaska around 40 years ago. As stated in a post where the link between "new" and "territory" appeared, BP's original North Slope pioneers charted new territory working and living in a polar environment and many of them were still there some 40 years later.

Fourth, BP maintained outstanding production capacity. BP's Whiting Refinery was the largest refinery in the Midwest and could produce enough gasoline each day to fuel 6 million cars, and its Cherry Point Refinery helped fuel cars, trucks, and airplanes throughout the Pacific Northwest, as stated in posts where links among "fuel", "6million", "cars", and "trucks" appeared. Fifth, BP made contributions to economies of different states including Ohio, Texas, and Alaska. BP-Husky Toledo Refinery helped Ohio's economy, as denoted by the link between "help" and "ohio"; its Texas City Chemicals had made significant contributions to the southeast Texas economy and local schools, as indicated by links among "make", "significant", and "contributions"; and BP was a pioneer to explore Alaska, as mentioned above.

Sixth, BP gave back to the society. As suggested by the big node "help" and nodes around it including "strengthen", "children", and "family", BP helped strengthen communities from Alaska to South Carolina and its Whiting Refinery raised more than $300,000 to help children, families, and seniors across Lake County. Lastly, the company was a leader in the industry and provided insightful industry reports such as BP Statistics. Trends in the industry, such as how oil demand was affected by electric vehicles, drew attention from the company, as denoted by links among "new", "electric", "vehicles", "cars", "affect", "oil", and "demand".

Network Group 6. Network group 6 is displayed in Figure C6. There is no node that is relatively bigger than other nodes in the picture. Node "job" and nodes around it including "16200", "13600", "145000", "7200" and "American" all indicate BP supported American jobs,

which is the primary image demonstrated by network group 6. More specifically, BP supported

13,600 jobs in Indiana, 16,200 jobs across Alaska, and more than 7,200 jobs in Washington with

over 900 directly employed by the company. And a post states that BP supported 145,000

American jobs from Alaska to the Gulf of Mexico. Another image of BP displayed by network

group 6 is offering jobs to military personnel and veterans. As portrayed in posts where links

among "unrivaled", "experience", and "outstanding" appeared, BP launched round two of its

Military Placement Program and thought military personnel could offer unrivaled experience,

outstanding personal qualities, and a wealth of transferrable skills. Network group 6 also shows

BP presented an attitude of valuing teachers. Links among "recognizes", "29", "outstanding",

"teacher", and "statewide" indicate BP Alaska recognized 29 outstanding teachers statewide; and

nodes "national teachers day" and "thank a teacher" denote BP celebrated National Teachers

Day with a hashtag #ThanksATeacher.

Network Group 7. Network group 7 is displayed in Figure C7. As in network group 6,

there is no node in this picture that is relatively bigger than other nodes. The following images of

BP are demonstrated by nodes and links in network group 7. First, BP was technologically

advanced, valued technology, was an active participant in OTC, and loved STEM. Nodes

"bp_tech", "stem", and "otc2017" represent hashtags #BPtech, #STEM, and #OTC2017

respectively. Links among "encouraging", "stem", "future", "energy challenge", "offshore

technology conference" indicate BP encouraged STEM through mentorship and supported the

inaugural OTC Energy Challenge, which encouraged future innovators.

Second, BP attempted to give back to the society. Node "second harvest food bank"

refers to the largest charitable anti-hunger network in South Louisiana; and with the help of BP,

the NGO distributed 500,000+ bags to mailboxes across the metro area in its biggest one-day

food drive of the year. Third, BP maintained good infrastructures and high production capability.

As delineated in posts where links among "pipeline", "network", "carrying", "1.3million", and

"barrels" appeared, BP's US pipeline network spanned for nearly 4,000 miles; and every day

BP's 4,000 miles of pipelines carried 1.3 million barrels of crude oil, natural gas liquid, and

refined products. Fourth, BP valued sustainability by investing in a low-carbon future, as denoted

by the link between "low-carbon" and "future". Fifth, BP had a great history of making

explorations in Alaska and supporting its economy. The link between "Prudhoe bay" and "field"

represents BP's Prudhoe Bay oil field in Alaska, which had a history of more than 40 years and

supported more than 16,000 jobs. Lastly, BP used FLIR cameras to inspect difficult-to-reach

pipelines in Alaska, as illustrated by links among "inspect", "difficult to reach", and "pipeline".

Network Group 8. Network group 8 is displayed in Figure C8. Again, there is no node

that is relatively bigger than other nodes in the picture. The following images of BP are

demonstrated by nodes and links in network group 8. First, BP supported women in career

development in the STEM field. A senior mathematician employed by BP was the first female

employee admitted to the computer department's Senior Luncheon Club in 1967, as stated in a

post where the link between "first" and "female" appeared. In a post where the link between

"first" and "women" appeared, BP stated it was time to celebrate #INWED17 (International

Women in Engineering Day 2017) with one of the first women to drill in the Mediterranean.

Second, BP was a company with great history. As described in a post where the link

between "bp whiting refinery" and "first" appeared, BP's Whiting Refinery first opened in 1889,

as part of John D. Rockefeller's Standard Oil Company, and it had been a key anchor of the

northwest Indiana economy for more than 125 years. As stated in a post where the link between

"first" and "power" appeared, the Wright brothers piloted the first powered airplane in 1903 and Air BP had served the aviation industry for 90 years.

Third, BP maintained high production capacity and provided large-scale services. BP's wind farm in Colorado could generate enough electricity to power approximately 65,000 average homes for a year and its wind farm in West Texas could generate enough electricity each day to power 43,000 homes, as denoted by links among "power", "approx.", "65000", "average", "43000", and "home". BP's ampm stores served 24 million customers per month, as denoted by links among "store", "serve" and "24million".

Network Group 9. Network group 9 is displayed in Figure C9. No node is relatively bigger than other nodes. The following images of BP are demonstrated by nodes and links in network group 9. First, BP was committed to environmental protection. Its Cooper River Chemicals plant decreased greenhouse gas emissions and electricity consumption by about 40% with infrastructure improvements and had a distinguished record of environmental stewardship with its employees showing support for the local wildlife around the facility, as denoted by links among "cooper river chemicals", "infrastructure", "facility", "plant", "decreased", and "greenhouse". The nearly 6,000 acres of BP's Cooper River facility included five distinct types of habitats and occupied only 450 acres of its 6,000-acre uplands and wetlands preserve.

Second, BP maintained outstanding infrastructures and kept upgrading and improving them. As described in posts where links among "texas city chemicals", "plant", "facility", "petrochemical", and "spar" appeared, BP's Texas City Chemical's facility could house all 122 high-school football fields in the Houston area; the company completed upgrades of South Carolina petrochemical facility; and its only floating spar facility in the Gulf was Mad Dog platform.

Third, modern technologies were used by BP to enhance safety. The link between "underwater" and "robots" indicates BP engineers used underwater robots to keep watch over safe operations from thousands of feet above; and links among "meet", "five", "cool", and "robots" represent meeting five cool robots, including the one that helped BP safeguard maritime environments and rapidly respond to crises.

Network Group 10. Network group 10 is displayed in Figure C10. Node "cherry point refinery" seems to be the central node in this picture. The following aspects of Cherry Point Refinery were described in posts where nodes around "cherry point refinery", including "provide", "manages", "improve", "located", "environmental", and "standards", appeared. The refinery located in Blaine, Washington had been operating since 1971 and supported 7,200 jobs. It provided a majority of the jet fuel used at international airports in Seattle, Portland, and Vancouver and managed 2,500 acres of land used for ecological restoration & habitat preservation around the refinery. Since 2002, BP had invested $1B+ to modernize it and improve its environmental standards & efficiency. And environmental stewardship was part of Cherry Point Refinery's business. These aspects of Cherry Point Refinery reflect BP's commitment to environmental protection, the effort it made, and its outstanding infrastructures.

Network group 10 also demonstrates BP was a leader in exploring renewable energy. Links among "onshore", "wind farm", and "located" indicate BP's renewable assets included 14 onshore wind farms located in nine states from the Hawaiian island of Maui to the green hills of northeast Pennsylvania. Third, BP valued safety and adopted new technologies to enhance safety. Links among "virtual reality", "onshore", "simulator", and "immersive" denote BP teams were trained and retrained in virtual reality simulators to be better prepared for any situation. Fourth, BP maintained high production capacity. As mentioned above, Cherry Point Refinery

provided a majority of the jet fuel used at several international airports. And links among "pipelines and logistics", "pipelines logistics business", "manages" reflect every day BP's US Pipelines & Logistics business managed nearly 4,000 miles of pipeline, which carried 1.3 million barrels of crude oil, natural gas liquids and refined products. Lastly, BP shared insight on energy industry. BP executives provided the latest developments in the global energy landscape at OTC, as denoted by the link between "executives" and "provide".

Network Group 14. Network group 14 is displayed in Figure C14. The node "performance" is the central node in this network picture. Links among "financial", "quarter", and "performance" represent BP's financial performance. Nodes "most", "heroic", "sport", "medal", and "performance" denote the good performances of athletes of BP-supported Team USA in Rio 2016 Paralympic Games. The link between "required" and "performance" appeared in a post arguing Castrol EDGE bio-Synthetic, a revolutionary new approach to motor oils, was a car oil that not only can give the high level of performance required by today's engines, but can also harness the natural lubricating properties of plants. In addition, the link between "required" and "core" indicates BP considered big data analysis as a required core competency for the energy industry and actively used it to enhance operations and safety. In a word, images of BP demonstrated by nodes and links in network group 14 include good financial performance, supporter of Team USA in Paralympic Games, excelling in big data analysis, and good products and brands.

Network Group 15. Network group 15 is displayed in Figure C15. One image of BP demonstrated by network group 15 is maintaining good infrastructures. Links among "thunder horse", "south expansion", and "project" represent BP's Thunder Horse South Expansion project, which involved ports in Texas, Louisiana and Alabama; links among "regulation football

fields", "thunder horse", and "platform" appeared in posts stating BP's Thunder Horse platform's main deck was big enough to fit nearly three regulation football fields; and links among "6", "major", and "project" refer to BP's six major projects in 2016. The other image shown by network group 15 is BP operated the largest renewable energy business. Links among "major", "international", and "oil and gas company" appeared in posts stating that BP had the largest operated renewable energy business of any major international oil and gas company.

Network Group 16. Network group 16 is displayed in Figure C16. Network group 16 demonstrates BP attempted to create positive links to respected organizations by sending birthday greetings. Nodes "birthday", "happy", and the numbers linked to them indicate BP made greetings to US marine corps on its 241st birthday and thanked the men and women who serve, made greetings to US Navy on its 241st birthday and thanked all the Navy service members including BP employees who used to be the Navy service members, and made greetings to the United States Army on its 242nd birthday, to the United States Air Force on its 69th birthday, and to the US Coast Guard on its 226th birthday. BP also thanked its wonderful employees and hoped they have a happy, healthy, and safe Thanksgiving, as denoted by nodes "happy", "thanksgiving", and "safe", and thanked some congressmen for their visit to the Thunder Horse Platform, as denoted by the link between "thank" and "congressman". Lastly, network group 16 demonstrates BP supported science education. Links among "thank", "BP America", "astellas foundation", "cdw corporation", and "hsbc us" appeared in a post BP shared from another organization who expressed its thanks to BP America, Astellas Foundation, CDW Corporation, HSBC US, State Farm and Motorola Solutions for their time and support in its Science Fair.

Frequency Table and Centrality Measures. Table C1 lists the nodes ranked from 1st to 50th on frequency. Tables C2, C3, and C4 list the total-degree centrality, betweenness centrality, and closeness centrality of the nodes that are ranked from 1st to 70th on the three centrality measures. Values in each table are standardized values scaled to go between 0 and 1, in such a way that networks of different sizes can be compared. Table C5 lists the top scoring nodes ranked from 1st to 100th side-by-side for the three centrality measures.

BP's image as a sponsor of Team USA in the Rio Paralympic Games is demonstrated by "team usa" (#4), "energy within" (#5), "nathan adrian" (#22), "brad snyder usa" (#33), paralympian (#37), and "rio 2016 paralympic games" in Table C1 and "team USA", "united states", "energy within", "paralympian", "proudly", "support", "team", "athlete ambassador", "medal", "congratulations", "the armless archer", "Olympian", "sponsor", "road to rio", "sport", and "performance" in Table C5. Safety as an essential value of BP is displayed by "safety" (#3), "team" (#16), "train" (#20), "offshore" (#30), "operations" (#42), and "safer" (#47) in Table C1 and "safety", "offshore", "every", "drill", "safely", "culture", "24/7", "foster", "transportation", "virtual reality", "build", and "safer" in Table C5. BP's images of providing American jobs, helping local business and communities, being a pioneer in exploring Alaska, and supporting American economy are demonstrated by "job" (#8), "support" (#9), "help" (#11), "alaska"(#18), "community" (#21), "economy"(#36), and "invest"(#45) in Table C1 and "support", "help", "local", "donate", "community", "united states", "business", "volunteer", "job", "economy", "invest", "reinvest", "ohio", "Washington", "Alaska" "BP alaska", "north slope of Alaska", and "40 years" in Table C5.

BP's images of valuing new technology and supporting STEM and future innovators are demonstrated by "technology" (#10), "new" (#13), "stem" (#38), "future" (#40), and "students"

(#50) in Table C1 and "STEM", "math", "new", "science", "technology", "encouraging", "future", "BP tech", "launch", "drill", "digital", "unveils", "engineer", "otc2017", "virtual reality", "big data", "drone", "planes", and "thermal imaging" in Table C5. Its image of making effort to end multiple sclerosis is indicated by "bp ms 150" (#24) in Table C1 and "end", "multiple sclerosis", and "bp ms 150" in Table C5. Its images of being a leader in exploring renewable energy and being one of the largest energy companies in the world are shown by "largest" (#29), and "wind farm" (#32) in Table C1 and "energy", "largest", "major", "18000", "retail", and "no.1" in Table C5.

BP's high production capacity and good performance are demonstrated by nodes such as "power", "energy", "fuel", "cars", "oil", "gas", "domestic", "deliver", "enough", "electricity", "entire", "provide", "largest", "operate", "performed", "onshore", "production", "producer", "supply", "serve", "carrying", "natural gas", and "complete" in Table C5. The outstanding infrastructures BP maintained are demonstrated by nodes such as "thunder horse", "south expansion", "project", "petrochemical", "largest", "facility", "cherry point refinery", "approves", "complete", "mad dog platform", "refinery", "Texas city chemicals", and "cooper river chemicals" in Table C5 and "project" (#26) and "thunder horse" (#27) in Table C1.

Other images of BP shown by nodes in Table C5 include maintaining good and effective operations, as displayed by "operations", "process", "pipeline & logistics", "operate", "retail", "serve", and "largest"; supporting women, as denoted by "first", "women", "celebrate", and "iwd2017"; and making effort to reduce emissions, as indicated by "emissions", "decreased", "greenhouse", and "gas".

Summary of BP's Images. To summarize, the dominant nodes listed in Tables C1, C2, C3, C4, and C5, and the 17 semantic network groups generated in ORA based on the messages collected from the Facebook account of BP demonstrate the following images of BP.

First, safety was an essential value of BP and the company had been making great effort to develop a culture of safety. Safety was designed into everything from design through operations and every small task was assessed for risk to increase safety. High technologies, such as underwater robots, drones, automation, and FLIR cameras, were used by BP to predict, identify and prevent potential safety challenges. BP took many actions such as monitoring weather constantly, providing 24/7 support to offshore teams, and training and retraining teams in virtual reality simulators to ensure safety. In addition to safety, efficiency was also valued by BP. Efficiency and safety were considered as going hand-in-hand in BP and the company tried to develop new technology to make operations safer and more efficient.

Second, BP made great contributions to American economy. BP invested more in the US than in any other country and reinvested every dollar earned in the US back to the country. The company had made contributions to Alaska's economy through production at Prudhoe Bay oil field in Alaska for 40 years. BP also contributed to economies in states such as Indiana, Texas, and Ohio through huge investments and supported jobs across the country.

Third, BP maintained outstanding infrastructures such as the Cooper River facility, Texas City Chemical's facility, South Carolina petrochemical facility, Thunder Horse platform, and Mad Dog platform, and the company kept upgrading and improving its infrastructures. Every day BP's 4,000 miles of pipelines carried 1.3 million barrels of crude oil, natural gas liquid, and refined products. Its Cherry Point Refinery provided a majority of the jet fuel used at several international airports. The company processed geophysical data at its Center for High-

Performance Computing in Houston, which was home to one of the world's largest

supercomputers for commercial research and had the computer memory of 170,000 Apple

MacBook laptops.

Fourth, BP was one of the world's leading energy companies. It was an industry leader

and an active participant in international energy conferences, and published reliable and

insightful reports on the energy industry such as BP Statistics and BP Energy Outlook. BP's

marketing and trading business was the No.1 marketer of natural gas in North America. BP was

also a company with a great history. For example, the company was a pioneer to explore Alaska

around 40 years ago. Its Prudhoe Bay oil field in Alaska has a history of more than 40 years and

supported more than 16,000 jobs. BP was also a leader in exploring renewable energy, directly

operating 14 wind farms onshore in eight states.

Fifth, BP made great efforts to give back to the society. The company sponsored the US

Paralympics national teams, supported institutions and initiatives that strengthened the

communities where its employees lived and worked, sponsored the BP MS 150 to end multiple

sclerosis, and donated over a million dollars to US community programs. BP helped strengthen

communities from Alaska to South Carolina and made contributions to local schools in Texas.

BP Whiting Refinery raised funds to help children, families, and seniors across Lake County,

and BP Alaska recognized 29 outstanding teachers statewide.

Sixth, BP maintained outstanding production capacity. BP's Whiting Refinery was the

largest refinery in the Midwest, which could produce enough gasoline each day to fuel 6 million

cars. The company also maintained outstanding financial performance and delivered enough fuel

in 2015 to run all the cars in three states for a whole year. BP's Cherry Point Refinery helped

fuel cars, trucks, and airplanes throughout the Pacific Northwest. The company's wind farm in

Colorado could generate enough electricity to power approximately 65,000 average homes for a year and its wind farm in West Texas could generate enough electricity each day to power 43,000 homes.

Seventh, BP valued new technology as the company's culture and was technologically advanced. New technologies such as thermal imaging technology, drone technology, digital rocks technology, seismic imaging technology were adopted by the company to enhance operations and safety. BP was pioneering drone technology to monitor refinery operations and drone technology took the company's safety technology to new heights. FLIR cameras were used by BP in Alaska to inspect difficult-to-reach pipelines. BP took leap forward in seismic imaging technology identifying additional resources in the Gulf of Mexico. The company also expressed its love of STEM. It encouraged STEM through mentorship and its engineers shared advice for others interested in a STEM field. BP also supported the inaugural Offshore Technology Conference Energy Challenge to encourage future innovators.

Eighth, BP valued sustainability and the environment. The company was a leader in exploring renewable energy and had the largest operated renewable energy business of any major international oil and gas company. It promised to invest in a low-carbon future and paid attention to environmental protection through decreasing gas emission and electricity consumption with infrastructure improvements. Its Cooper River Chemicals plant decreased greenhouse gas emissions by 40% with infrastructure improvements. The company also maintained a distinguished record of environmental stewardship, protected local wildlife, minimized intrusion upon uplands and wetlands preserve in and around its facility, made huge investment to modernize the refinery to improve its environmental standards and efficiency, and supported student activities to provide free environmental education programs.

Ninth, BP emphasized the diversity of its employees by offering jobs to military personnel and veterans and supporting women to develop careers in STEM. It employed former coast guard and navy service members and launched its Military Placement Program. BP contended that military personnel could offer unrivaled experience, outstanding personal qualities, and a wealth of transferrable skills. A senior mathematician employed by BP was the first female employee admitted to the computer department's Senior Luncheon Club in 1967. One of its female employees was featured as a STEM influencer on chicago-woman.com and talked about her experience in STEM as a research chemist supporting BP refining operations. The company also celebrated #INWED17 with one of the first women to drill in Mediterranean.

Other images that are also demonstrated by the nodes and links, but not as dominant as the images mentioned above include being innovative and creative in enhancing its service, employees enjoying working in the company, providing good and reliable products, a large cross-national company with large-scale services, displaying good financial performance, creating positive links to respected organizations, thanking and valuing its employees, and supporting science education.

Semantic Network Analysis of the Twitter of BP

The semantic networks generated in ORA are based on the textual data collected from the Twitter page of BP, including 786 posts posted from January 1st, 2017 to June, 30, 2017. The overall network picture is displayed in Figure A3 in Appendix A. The overall semantic network includes 17 network groups, with nodes in same colors belonging to same groups, based on the Newman grouping algorithm. The pictures of these 17 network groups are displayed in Appendix D. All nodes in these pictures are sized by total-degree centrality values. In the following sections, the interpretation of 11 of the 17 network group pictures is presented. Network groups

5, 7, 11, 12, 13, and 17 include much fewer nodes compared with other networks and the images of BP demonstrated by these network groups are also demonstrated in the 11 groups interpreted below.

Network Group 1. Since network group 1 is very large with many nodes, in order to show the picture more clearly, network group 1 is divided into three parts for display. The picture of part 1 of network group 1 is displayed in Figure D1.1. It is not surprising that "bp" is the biggest node and "bp america" is the second biggest node in this picture. Part 2 of network group 1 is displayed in Figure D1.2. Node "energy" is the biggest node in this network picture, and nodes "future", "global", and "market" are also relatively big. Part 3 of network group 1 is displayed in Figure D1.3. The biggest node in this picture is "bp stats" and nodes such as "energy outlook", "cera week", "otc2017" and "industry" are also relatively big.

To summarize, the following images of BP are demonstrated by nodes and links of the three parts of network group 1. First, BP was a supporter of STEM education. BP realized the importance of supporting and inspiring the next generation of leaders of the industry and its employees participated in a variety of activities to help prepare students for a bright future and a career in STEM related fields. The company provided students with the opportunity to learn about BP's business and gain hands-on experience through its early engagement program, as indicated by links among "early", "engagement", and "program" in Figure D1.1; sponsored the NSBE (National Society of Black Engineers) #BlackSTEMLikeMe campaign along with other organizations, as denoted by links among "black stem like me", "nsbe", "sponsor", and "campaign" in Figure D1.1; and served as one of the judges and sponsors of #BZScienceFair2017, as indicated by the link between "judge" and "sponsor" in Figure D1.1. BP's employees were honored to judge Chicago @CPSScienceFair and help prepare students for

a career in STEM related fields, as shown by the link between "Chicago" and "cps science fair" in Figure D1.2; and encouraged and celebrated STEM as part of @ISTScience Girl Power event in Toledo, Ohio, as denoted by the link between "girl power" and "event" in Figure D1.2.

BP also sent engineers to share their personal career stories and advice with students, as indicated by the link between "personal" and "career" in Figure D1.1; celebrated with STEM resources to help inspire students on Pi Day, as denoted by the link between "help" and "inspire" in Figure D1.1; encouraged girls to pursue future and develop careers in STEM fields, as shown by links among "bp", "encourage", and "girls" in Figure D1.1; and sponsored @LoveSTEMSD which lots of future engineers, geologists and scientists would attend, as demonstrated by links among "future", "engineers", "geologists", and "scientists" in Figure D1.2. In addition, BP announced 1.766M Pledge Commitments & 800K+ Completed Mentorships at #MWMSenate17 (MWM refers to Million Women Mentors) and helped instill confidence in girls to help them succeed in STEM, as represented by links among "announce", "1.766m", "pledge", "commitment", "800k", "complete", and "mentorship" and links among "help", "million w mentors", and "instill" in Figure D1.1.

Second, BP made effort to give back to the society and assume social responsibility. As represented by links among nodes "sponsor", "attend", and "chas chamber s" in Figure D1.1, BP sponsored and attended @ChasChamber's Legislative Appreciation Reception, which honored South Carolina "Road Warrior" legislators. The company had donated $130M to U.S. communities and Team BP had donated $17M to multiple sclerosis research since 2001, as described in tweets where the link between "BP" and "donate" in Figure D1.1 appeared. As denoted by links among "raise", "rodeo run", and "fund", 370 Team BP runners supported the RodeoRun raising funds for @RodeoHouston Educational Fund. BP military veterans

participated in river challenge to raise awareness of PTSD, as described in a tweet where the link between "BP" and "military" in Figure D1.1 appeared. BP employees worked to repair homes and help the community in Houston, as portrayed in a tweet where links among "bp", "bp America", and "employee" in Figure D1.1 appeared. Links among "fundraising", "event", and "cycle" in Figure D1.2 indicate BP MS 150 was the biggest fundraising event for the @MSSociety and was the premier fundraising cycling series in the nation.

BP also helped @WhatcomLiteracy surpass their fundraising goal for their adult literacy programs in Whatcom County, as denoted by the link between "fundraising" and "goal" in Figure D1.2; helped fund construction projects in the Blaine School District, as indicated by the link between "help" and "fund" in Figure D1.1; delivered 150 meals on wheels, as described in a tweet where the link between "second" and "nature" in Figure D1.1 appeared; was the founding sponsor of #MakeNewHistory, as denoted by the node "founding sponsor" in Figure D1.1; and made donations equivalent to the volunteer hours contributed by its employees, as displayed by the link between "contribute" and "hours" in Figure D1.3. As portrayed in tweets where links among "proudly", "donate", "employees", and "cherry point refinery" in Figure D1.1 appeared, BP's Cherry Point Refinery proudly donated fire suppression gear to @BhamTechCollege for their welding program, donated quad vehicles to @GrowingVeterans, an organization helping veterans grow food and communities, donated $20,000 to @NooksackSalmon Students for Salmon Education program to encourage #STEMed in #Whatcom County, and donated flags to local Kiwanis group. BP Cherry Point employees had also contributed over 4,500 volunteer hours to Whatcom County in 2016.

Third, BP was an active participant of a number of energy conferences and provided reliable and insightful reports and analysis on the energy industry, as demonstrated by the four

relatively big nodes in Figure D1.3, including "bp stats", "cera week", "otc2017", and "energy outlook". Node "bp stats" refers to the hashtag #BPstats, which represents BP's Statistical Review of World Energy; node "energy outlook" represents BP Energy Outlook; and nodes "cera week" and "otc2017" represent CERA (Cambridge Energy Research Associates) Week and Offshore Technology Conference 2017 respectively. Other nodes in Figure D1.3 such as "otc", "otc Houston", and "energy challenge" all represent conferences in the energy field.

Links among "energy outlook", "report", and "2035" in the lower left of Figure D1.3 represent BP's Energy Outlook 2035 report. Links among "chief economist", "economist", "present", "newly", "release", and "outlook" in Figure D1.1 and the link between "launch" and "energy outlook" appeared in tweets describing when BP launched its Statistical Review of World Energy and US Energy Outlook, which were presented at @AGA_NaturalGas Roundtable, @ColumbiaUEnergy, the IAGC Annual Conference, and @LMOGA (Louisiana Mid-Continent Oil and Gas Association) meeting. BP Statistical Review reviewed the world energy market and showed energy markets were in transition; and BP Energy Outlook provided a full picture of the energy future and discussed the impact of LNG growth on global gas markets.

BP was an active participant of OTC and a supporter of the OTC Energy Challenge, where Houston high school students got chances to solve real-world energy challenges, as indicated by links among "real world", "otc Houston", and "energy challenge" in Figure D1.3. In OTC2017, BP's Chief Executive Upstream talked about the future of energy and BP highlighted its natural gas projects and clean energy future, as portrayed in tweets where node "chief executive upstream" in Figure D1.1 and the link between "future" and "energy" in Figure D1.2 appeared; and BP executives and managers provided the latest developments in the global energy landscape and talked about the Mad Dog Phase 2 Project, as described in tweets where links

among "bp", "executives", and "provide" in Figure D1.1 and the link between "energy" and "landscape" in Figure D1.2 appeared.

In CERAWeek, BP executives and managers played a leading role at the conference. As depicted in tweets where links among "bp", "ceo", "bob dudley", "global head of upstream technology", "discuss", "share", "speak", and "highlight" in Figure D1.1 appeared, at CERA week, BP CEO Bob Dudley shared BP's stronger path for growth, spoke about the company's upcoming projects, talked about BP's commitment to the Oil and Gas Climate Initiative (OGCI), and highlighted BP's presence in alternative energy; and BP's Global Head of Upstream Technology discussed how technology was transforming oil and gas. As portrayed in tweets where links among "global", "energy", "market", and "balance" in Figure D1.2 appeared, BP's Wind Energy CEO spoke about the state of renewables in a global market and BP's Head of Exploration shared thoughts on the new global energy balance at CERAWeek. BP America was also an investor sponsor of #NALEOEnergy for the key insights provided on US energy resources, as described in a tweet where the link between "insight" and "provide" in Figure D1.1 appeared. BP employees talked about the key issues that would shape energy supply and demand through 2035 @CES_Baker_Inst @BakerInstitute, as denoted by links among "ces baker inst", "baker institute", and "2035" in Figure D1.3.

Fourth, BP made efforts to protect the environment and advance a low-carbon future. The company upgraded its Cooper River facility, which helped nature thrive in South Carolina as stated, to advance low-carbon manufacturing, as portrayed in tweets where the link between "modernization" and "program" and the link between "help" and "nature" in Figure D1.1 appeared. BP's Cherry Point Refinery remained committed to environmental protection and restoration, as stated in a tweet where the link between "bp America" and "cherry point wa" in

Figure D1.1 appeared. In 2015, BP's wind farms helped avoid around 3 million tons of CO_2 emissions, as indicated by the link between "help" and "avoid" in Figure D1.1.

Despite the Trump administration's withdrawal from the Paris climate accords, BP stated in a tweet where node "paris climate accord" in Figure D1.1 appeared that it welcomed the Paris agreement when it was signed and will continue to support it. BP is also one of the founding members of the Climate Leadership Council, as represented by nodes "climate leadership council" and "founding members" in Figure D1.1. Furthermore, as delineated in tweets where links among "renewable", "energy", and, "power" in Figure D1.2 appeared, BP supported renewable energy through wind and biofuels and led all the so-called Big Oil giants in operational renewable power. The company made investments for a low-carbon future, as suggested by the link between "low-carbon" and "future" in Figure D1.2; and partnered with others to expand US renewable natural gas transportation fueling capabilities, as denoted by the link between "fuel" and "capability" in Figure D1.2. BP recognized the long wavelength transition to low carbon, and as a part of OGCI, the company planned to open a collaboration center at the Imperial College London to bring together innovative ideas on lower emissions, as described in a tweet where the link between "innovative" and "idea" in Figure D1.2 appeared.

Fifth, BP maintained outstanding infrastructures. As portrayed in tweets where the link between "bp" and "complete" in Figure D1.1 appeared, the company completed upgrade of its South Carolina petrochemical facility and completed its Thunder Horse South Expansion project. As stated in tweets where the link between "Houston" and "area" and the link between "50trillion" and "cubic feet" in Figure D1.2 appeared, BP's Texas City Chemical's facility could house all 122 high-school football fields in the Houston area; and the total acreage of BP's Tortue field was bigger than the Greater Houston area at 33,000 square kilometers, and could

contain a further 50 trillion cubic feet. And BP's supercomputer facility in Houston expanded its capabilities in exploration and reservoir management, as contended in a tweet where the link between "expand" and "capability" in Figure D1.2 appeared.

Sixth, BP made efforts to ensure safety in its operations and considered safety as its number one priority. BP teams trained and retrained in VR simulators to be better prepared for any situation offshore, as portrayed in a tweet where the link between "better" and "prepare" in Figure D1.1 appeared. To advance safety, the company also empowered anyone to stop a job if something didn't seem right, as indicated by the link between "bp" and "empower" in Figure D1.1. As delineated in tweets where nodes "chief", "facilities engineer team lead", "process asset development engineer", "speak", and "explain" around "bp" in Figure D1.1 appeared, a BP chief spoke about technology deployment to drive safe and reliable operations; a BP Facilities Engineer Team Lead described process safety and the crucial part she played in it; and a BP Process & Asset Development Engineer explained how efficiency and safety went hand-in-hand in the company. As described in tweets where links among "number", "one", and "priority" in the middle of Figure D1.2 appeared, BP's Vice President of Global Projects, Offshore, expressed that irrespective of the oil price BP will never compromise on safety in its projects, and safety is and will remain the company's number one priority; BP's Regional President of Gulf of Mexico also expressed as they continued to innovate in the Gulf, they must do it safely and mindful that safety is the company's number one priority.

Seventh, BP made big contributions to American economy. As stated in tweets where links among "150 years", "babc member", and "bp America" at the lower right of Figure D1.1 and the link between "energy" and "security" in Figure D1.2 appeared, for 150 years, BABC (British-American Business Council) Member BP had been contributing to America's economy,

and made historic contribution to US energy security. As described in tweets where the link between "reinvests" and "100percent" in Figure D1.1, the link between "energy" and "company" in Figure D1.2, and the link between "American" and "economy" in Figure D1.2 appeared, BP had reinvested 100% of every dollar earned in the US back into the country over a decade; no energy company had invested more in America than BP; BP America energized the American economy with over 140k jobs; and BP had invested $90 billion in the US over a decade. BP's Whiting refinery had been a key anchor of the northwest Indiana economy for more than 125 years, as denoted by the link between "Indiana" and "economy" in Figure D1.2.

Eighth, BP was a company maintaining high production capacity. As stated in tweets where links among "produce", "generate", "enough", "energy", and "electricity" in Figure D1.2 appeared, BP's wind farm in Colorado could generate enough electricity to power approximately 65K homes for a year; and its Thunder Horse could produce enough energy to power all the homes in Washington DC for three and a half months in one day. The link between "gross" and "generate" in Figure D1.2 indicates the 13 windfarms in seven states directly operated by BP had a gross generating capacity of 2,259 megawatts; and links among "capacity", "produce", "gross", and "barrels" in Figure D1.2 and the link between "crude oil" and "per day" in Figure D1.3 represent BP's Mad Dog Phase 2, which would include a floating production platform with the capacity to produce up to 140K gross barrels of crude oil per day. BP Prudhoe Bay field had produced 12.5 billion barrels of Alaska oil over 40 years, as denoted by the link between "produce" and "12.5billion" in Figure D1.2. And the link between "200million" and "cubic feet" in Figure D1.2 indicates BP's Thunder Horse platform could produce up to 200 million cubic feet of natural gas per day.

Other images of BP that are not as prominent as the eight images mentioned above include adding benefits for its US employees including paternal leave and transgender reassignment surgery, as described in tweets where links among "bp", "bp America", and "employee" in Figure D1.1 appeared; maintaining strong downstream marketing growth and good operational performance, as denoted by links among "downstream", "marketing", "operational", "momentum", and "performance" in Figure D1.2; advancing the inclusion of Hispanics, as indicated by links among "Houston", "Hispanic forum", and "career day" in Figure D1.2; expanding digital rocks technology program, as represented by the link between "expand" and "digital rocks" in Figure D1.2; good brands such as Castrol and good products, as shown by links among "global", "lubricant", and "brand" in Figure D1.2; excellent employees, as denoted by links among "inaugural", "honorees", "named", "distinguished alumni" and "award" in Figure D1.2; and building Whiting, IN refinery in 1889 as first to refine sour crude oil, as indicated by links among "refine", "sour", and "crude oil" in Figure D1.3.

Network Group 2. Network group 2 is displayed in Figure D2. The primary image of BP demonstrated by network group 2 is BP's dedication to a low carbon future and emission reduction. As described and stated in tweets where links among "fewer", "lower", "low", "reduce", "co2", "carbon", "emissions", and "customers" in the left part of the picture appeared, BP Cooper River's $200M upgrade allowed the company to produce PTA (purified terephthalic acid) with less energy and fewer carbon emissions; BP devoted to a lower carbon future and invested in lower carbon technologies; BP's CEO discussed the move to a lower carbon world at #BPAGM; venturing and low carbon across multiple fronts was one of BP's strategies; BP's wind portfolio helped avoid around 3 million tons of CO2 emissions in 2015; and BP invested

$200M in a Charleston area chemical plant to save energy and reduce emissions, and helped its customers reduce emissions.

The other image of BP demonstrated by network group 2 is BP's good financial and operational performance. As portrayed in tweets where links among "reduce", "controllable", "cash", "maintenance", "focus", "original", and "cost" in the middle of the picture appeared, BP made good financial progress in 2016 and reached its target of reducing controllable cash costs by $7 billion a year ahead of plan; BP's global lubricant brand @Castrol had joined up with @Romax_InSight to cut maintenance costs for wind turbines; focusing on returns and costs was one of BP's strategies; and BP successfully cut the cost for the Mad Dog 2 project to less than half of the original cost.

BP was also a pioneer in exploring Alaska. As stated in tweets where links among "original", "frozen", and "north slope" appeared, BP's North Slope pioneers charted new territory and many of them were still there after 40 years. Node "inwed17" refers to International Women in Engineering Day 2017 and appeared in tweets celebrating #INWED17 with one of the first women to drill in the Mediterranean, which suggests BP supported women to develop careers in engineering. Moreover, BP portrayed its story as one of recovery, rebuilding and resilience since 2010 in a tweet where the link between "rebuild" and "recovery" appeared.

Network Group 3. Network group 3 is displayed in Figure D3. The primary image of BP demonstrated by network group 3 is safety as a goal and culture in BP, as demonstrated by the biggest node "safety", which is also a central node among nodes in the upper left of the picture. As described in tweets where links among "safety" and nodes around it including "national safety month", "improve", "process", "maintain", "right", "culture", "expert", "increase", "no. 1", and "drive" appeared, BP considered safety as its number 1 core value, continued to improve

process and personal safety, attempted to create and maintain a culture of safety, assessed every task for risk to increase safety, and made effort to maintain safety in a low-oil price environment. These tweets also described how BP drill teams stayed in constant communication with onshore experts to enhance safety through 24/7 backup to offshore teams. As portrayed in tweets where the link between "offshore" and "rig" in the lower right of the picture appeared, simulators were used by BP to train offshore rig teams to enhance safety. And links among "go", "home", "safely", and "offshore" in the right part of the picture appeared in tweets stating that BP empowered anyone to stop a job if something didn't seem right so that everyone can go home safely and training in virtual reality onshore enabled BP teams to drill safely offshore. Links among "go", "oilfield", and "digital" indicate the oilfields had gone digital and BP used data to ensure safer operations.

Another image of BP demonstrated by network group 3 is efficiency. As portrayed and stated in tweets where links among "increase", "improve", "efficiency", "safety", "go", and "hand-in-hand" appeared, BP acted to make the company competitive by increasing efficiency and reducing costs, while keeping safety as the first priority; @generalelectric and @BP_America launched new tech to improve efficiency by 2-4%; and efficiency and safety went hand-in-hand at BP. Third, BP made effort to give back to the society. Links among "register", "177", "donors", and "rock" indicate BP's Cherry Point refinery worked with @BloodworksNW to register 177 donors and collect 160 units helping patients throughout Washington state.

Fourth, BP hired capable employees. Links among "mindset", "leadership", "need", and "culture" indicate a BP employee discussed the skill set, mindset, leadership and culture needed to support today's digital transformation. Fifth, BP maintained high production capacity. Links

among "approx", "65k", and "home" denote BP's wind farm in Colorado could generate enough electricity to power approximately 65K homes for a year. Sixth, BP stayed competitive in the industry. The link between "offshore" and "basin" appeared in a tweet stating that BP was successful in #GoM (Gulf of Mexico) lease sale, which enabled the company to continue investment in the U.S. offshore basin.

Other images of BP demonstrated by network group 3 include recognizing leadership drove behavior and behavior drove culture, as denoted by the link between "leadership" and "drive"; expanding the Digital Rocks program aiming to describe rocks with a computer, as indicated by the link between "describe" and "rock"; forecasting to reduce the original cost for the Mad Dog 2 by 50% with improved seismic imaging, as described in a tweet where the link between "improve" and "seismic" appeared; and adopting the seismic processing & modeling technology, as denoted by links among "seismic", "modeling", and "process".

Network Group 4. Network group 4 is displayed in Figure D4. The following images of BP are demonstrated by network group 4. First, becoming safer and more efficient was one of the goals of BP. As stated in tweets where links among "pursue", "efficient", and "execution" appeared, BP's sustainability report depicted the company's pursuit of efficient operations; and safe, reliable and efficient execution was a strategy BP adopted. As indicated by the link between "more" and "modern", BP aimed to build a business that is safer, more modern and efficient, and delivering real value and tangible growth to 2021 and beyond. As portrayed in tweets where the link between "more" and "efficient" appeared, BP designed a new shipping fleet to make fuel transport safer and more efficient; big data and tech was merging and making BP's business better and more efficient; a BP employee discussed about how automation can help make the

industry safer and more efficient; and BP celebrated inventors who developed new tech to make its operations safer and more efficient on Inventors Day.

Second, BP made contributions to American economy. As described in tweets where links among "invest", "more", "90billion", "earn", and "dollar" appeared, BP invested more in the U.S. than in any other country and no energy company had invested more in America over a decade; the company had invested $90 billion in the US over a decade with every dollar of profits earned invested back into the American economy. Third, BP strived to stay competitive in the industry. As delineated in tweets where links among "more", "competitive", and "modern" appeared, BP had a reshaped portfolio which was more competitive, more resilient and was able to respond to a low oil price; the company was weighing upgrade of US wind turbines to be more competitive with natural gas; and a BP employee spoke about the opportunity to build a modern, competitive industry at CERAWeek.

Fourth, BP maintained high capabilities to process and analyze a huge amount of data. BP's wells were based on processing almost a billion data points per second, which had a very real impact on the speed, reliability and safety of what the company could achieve, as denoted by links among "1 billion", "data", and "point" in the upper left of the picture. As portrayed in tweets where the link between "more" and "data" appeared, each well BP had on fiber on that system streamed more data than Twitter received tweets per second; and BP engineers were spending less time hunting for data and more time analyzing it. Fifth, BP provided high-quality and insightful industry reports. Links among "high-quality", "objective", "globally", "consistent", and "data" at the top of the picture appeared in a tweet stating that for 66 years, the BP Statistical Review of World Energy had provided high-quality objective & globally consistent data on world energy markets.

Other images of BP as demonstrated by network group 4 include investing $200M in a Charleston area chemical plant to save energy and reduce emissions, as indicated by the link between "invest" and "200m"; encouraging its employee to look out for each other on the job to reduce risk and cultivate a culture of care to create a safer workplace, as denoted by the link between "more" and "eyes"; honoring more than 100 outstanding Toledo area high school students, as shown by the link between "honors" and "more"; identifying more than 200 million barrels of additional resources at its Atlantis field in the deepwater Gulf of Mexico thanks to a major breakthrough in seismic imaging, as represented by links among "identify", "more", "additional", and "resource"; looking at wind energy for more #MFG (manufacturing) jobs, as suggested by the link between "more" and "mfg"; saluting the brave men & women serving their communities by sponsoring First Responders Day at #RODEOHOUSTON, as denoted by the link between "serve" and "men and women"; committing to cleaner and cheaper American energy, as revealed by the link between "cleaner" and "cheaper"; and valuing execution as one of the strategies of the company, as represented by the link between "greatest" and "execution". Lastly, BP provided large-scale service. As delineated in a tweet where the link between "serve" and "more" appeared, in 2016 BP traders completed around 550,000 transactions and served more than 12,000 customers across some 140 countries.

Network Group 6. Network group 6 is displayed in Figure D6. One of the images of BP demonstrated by network group 6 is being a supporter of STEM education and encouraging young women interested in STEM careers. As delineated in tweets where links among "host", "50", "bcsd schools", and "cooper river" appeared, BP hosted 50 @SBISD (Spring Branch Independent School District) young women interested in STEM careers, worked with the Center for the Birds of Prey to host @BCSDSchools Cainhoy Elementary School students who learned

about wildlife and more, and hosted students from @SC_GSSM's (South Carolina Governor's

School for Science and Mathematics) CREATEng camp for a day of engineering &

manufacturing. CREATEng campers had a chance to explore BP's Cooper River plant and learn

more about real-life engineers.

Second, BP maintained outstanding infrastructures. As portrayed in tweets where links

among "cooper river", "pta", "plant", "floating", "spar", "petrochemical", and "facility"

appeared, BP's Cooper River facility celebrated completing the $200 million modernization

program which began new era of low-carbon manufacturing; and the company completed

upgrades of the South Carolina petrochemical facility, and maintained Mad Dog platform, a

floating spar facility, in the Gulf.

Other images of BP demonstrated by network group 6 include being named as a "Top 50

Employer" by the readers of "Careers & the disABLED" magazine, as indicated by the link

between "50" and "employer"; actively answering questions on social media, as represented by

links among "host", "linkedin", and "qa"; and sponsoring and attending @ChasChamber's

Legislative Appreciation Reception, which honored South Carolina's "Road Warrior" legislators,

as suggested by links among "sc", "road warrior", and "legislators".

Network Group 8. Network group 8 is displayed in Figure D8. The following images of

BP are demonstrated by network group 8. First, BP supported a large number of American jobs.

As shown by links among "13000", "mfg green", "7000", "high-paying", "local", and "job",

BP's Whiting Refinery supported more than 13,000 jobs in Indiana; its Cherry Point Refinery

supported 7,000 high-paying local jobs throughout Washington state; and the company looked at

wind energy for more manufacturing jobs. Second, BP was a leader in exploring renewable

energy. BP operated the largest renewables business of any major oil and gas company, as indicated by the link between "renewables" and "business".

Third, BP made effort to protect the environment. As described in tweets where links among "6000", "manage", "2500", and "acres" appeared, the nearly 6,000 acres of BP's Cooper River facility included five distinct types of habitats; and BP's Cherry Point Refinery managed 2,500 acres of land used for ecological restoration and habitat preservation around the refinery. BP also supported environmental efforts in Whatcom County, and managed local environmental impacts to achieve its sustainability goal, as denoted by links among "manage", "local", "environmental", "effort", and "impact". Fourth, BP maintained good financial and operational performance. The company opened its first retail site from scratch in Mexico in 2017 and operated 18000 retail sites in 2016, as described in tweets where links among "open", "retail", "business", and "site" appeared; and added more than 30 new convenience partnerships to the company's retail portfolio in 2017, as suggested by the link between "retail" and "portfolio".

Fifth, safety was an essential culture of BP. FLIR cameras were used by BP to inspect difficult-to-reach pipelines in Alaska, as suggested by links among "inspect", "difficult-to-reach", and "pipeline" in the right side of the picture; wireless sensor monitoring technology helped BP engineers monitor pipelines 24/7, as denoted by the link between "pipeline" and "24_7"; and the Remote Operations Center at BP wind farms had onsite teams' back 24/7, as indicated by the link between "back" and "24_7". Furthermore, BP's US Pipelines business was honored by API Global with the Pipeline Occupational Safety Performance Award, as depicted in a tweet where the link between "pipeline" and "business" appeared.

Other images of BP demonstrated by network group 8 include working with a large number of local businesses, as denoted by links among "13000", "local", and "business"; growth

from a balanced and actively managed portfolio as one of the company's strategies, as suggested by the link between "manage" and "portfolio"; diversity and inclusion efforts, as shown by links among "Hispanic", "inclusion", and "effort"; donating flags to local Kiwanis group, as represented by the link between "local" and "Kiwanis"; encouraging a change-agent culture and using technology to maintain a safe and competitive business, as described in tweets where links among "lower48", "onshore", and "business" appeared; building a pipeline with Fairbanks Local 375 Pipefitters in Prudhoe Bay under -19 degrees F, as indicated by links among "fairbanks", "local", "375", and "pipefitters"; making progress in shifting exploration portfolio towards natural gas and advantaged oil, as stated in a tweet where the link between "exploration" and "portfolio" appeared; an employee being awarded as a young Hispanic corporate achiever by @HACRORG (Hispanic Association on Corporate Responsibility) as part of their Young Hispanic Corporate Achievers Program, as indicated by the link between "hispanic" and "corporate"; supporting @IMSA_ (Illinois Mathematics and Science Academy) and seeing its new community innovation center open for Illinois students, as demonstrated by the link between "community innovation center" and "open"; and its US pipeline network spanning nearly 4,000 miles, as represented by links among "pipeline", "network", and "spans".

Network Group 9. Network group 9 is displayed in Figure D9. Nodes "safe" and "operation" seem to be the two central nodes in this picture, which suggests the primary image of BP demonstrated by network group 9 is safe and reliable operations. As depicted in tweets where links among "safe", "reliable", "ensure", "closely", "monitor", "refinery", "safer", and "operation" appeared, BP used data and technology to drive and ensure safer and reliable operations, to pioneer drone technology to monitor refinery operations and using ROVs to inspect operations under the sea, and to closely monitor weather in the gulf.

Other images of BP demonstrated by network group 9 include making efforts to act swiftly and decisively to transform operations and performance and become a magnet for digitally native oil and gas professionals, as indicated by links among "digitally", "native", "oil and gas", and "professionals"; strategies including transition to a lower carbon and digitally enabled future, capability based on global and modern workforce, and being digitally enabled, as depicted in tweets where the link between "digitally" and "enabled" appeared; and identifying more than 200 million barrels of additional resources at its Atlantis field in the deepwater Gulf of Mexico thanks to a major breakthrough in seismic imaging, as delineated in a tweet where the link between "seismic imaging" and "enabled" appeared.

Network Group 10. Network group 10 is displayed in Figure D10. Nodes "bp ms 150" and "multiple sclerosis" seem to be the central nodes in the left part of the picture, which indicates a primary image is BP sponsored BP MS 150 and made big effort to help end multiple sclerosis. As stated in tweets where the link between "multiple sclerosis" and "research" appeared, Team BP had donated $17M to MS research since 2001. Node "msawareness" refers to the hashtag #MSAwareness, which denotes increasing the awareness of MS was the objective of BP MS 150. Nodes "ms society", "cyclists", "bike", "congratulations" and "jersey" around "bp ms 150" all appeared in tweets describing the activity of BP MS 150.

Second, BP supported STEM education and education generally. As depicted in tweets where links among "create", "discover", "congratulations", "ccsd connects", "education", "research", "fun", "e week 2017" and "honored" appeared, BP attended Chicago Public Schools Student Science Fair, supported the STEM program of Laing Middle School, supported education and research at Texas A&M, helped make STEM education fun at Philip Simmons Elementary School's Maker Space Lab, and attended Hispanic Forum Career Day to help inspire

future engineers. BP also recognized 29 outstanding teachers in Alaska and honored more than

100 outstanding Toledo area high school students, as denoted by links among "bp Alaska",

"recognize", "29", "100", and "outstanding" in the right part of the picture. A BP employee also

shared with the OTC Energy Challenge how she got started in a STEM field and her mentoring

experience, as suggested by the link between "mentoring" and "experience".

Third, BP was a company of great history and made historic contribution to Alaska's

economy and the energy security of the US. Nodes "Alaska" and "bp Alaska" seem to be the two

central nodes in the right part of the picture. As shown in tweets where links among "historic",

"picture", "BP Alaska", "nears", and "contribution" appeared, BP posted a picture of its explorer

standing by a glacial lake while surveying in Alaska in 1961; BP's Whiting Refinery was built in

1889 as the first to refine sour crude oil; and BP's Prudhoe Bay oil field in Alaska had reached

40 years of production, a milestone highlighting its historic contribution to US energy security.

Other images of BP as demonstrated by network group 10 include presenting Energy Outlook at

LMOGA meeting, as represented by the link between "lmoga" and "meeting"; and encouraging a

mentoring culture, as indicated by the link between "mentoring" and "moment".

Network Group 14. Network group 14 is displayed in Figure D14. The primary image of

BP demonstrated by network group 14 is BP valued STEM and supported STEM education. As

depicted in tweets where links among "hands-on", "love", "science", and "play" appeared, BP's

STEM Grant visited Sundown Elementary School, which provided before-school hands-on

science for kids; and the company stated it loved science, technology, engineering, and math

(#STEM). A BP employee spoke about the crucial role of STEM in the energy industry at

@MillionWMentors #MWMSenate17, as described in a tweet where the link between "crucial"

and "role" appeared.

Second, BP was an active participant of energy conferences and provided insightful and reliable industry reports and analysis. BP attended leading international energy conferences and BP executives played a leading role at energy conference at CERAWeek, as delineated in tweets where links among "play", "lead", "international", and "role" appeared. BP discussed how electric vehicles would affect oil demand, as denoted by the link between "affect" and "oil demand". Third, BP gave back to the society and supported local communities. BP's Cherry Point Refinery donated flags to local Kiwanis group and donated quad vehicles to @GrowingVeterans which helped veterans grow food and communities, as described in tweets where links among "Ferndale wa", "food", and "community" appeared.

Fourth, growth and good financial performance were goals of BP. As portrayed in tweets where links among "lead", "seek", "disciplined", and "growth" appeared, market led growth in the downstream was one of BP's strategies; the company sought growth by polishing its US gas assets; and its Chief Executive Upstream stated in OTC2017 that the future for the company is one of disciplined growth. "Focused on returns: value based, disciplined investment and cost focus" was one of BP's strategies, as stated in a tweet where the link between "disciplined" and "investment" appeared. The significant and rapid change the company made to its cost base enabled itself to make good financial progress in 2016 and reach its target of reducing controllable cash costs by $7 billion a year ahead of plan, as portrayed in a tweet where the link between "rapid" and "change" appeared.

Other images of BP demonstrated by network group 14 include touting natural gas deals and clean-energy future, as denoted by the link between "deal" and "clean energy"; identifying Denver as an important energy hub of the future, as described in a tweet where the link between

"final" and "deal" appeared; and approving investment for Mad Dog 2 in 2016, as represented by the link between "approved" and "investment".

Network Group 15. Network group 15 is displayed in Figure D15. Nodes "new", "project", and "oil", the three biggest nodes, seem to be the three central nodes in the picture. The following images of BP are demonstrated by nodes and links of network group 15. First, BP maintained outstanding infrastructures and exceptional capability to improve its infrastructures with low costs in a low-price environment. The new projects BP intended to finish included a new project in Mauritania and Senegal, the Mad Dog 2 project, and the Thunder Horse South Expansion project, as indicated by links among "new", "project", "oil", "platform", "mad dog", "mad dog 2", "phase 2", "field", and "south expansion". As portrayed in tweets where links among these nodes appeared, Mad Dog Phase 2 Project, BP's only floating spar facility in the Gulf, was planned to be built to include a floating production platform with the capacity to produce up to 140K gross barrels of crude oil per day; with Mad Dog 2, BP transformed its approach to deepwater development; and BP's Thunder Horse South Expansion project involved ports in Texas, Louisiana, and Alabama. Links among "6", "7", "major", and "project" denote six major projects BP finished in 2016 and seven major projects it planned to complete. Links among "get", "online", "come", and "project" represent some major projects BP planned to bring or brought online, including the Thunder Horse South Expansion project. Moreover, BP successfully reduced the cost of the Mad Dog 2 project to half of its original cost, as described in tweets where the link between "mad dog" and "field" and the link between "9b" and "project" appeared; and the Thunder Horse South Expansion project achieved first oil 11 months ahead of schedule and $150m below budget, as denoted by links among "south expansion", "project", "achieve", and "first".

Second, BP maintained good financial and operational performance. BP's first quarter earnings and cash flow in 2017 were robust, as stated in a tweet where links among "first", "quarter", and "earnings" appeared. One of the highlights of BP's downstream performance in 1Q 2017 was a new joint venture agreed for retail in Indonesia, as denoted by the link between "new" and "joint venture". BP finished 6 major projects in 2016 and new projects were on track, as mentioned in the last paragraph. BP's operating cash flows was $4.4 billion in 1Q 2017 and $17.8 billion in 2016, as stated in tweets where the link between "operate" and "cash flow" appeared. Furthermore, BP had a reshaped portfolio that was more competitive and more resilient that was able to respond to a low oil price, as stated in a tweet where the link between "oil" and "price" appeared.

Third, BP was technologically advanced and new technologies were employed by the company to enhance safety. BP's proprietary digital rocks technology program got a key upgrade from a new multi-year commercial agreement with Exa Corporation, as indicated by links among "new", "multi-year", and "commercial" in the lower left of the picture. The company engineered 32 new ships with advanced technology to transport oil and gas safely, as represented by links among "engineer", "32", "new", and "ship"; and closely monitored weather in the Gulf during Atlantic hurricane season, as depicted in a tweet where the link between "hurricane" and "season" appeared. BP invested in industry-leading technologies that helped develop new resources and extend the life of existing fields in Alaska, developed new, industry-leading software to monitor drilling operations in real-time, and celebrated inventors who developed new technology to make its operations safer and more efficient on Inventors Day, as delineated in tweets where links among "develop", "new", and "industry-leading" appeared. A BP engineer, anywhere in the world, could get real-time alerts on wells based on processing almost a billion

data points per second, as denoted by the link between "get" and "real-time". BP maintained

safety in a low-oil price environment and resilience to different price environments, as described

in tweets where links among "oil", "price" and "environment" appeared.

Other images of BP demonstrated by network group 15 include pioneers to explore

Alaska, as denoted by links among "pioneer", "chartered", and "new"; former BP terminal

helping clear the way for a new port on the Delaware River, as depicted in a tweet where the link

between "new" and "port" appeared; directly operating 13 windfarms in seven states, having the

largest operated renewables business of any oil major, and leading all the so-called Big Oil giants

in operational renewable power, as indicated by links among "directly", "operate", "largest",

"big oil", and "giant"; advantaged manufacturing as one of the company's downstream

strategies, as represented by the link between "advantaged" and "manufacturing"; and shifting

exploration portfolio towards natural gas and advantaged oil in the upstream as a company

strategy to create a stronger platform for growth, as denoted by links among "natural gas",

"advantaged", and "oil".

Network Group 16. Network group 16 is displayed in Figure D16. One image of BP

demonstrated by network group 16 is BP maintained good financial performance. BP made good

financial progress in 2016, as represented by links among "good", "financial", and "progress".

Links among "1q2017", "financial", "latest", "result", and "bp results" in the left part of the

picture denote BP's financial results for 1Q 2017, 4Q 2016, and full year 2016; and links among

"deliver", "solid", and "result" appeared in a tweet stating that BP delivered solid results in

tough conditions in 2016. Second, BP made effort to give back to the society. BP America

delivered 150 meals on wheel, as denoted by links among "deliver", "150", and "meals on

wheel" in the right part of the picture. Third, BP was building a business that was safer, more

modern and efficient, and delivering real value and tangible growth, as stated in a tweet where the link between "deliver" and "real" appeared.

Frequency Table and Centrality Measures. Table D1 lists the nodes ranked from 1st to 50th on frequency. Tables D2, D3, and D4 list the total-degree centrality, betweenness centrality, and closeness centrality of the nodes that are ranked from 1st to 70th on the three centrality measures. Values in each table are standardized values scaled to go between 0 and 1, in such a way that networks of different sizes can be compared. Table D5 lists the top scoring nodes ranked from the 1st to the 100th side-by-side for the three centrality measures. It is not surprising that "bp" and "bp America" are ranked the 1st and the 2nd in Table D1 and ranked the1st, the 2nd, or the 3rd on the three centrality measures, as the two nodes are company names.

BP's images of considering safety as an essential goal and culture and employing new technology to enhance safety are demonstrated by nodes "safety" (#10), "new" (#13), "technology" (#19), and "offshore" (#47) in Table D1 and "safety", "more", "operations", "safer", "offshore", "improve", "empower", "ensure", and "safe" in Table D5. Along with safety, BP also valued efficiency, which is shown by nodes such as "go", "hand-in-hand", and "efficient" in Table D5. BP's images of being an active participant of a number of energy conferences and an industry leader providing reliable reports on energy industry are demonstrated by nodes such as "launch", "energy outlook", "outlook", "baker energy", "BP stats", "otc", "otc2017", "cera week", "otc houston", "energy challenge", "e-week 2017", "engineers week", "oil and gas", "natural gas", "future", "industry", "provide", "attendees", and "lead" in Table D5 and nodes "bp stats" (#5), "energy outlook" (#20), "energy" (#3), "oil" (#9), "otc2017" (#7), "cera week" (#14), "speak" (#16), and "share" (#24) in Table D1.

BP's images of making contribution to the US economy, supporting American jobs, and investing in the US are demonstrated by nodes "support" (#4), "united states" (#6), "help" (#15), and "invest" (#34) in Table D1 and "job", "invest", "economy", and "reinvests" in Table D5. The company's images of supporting local communities and giving back to the society are denoted by nodes "sponsor" (#23), "whatcom" (#39), and "bp ms 150" (#31) in Table D1 and "help", "create", "effort", "proudly", "GHP Rise", "sponsor", "local", "development", "multiple sclerosis", and "BP MS 150" in Table D5. The images of maintaining good infrastructures and high production capacity are displayed by nodes "project" (#11), "new" (#13), "production" (#35), "thunder horse" (#38), "cherry point refinery" (#40), "major" (#41), and "platform" (#46) in Table D1 and "project", "major", "cherry point refinery", "cooper river facility", "cherry point", "platform", "complete", "approved", "south expansion", "mad dog", "produce", "production", "pipeline", "per day", "barrels", "largest", and "enough" in Table D5. The company's support of STEM, STEM education, and future scientists, engineers, and leaders is displayed by nodes "future" (#12), "stem" (#17), "sponsor" (#23), and "students" (#30) in Table D1 and "future", "leader", "engineers", "host", "encourage", "event", "campaign", and "love STEM SD" in Table D5. And node "growth" (#32) in Table D1 denotes growth as one of the goals of BP.

In addition to the common images as demonstrated by the nodes in Table D1 and Table D5, nodes in Table D5 also show other images of BP. Nodes such as "new", "launch", "resource", "data", "reservoir", "management", "expand", "develop", "BP tech", "seismic imaging", "innovative", "digital", "enabled", and "lead" demonstrate BP valued high technology, was technologically advanced, and valued innovation. The efforts BP made to protect the environment, reduce emissions, and create a low carbon future are denoted by nodes

such as "impact", "effort", "environmental", "environment", "Paris Climate Accord", "carbon dividends", "lower", "carbon", "emissions", "reduce", "cleaner", "fuel", and "future". BP's image as a pioneer in exploring and developing Alaska is displayed by nodes such as "Prudhoe Bay", "Alaska", "BP Alaska", and "40 years"; and its image of hiring great employees is shown by nodes "distinguished alumni", "employees", and "congratulations". BP's good financial and operational performances are demonstrated by nodes such as "grow", "1q2017", "maintain", "financial", "result", "growth", "highlight", and "performance"; and BP's image of being a leader in exploring recyclable energy is demonstrated by nodes such as "energy", "renewables", "AWEA", "directly", "operate", "renewable", "largest", and "lead".

Nodes such as "gulf of Mexico", "expand", "capability", "cost", "development", and "lead" demonstrate BP was competitive and capable of controlling costs to enhance its financial performance; BP's support of veterans is implied by nodes "Chicago", "Houston", and "military"; its valuing of diversity is implied by nodes "hacr2017" and "effort"; and the effort it made to boost employee benefits is demonstrated by "add", "boost", and "employee".

Summary of BP's Images. To summarize, the dominant nodes listed in Tables D1, D2, D3, D4, and D5, and the 17 semantic network groups generated in ORA based on the messages collected from the Twitter account of BP demonstrate the following images of BP.

First, BP supported STEM, STEM education, and future scientists, leaders, and engineers. The company realized the importance of supporting and inspiring the next generation of leaders of the industry and BP employees participated in a variety of activities to help prepare students for a bright future and a career in STEM related fields. BP provided students with the opportunity to learn about its business and gain hands-on experience through its early engagement program, sent engineers to share their personal career stories and advice with

students, celebrated with STEM resources to help inspire students, encouraged girls and women to pursue future and develop careers in STEM fields, stated it loved STEM, and participated in a variety of activities to support STEM education.

Second, BP made great effort to give back to the society and assume social responsibilities. The company had donated $130M to US communities over the past 5 years, helped fund construction projects in the Blaine School District, delivered 150 meals on wheels, donated flags to local Kiwanis group, supported a healthy lifestyle in Alaska, and made generous donation equivalent to the volunteer hours contributed by its employees. BP military veterans participated in activities to raise awareness of PTSD and BP employees worked to repair homes and help the community in Houston. BP Cherry Point employees had contributed over 4,500 volunteer hours to Whatcom County in 2016. BP also sponsored BP MS 150 and made great effort to help end multiple sclerosis.

Third, BP was an active participant at a number of energy conferences and an industry leader providing reliable and insightful reports and analysis on the energy industry. The company launched its Statistical Review of World Energy and 2017 US Energy Outlook, which were presented at @AGA_NaturalGas Roundtable, @ColumbiaUEnergy, the IAGC Annual Conference, and @LMOGA meeting. BP was also an active participant of OTC, a supporter of the OTC Energy Challenge, and an investor sponsor of #NALEOEnergy for the key insights provided on US energy resources.

Fourth, BP worked to protect the environment and advance a low-carbon future. In 2015, BP's wind farms helped avoid around 3 million tons of CO_2 emissions. Despite the Trump administration's withdrawal from the Paris climate accords, BP stated that it welcomed the Paris agreement when it was signed and will continue to support it. The company was also one of the

founding members of Climate Leadership Council. BP upgraded its infrastructure in Cooper

River to produce PTA with less energy and fewer carbon emissions, invested in lower carbon

technologies, developed a wind portfolio that helped avoid CO_2 emissions, invested \$200M in a

Charleston area chemical plant to save energy and reduce emissions, and helped its customers

reduce emissions.

Fifth, BP maintained good financial and operational performances. The company made

good financial progress in 2016 and reached its target of reducing controllable cash costs by \$7

billion a year ahead of plan. BP opened its first retail site from scratch in Mexico in 2017, added

more than 30 new convenience partnerships to the company's retail portfolio in 2017, cut the

cost for its Mad Dog 2 project to less than half of its original cost, made a new joint venture

agreed for retail in Indonesia in 1Q 2017, finished six major projects in 2016, and operated

18000 retail sites in 2016. The company's financial results were robust and showed continued

operational momentum.

Sixth, BP maintained outstanding infrastructures and exceptional capability to improve

its infrastructures with low costs in a low-price environment. The new projects BP intended to

finish included a new project in Mauritania and Senegal, the Mad Dog 2 project, and the Thunder

Horse South Expansion project. The company completed upgrade of its South Carolina

petrochemical facility. BP's Texas City Chemical's facility could house all 122 high-school

football fields in the Houston area. The total acreage pf BP's Tortue field was bigger than the

Greater Houston area at 33,000 square kilometers. And BP's supercomputer facility in Houston

expanded its capabilities in exploration and reservoir management.

Seventh, BP made efforts to ensure safety in its operations and considered safety as its

number one priority. The company considered safety as its number 1 core value, continued to

improve process and personal safety, attempted to create a culture of safety, used data to ensure safer operations, and made effort to maintain safety in a low-oil price environment. High technologies were employed by the company to enhance safe and reliable operations. BP teams trained and retrained in VR simulators to be better prepared for any situation offshore. BP drill teams stayed in constant communication with onshore experts to enhance safety through 24/7 backup to offshore teams, and every task in BP was assessed for risk to increase safety.

Eighth, BP attempted to maintain and increase efficiency. A BP Process & Asset Development Engineer explained how efficiency and safety went hand-in-hand in the company and BP's Chief Executive Upstream expressed that BP acted to make the company competitive by increasing efficiency and reducing costs, while keeping safety as the first priority. The company aimed to build a business that is safer, more modern and efficient, and delivering real value and tangible growth. New technologies such as big data and automation also helped enable BP's business to be better and more efficient.

Ninth, BP made big contributions to the American economy and made historic contribution to US energy security. BP had reinvested 100% of every dollar earned in the US back into the country over the past ten years, and no energy company had invested more in America than BP. BP America energized the American economy with over 140k jobs and the company had invested $90 billion in the US over the past decade. BP's Whiting refinery, which was built in 1889 as the first to refine sour crude oil, had been a key anchor of the northwest Indiana economy for more than 125 years and supported more than 13,000 jobs in Indiana. BP's Cherry Point Refinery supported 7,000 high-paying local jobs throughout Washington state; and the company looked at wind energy for more manufacturing jobs. BP was a company of great history and made historic contribution to Alaska's economy, with its Prudhoe Bay oil field in

Alaska reaching 40 years of production, a milestone highlighting its historic contribution to US energy security.

Tenth, BP was a company maintaining high production capacity. The company's wind farm in Colorado could generate enough electricity to power approximately 65K homes for a year. 13 windfarms in seven states directly operated by BP had a gross generating capacity of 2,259 megawatts. BP's Thunder Horse was planned to produce enough energy to power all the homes in Washington DC for three and a half months; its Mad Dog Phase 2 would include a floating production platform with the capacity to produce up to 140K gross barrels of crude oil per day; and its Prudhoe Bay field had produced 12.5 billion barrels of Alaska oil over 40 years.

Eleventh, BP valued technology and innovation, and was technologically advanced. The company engineered 32 new ships with advanced technology to transport oil and gas safely, invested in industry-leading technologies that helped develop new resources and extend the life of existing fields in Alaska, developed new, industry-leading software to monitor drilling operations in real-time, celebrated inventors who developed new technology to make its operations safer and more efficient on Inventors Day, and closely monitored weather in the Gulf during Atlantic hurricane season. BP also maintained high capabilities to process and analyze a huge amount of data.

Other images of BP that are not as prominent as the 11 images described above, but are also demonstrated by the semantic networks include sage investments, long history, boosting benefits for employees, good brands, good products, capable and outstanding employees, recovering from the 2010 oil spill, providing large-scale service, valuing execution, commitment to cleaner and cheaper American energy, being named as a "Top 50 Employer" by the readers of "Careers & the disABLED" magazine, actively answering questions on social media, diversity

and inclusion efforts, encouraging a change-agent culture, capability based on global and modern workforce, being digitally enabled, aiming to market led growth, seeking disciplined growth, and focusing on returns.

Comparison of BP's Images Demonstrated by the Three Sites

The comparison of BP's images demonstrated by the messages collected from the Facebook page and the Twitter account of BP indicates the images presented in the two sites are mostly consistent. First, semantic network analyses of both sites show safety was an essential value of BP and new technologies were employed by the company to enhance safety. Along with safety, efficiency was also valued in BP. Second, both social media sites conveyed BP's image of making great contributions to American economy. BP invested more in the US than in any other country and supported a large number of jobs in different states across America.

Third, both sites demonstrate BP maintained outstanding infrastructures, including the Cooper River facility, Texas City Chemical's facility, South Carolina petrochemical facility, Thunder Horse platform, and Mad Dog platform, and the company kept upgrading and improving its infrastructures. Fourth, the two sites both conveyed BP's image of maintaining high production capacity. Examples of facilities with outstanding production capacity included BP's Whiting Refinery, Cherry Point Refinery, windfarms in seven states, Thunder Horse, Mad Dog 2, and Prudhoe Bay field. Fifth, both sites presented and conveyed that BP was an active participant of a number of energy conferences and an industry leader providing reliable and insightful report and analysis on energy industry.

Sixth, another image of BP as demonstrated by both social media sites is making great effort to give back to the society and assume social responsibilities. Seventh, both sites demonstrate BP valued technology and innovation, and was technologically advanced. Eighth,

both sites show BP supported STEM and encouraged future engineers. Ninth, both sites demonstrate BP valued sustainability and the environment, was a leader in exploring renewable energy, and made investment in a low-carbon future. Other overlapping images demonstrated by the two sites include diversity and inclusion efforts, supporting women to develop careers in STEM, good and reliable products, a pioneer in exploring Alaska, good financial performance, etc.

It is not surprising that the images of BP demonstrated by the two organizationally-sanctioned social media sites of the company are consistent. It is highly possible that the two sites were maintained by the same group of staff in the company and these consistent images were exactly the images the company strategically intended to build and convey to the public. It is worthwhile to notice that the messages collected from the Facebook page of BP America were posted from July 1st, 2016 to June 30th, 2017 and the messages collected from the Twitter account of BP America were posted from January 1st, 2017 to June, 30, 2017. The mostly consistent images conveyed on the two sites during different time periods imply the stability of image construction, regardless of the time period and social media type.

Though the images conveyed by the Facebook page and the Twitter account are generally consistent, the different time periods of data collection cause some images conveyed in the Facebook messages to be different than those conveyed in the Twitter messages collected. For example, a majority of nodes and links in network group 2 of the semantic network generated based on messages from the Facebook page of BP America primarily show BP's image of supporting Team USA Paralympians at the Rio 2016 Paralympic Games, which is demonstrated in none of the network groups of the semantic network generated based on messages from the Twitter account of BP America, because the Rio 2016 Paralympic Games was held in 2016, but

the time period of data collection from the Twitter account started from January 1st, 2017. Another difference is that though conveyed on both sites, some images were emphasized more and some were emphasized less in the semantic networks generated based on messages from the two sites. For example, a large number of messages collected from the Twitter account of BP America conveyed BP's images of being an active participant of various energy conferences and supporting STEM and STEM education, which were not conveyed as often in messages collected from the Facebook page. Messages from the Twitter account also gave more details about BP's good operational and financial performance.

The images conveyed in messages collected from the Facebook page of Boycott BP are totally different from the images conveyed by the two organizationally-sanctioned social media sites of BP. According to the results of the semantic network analysis of the messages collected from the Facebook page of Boycott BP, the images of BP conveyed by the Facebook page of Boycott BP are primarily negative images related to the 2010 Deepwater Horizon oil spill and its devastating economic, environmental, and ecological impacts, which are completely not mentioned in the messages collected from the Facebook page and Twitter account of BP. BP did not even mention the 2010 oil spill and its negative impacts on its Facebook page and Twitter accounts, as shown by semantic network analyses of the messages collected from these sites.

The Facebook page of Boycott BP also conveyed safety problems and negative environmental impact of the more recent operations of BP. For example, BP dumped toxic mercury into Lake Michigan, leaked oil into North Sea, and spilled coal-bed methane produced water into Sauls Creek. These images of BP are also missing in the messages collected from the Facebook page and Twitter account of BP. In contrast, the two official social media sites of BP America emphasized how safety was considered as essential in BP and the company made great

effort to ensure safe and reliable operations, and the two sites also conveyed BP's image of protecting environment and reducing emissions.

It is not surprising that images conveyed by the two organizationally-sanctioned social media sites of BP are all positive and images conveyed by the counter-organizational social media site of BP are all negative, which is caused and determined by the different nature of the two types of sites. BP America's primary objective of establishing and maintaining its Facebook page and Twitter account is to promote corporate brands and build good images and reputation for the organization, while the Facebook page of Boycott BP was created to resist BP and memorialize the 2010 oil spill. Some images conveyed in the two types of sites are completely opposite, but they are about same issues such as attitudes towards the environment, environmental impacts, and attitudes towards communities.

Likert scales to measure the organizational image of BP

As discussed in Chapter 4, 7-point Likert scales to measure the organizational image of BP are designed based on the results of semantic network analyses of the two organizationally-sanctioned social media sites and the counter-organizational social media site. Ten dimensions are formulated to describe the organizational image of BP conveyed by the three social media sites, based on the integration of images summarized from the results of semantic network analyses of the three sites. These 10 dimensions are: industry leader, competence, safety, social responsibility, technology/innovation/change, supporting American economy, good workplace, performance/effectiveness, harming environment, and oil spill. Indicators to measure each dimension are displayed in Table 8.

Table 8

Items Measuring the Organizational Image of BP

Dimensions	Measurement items
Industry Leader	1. BP is a leader in the energy industry. 2. BP is a company with great history. 3. BP continues to make major contributions to the energy industry. 4. BP always provides insights for the energy industry.
Competence	1. BP maintains highly advanced infrastructures. 2. BP is technologically advanced in its operations and explorations. 3. BP maintains high production capacity. 4. BP maintains a modern workforce.
Safety	1. Safety is the No.1 core value of BP. 2. BP builds safety into everything from design through operations. 3. BP always maintains safety in its operations. 4. BP's practices are always safe.
Social Responsibility	1. BP actively engages in activities to benefit the society. 2. BP makes great effort to support local communities. 3. BP encourages employees to conduct volunteer work to benefit the society. 4. BP prioritizes social responsibility over profits.
Technology/Innovation/Change	1. BP values technology and innovation. 2. BP encourages a change-agent culture. 3. BP inspires future engineers and the next generation of energy leaders. 4. BP develops and invests in industry-leading technologies.

Table 8 (cont'd)

Items Measuring the Organizational Image of BP

Dimensions	Measurement items
Supports American Economy	1. BP makes huge investment in the United States. 2. BP works to make America stronger. 3. BP supports a large number of jobs across America. 4. BP supports economies in many states in America.
Good Workplace	1. BP is a good place to work. 2. BP is a company committed to inclusion and diversity. 3. BP works hard to drive gender equality in the workplace. 4. BP makes effort to create a culture of care.
Performance/Effectiveness	1. BP maintains good financial performance every year. 2. BP maintains marketing growth every year. 3. BP is building a business that is more efficient. 4. BP maintains strong operational performance every year.
Harms Environment	1. BP is not truly committed to environmental protection and restoration. 2. BP is among the top environmental, health, and safety violators. 3. BP does not care about environmental impacts in its operations. 4. BP has caused significant negative environmental impacts.
Oil Spill	1. BP's 2010 Deepwater Horizon oil spill was catastrophic. 2. BP's 2010 Deepwater Horizon oil spill severely harmed local businesses. 3. BP's 2010 Deepwater Horizon oil spill brought extensive environmental damage to the Gulf of Mexico. 4. BP attempted to reduce its financial responsibility for the disastrous effect of the 2010 Deepwater Horizon oil spill.

The dimension of "oil spill" is primarily deduced from the results of the semantic network analysis of the messages collected from the Facebook page of Boycott BP. Other dimensions covered the images summarized from the analyses of all of the three sites. In the 7-

point Likert scales, the points "1", "2", "3", "4", "5", "6", and "7" respectively represent "strongly disagree", "disagree", "somewhat disagree", "neither agree nor disagree", "somewhat disagree", "agree", and "strongly agree". Thus, each statement can be answered positively or negatively. For example, the Facebook page of Boycott BP conveyed BP polluted the environment and cannot ensure safety in its operations, while the two official sites presented BP made great effort to protect the environment and advance safety. All the statements measuring "harming environment" are negative, but the participants can choose "1" (strongly disagree) if they acknowledge BP's effort to protect the environment; similarly, all the statements measuring "safety" are positive, but the participants can also choose "1" (strongly disagree) if they think the objective of safety is not achieved in BP's operations.

Results of Phase 2

In Phase 2 of the study, relationships among social media use (SMU), organization-stakeholder dialogic communication (OSDC), organization-stakeholder relationship (OSR), organizational image, and organizational reputation were examined through SEM analysis. Amazon MTurk workers were recruited to fill out an online questionnaire. Prior to completing the survey, they were instructed to review posts and comments between July 15, 2019 and September 21, 2019 on the Facebook page of BP America (https://www.facebook.com/BPAmerica/) to answer the questions in the survey. There were three attention check questions in the survey and workers had to answer the first attention check question and at least one of the other two attention check questions correctly; otherwise, their HITs (Human Intelligence Tasks) would be rejected. There were a total of 102 eligible responses ($N = 102$). The online survey was conducted between September 18, 2019 and October 18, 2019.

Among 102 respondents, 17 (16.7%) followed a social media site about BP and 85 (83.3%) did not; 14 (13.7%) followed BP America's Facebook page and 88 (86.3%) did not; only five (4.9%) followed BP America's Twitter account and 97 (95.1%) did not; and only three (2.9%) followed Boycott BP's Facebook page and 99 (97.1%) did not. These statistics indicate that most participants were not fans or followers of the three social media sites examined. Since respondents were recruited through Amazon MTurk system, this result is not surprising.

Among 102 respondents, 89 (87.3%) had seen BP in the news or seen its advertising and 70 (68.6%) had used/purchased BP products. Only two (2%) respondents chose "Yes" when answering whether they or anyone in their family ever worked for BP and only seven (6.9%) chose "Yes" when answering whether they or anyone in their family ever worked for a different company in the energy industry. In terms of prior familiarity with the organization, 39 (38.2%) respondents answered they were very familiar with BP prior to this study, 56 (54.9%) were somewhat familiar, and only seven (6.9%) were not familiar with the company. In terms of their relationships to BP, among 102 respondents, 70 (68.6%) were customers of BP, eight (7.8%) identified themselves as environmentalists, two respondents identified themselves as residents affected by the oil spill, and 67 (65.7%) identified themselves as the general public. No respondent chose the categories of shareholder, current employee, former employee, regulator, or journalist. These statistics demonstrate that most participants had some knowledge and familiarity with BP and had used their products as BP customers; however, very few participants and their families ever worked in the energy industry or for BP or were directly affected by the oil spill.

Among the respondents, 62 (60.8%) were male and 40 (39.2%) were female. In terms of education, 21 (20.6%) received a high school degree or equivalent (e.g., GED), 15 (14.7%)

attended some college without receiving a degree, 11 (10.8%) received an associate degree, 50 (49%) received a bachelor degree, and only five (4.9%) received a graduate degree. As for age, no respondent was less than 21 years old, 22 (21.6%) were between 21 and 29 years old, 52 (51%) respondents were between 30 to 39 years old, 10 (9.8%) were between 40 and 49 years old, six (5.9%) were between 50 and 59 years old, and 12 (11.8%) were 60 years old or older.

When it comes to respondents' SMU, statistics show participants were more involved in consuming SMU than contributing SMU. More specifically, only the first item measuring consuming SMU, "I have seen information about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.)", has a moderately high mean ($M = 4.28$, $SD = 2.08$). All other items measuring both consuming and contributing SMU have mean scores less than 2.52, as shown in Table H1 in Appendix H. Overall, these statistics demonstrate respondents in this study were not heavily involved in SMU regarding BP. They somewhat had seen information about BP on various social media platforms; however, they rarely proactively searched for information about BP, clicked "like" to a post about BP, made comments on a post about BP, shared a post about BP, or discussed BP with others on social media.

Exploratory Factor Analyses. As introduced in Chapter 4, measurements of SMU, OSDC, and organizational image were mostly designed by the researcher, while measurements of OSR and organizational reputation were modified based on established measurements. Thus, before proceeding to the SEM analysis, the researcher conducted a series of exploratory factor analysis to determine whether the dimensions and the related items to measure SMU, OSDC, and organizational image are reasonable. In order to best assess this, multiple analyses were tried using varied extraction methods and rotations. If factor extraction based on eigenvalues did not

provide clear results, efforts were made to fix the number of factors to try and achieve clearer results.

First, factor analyses were performed on the six items that measure consuming and contributing SMU. Only one factor was extracted with the various extraction and rotation methods; however, given the expectation of two factors here, principal axis factoring extraction with varimax rotation and the number of factors fixed to two revealed the three items measuring consuming SMU loaded on factor 2 and the three items measuring contributing SMU loaded on factor 1 (see Table H2 in Appendix H). Thus, the original scale measuring SMU is kept. Reliability analysis of the three items for consuming SMU shows good internal consistency (*Cronbach's α* = .80). Reliability analysis of the three items for contributing SMU demonstrates excellent internal consistency (*Cronbach's α* = .93).

Second, factor analyses were performed on the 27 items measuring the nine dimensions of OSDC. In order to simplify items to measure each factor, the researcher deleted items with loadings less than .60 on all factors. Factor extraction based on eigenvalues only resulted in two factors. For example, principal component analysis factoring extraction with varimax rotation resulted in two factors, with the second item of openness, all items of equality, transparency, empathy, genuineness, and respect, and the first item of commitment loading on factor 1, and all items of interactivity and responsiveness, the first item of openness, and the second and third items of commitment loading on factor 2. Given the complexity of these two factors it was hard to assign reasonable meanings to each factor. The researcher then tried to fix the number of factors to 3, 4, and 5 and obtained the clearest results when the number was fixed to three and image factoring extraction with equamax rotation was adopted. The results are displayed in Table H3, which also summarizes each factor and its items. It seems that the results of the factor

analysis do not support measuring OSDC in behavioral and attitudinal dimensions. Transparency, which belongs to the behavioral dimension, and genuineness, which belongs to the attitudinal dimension, both loaded on factor 1. Some items of interactivity, responsiveness, and openness, which belong to the behavioral dimension, and two items of commitment, which belong to the attitudinal dimension, loaded on factor 2.

Table H3 demonstrates that there are three factors to measure OSDC. Factor 1 includes all items of transparency and genuineness and the first item of commitment. The first item of commitment is about BP's always providing useful information to people on its Facebook, which is clearly related to genuineness. Because all items loading on factor 1 relate to transparency and genuineness, factor 1 is named "transparency and genuineness". Reliability analysis of the seven items of factor 1 indicates excellent internal consistency (*Cronbach's α* = .97). Factor 2 includes all items of interactivity and responsiveness, except for the third item of interactivity, which was removed because of its low factor loading. Also on this factor are the second and third items of commitment (concerning BP's always replying to comments and addressing concerns, which also relate to interactivity and responsiveness) and the first item of openness (stating BP is easy to talk on its Facebook, which is also somewhat related to interactivity and responsiveness). Because all items loaded on factor 2 relate to interactivity and responsiveness, factor 2 is named "interactivity and responsiveness". Reliability analysis of the eight items of factor 2 shows excellent internal consistency (*Cronbach's α* = .95). Factor 3 includes all items of empathy and no other items are included. Thus, the name of factor 3 is "empathy". Reliability analysis of the three items of factor 3 demonstrates excellent internal consistency (*Cronbach's α* = .96). In summary, exploratory factor analysis generated three reasonable and reliable dimensions to measure OSDC: transparency and genuineness, interactivity and responsiveness, and empathy.

Third, factor analyses were performed on the 40 items measuring the 10 dimensions of organizational image. Again, in order to simplify items to measure each factor, the researcher deleted items with loadings less than .60 on all factors. The best results were achieved when alpha factoring extraction with direct oblimin rotation was performed. The results are displayed in Table H4, which also summarizes each factor and its items. The six factors were extracted based on eigenvalues. The researcher tried unsuccessfully to fix the number of factors to 3, 4, and 5 to see whether the dimensions could be further reduced.

The interpretation of factor 2, factor 4, factor 5, and factor 6 is rather straightforward, as each of them only includes items of a specific dimension of organizational image of BP. Factor 2 only includes three items related to oil spill and is thus named "oil spill". Reliability analysis of these three items shows excellent internal consistency (*Cronbach's α* = .94). Factor 4 only includes three items of harming environment and is thus named "harming the environment". Reliability analysis of these three items demonstrates good internal consistency (*Cronbach's α* = .86). Factor 5 includes all four items of safety and is therefore named "safety". Reliability analysis of these four items indicates excellent internal consistency (*Cronbach's α* = .96). Factor 6 includes all four items of performance/effectiveness and is thus named "performance/effectiveness". Reliability analysis of these four items indicates excellent internal consistency (*Cronbach's α* = .93).

As for interpretation of factor 1, the two items of social responsibility and the four items of supporting the American economy all denote meaning of benefiting the society. However, the three items of good workplace seem not related to either social responsibility or supporting American economy. Considering respondents of this study are Amazon MTurk workers with limited familiarity about how good the BP workplace is, (recall that only two (2%) answered

they or anyone in their family ever worked for BP and only seven (6.9%) answered they or

anyone in their family ever worked for a different company in the energy industry), a decision

was made to remove the three items of good workplace from factor 1. Only the items of social

responsibility and supporting the American economy were kept and factor 1 is therefore named

"benefiting the society". Reliability analysis of the six items of factor 1 shows excellent internal

consistency (*Cronbach's α* = .93). Factor 3 includes two items of industry leader and three items

of competence and thus it is named "leadership and competence". Reliability analysis of the five

items of factor 3 demonstrates excellent internal consistency (*Cronbach's α* = .91). In summary,

exploratory factor analysis revealed six reasonable and reliable dimensions to measure

organizational image of BP: benefiting the society, oil spill, leadership and competence, harming

the environment, safety, and performance/effectiveness.

   Structural Equation Modeling (SEM). After the factors of SMU, OSDC, and

organizational image were determined based on exploratory factor analysis, SEM was conducted

to examine the relationships among the five latent variables, which are SMU, OSDC, OSR,

organizational image, and organizational reputation. The assumed relationships among these

variables and the relevant hypotheses are displayed in the conceptual model in Figure 1 in

Chapter 3. For consistency, items of oil spill and harming the environment, and the third item of

control mutuality were reversely coded in the analysis, as these items are negative statements

about BP, while the rest of items are all positive statements. The mean of the values of respective

items was calculated to represent the value of each dimension of the five latent variables. If there

is a missing value for a specific item, the value of the corresponding dimension is still the mean

of the values of the remaining items, which is the default setting in SPSS when the function of

mean is used to calculate values. Therefore, there is no missing value for SEM analysis in this study. SPSS AMOS was adopted to conduct SEM analysis.

Initially the researcher incorporated all of the five latent variables and items measuring them in the specified model to be tested. Negative variances appeared and the solution was not admissible, which suggests either that the model is wrong or that the sample is too small. Since the sample size for this study is small ($N = 102$), it is highly possible that the reason why the solution was not admissible is the small sample size. The researcher then attempted to remove either organizational image or organizational reputation and the respective dimensions to reduce the number of observed variables in the model (with fewer observed variables, fewer responses are needed for SEM). After this action was taken, the new models became admissible, negative variances disappeared, and the sample size was sufficient. It is worthwhile to mention that H7 hypothesizes there is an interrelationship between organizational image and organizational reputation and thus it is necessary to incorporate both organizational image and organizational reputation in the model to test H7. To avoid an inadmissible solution, SMU, OSDC, OSR and their dimensions were deleted in the model to test H7. To summarize, to test H7 only organizational image and organizational reputation and their dimensions were kept in the model; and to test the rest of the hypotheses, only one of them along with all other variables and their dimensions were kept in the model.

The path diagram of the model that removes organizational image and its dimensions is displayed in Figure H1. The initial model does not fit well (*Chi-square* = 281.53, *df* = 86, *p* = .000, *GFI* = .70, *CFI* =. 90, *RMSEA* = .15). In order to obtain better goodness of fit, the researcher attempted to add some error covariances based on modification indices and found a slightly better model was achieved (*Chi-square* = 82.27, *df* = 60, *p* = .03, *GFI* = .90, *CFI* = .99,

RMSEA = .06). All model fit indices are improved, with reduced Chi-square, decreased RMSEA, and increased GFI and CFI. It is worth mentioning that CFI is now greater than .95 and RMSEA is now less than .80, which meets the criteria of a good-fitting model. The path diagram of the new model with standardized estimates is exhibited in Figure H2.

Table H5 displays the regression weights and standardized regression weights. As demonstrated in Table H5, SMU positively predicts OSDC (*estimate* = 0.33, *standardized estimate* = .30, *p* = .009); thus, this part of H1 is supported for this case. OSDC positively predicts OSR (*estimate* = 0.79, *standardized estimate* = .96, *p* < .001), thus, H2a is supported for BP. OSR positively predicts organizational reputation (*estimate* = 1.01, *standardized estimate* = .81, *p* < .001), thus H6 is supported for this case. OSDC does not significantly predict organizational reputation (*p* = .444); therefore, H4a is rejected for this organization. The results demonstrate that OSDC does not directly affect organizational reputation, but does so indirectly. The relationship between OSDC and organizational reputation is mediated by OSR. H2b and H4b were not tested for the case of BP, as perceived dialogic communication on counter-organizational social media was not measured for this case.

Table H6 presents squared multiple correlations. Predictors of organizational reputation explain 89% of its variance and predictors of OSR explain 92% of its variance, which indicates good selection of predictors. However, the predictor of OSDC (i.e., SMU) only explains 9% of its variance; this might be because participants were mostly not users of the three social media sites examined in the study. Table H7 lists direct, indirect, and total effects and the corresponding standardized effects. The direct effect of SMU on OSDC, which is also the total effect, is 0.33, which is not high. SMU's indirect effects on OSR and organizational reputation, which are also the total effects, are 0.26 and 0.31 respectively, which are not high either. The

direct effect of OSDC on OSR is 0.79 and the direct effect of OSR on organizational reputation, which is also its total effect, is 1.01. OSDC's direct effect on organizational reputation is only 0.14, but its indirect and total effects on it are 0.80 and 0.94 respectively, which denotes the mediating effect of OSR. The standardized direct, indirect, and total effects of SMU on OSDC, OSR, and organizational reputation are all smaller than .31, indicating SMU's effects on these variables are not high. The standardized direct effect of OSDC on organizational reputation is only .14, but its standardized indirect and total effects on organizational reputation are .78 and .92 respectively, which indicates the mediating effect of OSR. OSDC's standardized direct and total effects on OSR are .96 and OSR's standardized direct and total effects on organizational reputation are .81.

To examine the effects on organizational image, similar steps were taken. In order to reduce the number of observed variables, organizational reputation and its dimensions are removed in the specified model to be tested, which is displayed in Figure H3. The initial model does not fit well (*Chi-square* = 266.94, *df* = 86, *p* = .000, *GFI* =. 72, *CFI* = .89, *RMSEA* = .14). In order to obtain better goodness of fit, the researcher attempted to add some error covariances based on modification indices and found a model where all fit indices are improved, with significantly reduced Chi-square, decreased RMSEA, and increased GFI and CFI (*Chi-square* = 80.68, *df* = 65, *p* =. 091, *GFI* = .91, *CFI* = .99, *RMSEA* = .05). The path diagram of the new model with standardized estimates is exhibited in Figure H4.

Table H8 displays the regression weights and standardized regression weights. As demonstrated in Table H8, SMU positively predicts OSDC (*estimate* = 0.30, *standardized estimate* = .28, *p* = .016), thus supporting this part of H1 for BP. OSDC positively predicts OSR (*estimate* = 0.80, *standardized estimate* = .96, p < .001), supporting H2a for this case. OSR

positively predicts organizational image (*estimate* = 0.80, *standardized estimate* = .97, p < .001), thus supporting this aspect of H5 for this company. OSDC does not significantly predict organizational image (*p* = .983); thus, this aspect of H3a is rejected for this case. The results show that OSDC does not directly affect organizational image, but does so indirectly. The relationship between OSDC and organizational image is mediated by OSR. H2b and H3b were not tested for the case of BP, as perceived dialogic communication on counter-organizational social media was not measured for this case.

Table H9 presents squared multiple correlations. Predictors of organizational image explain 95% of its variance and predictors of OSR explain 92% of its variance. However, the predictor of OSDC (i.e., SMU) only explains 8% of its variance; this might be because participants were mostly not users of the three social media sites examined in the study. Table H10 lists direct, indirect, and total effects and the corresponding standardized effects. The direct effect of SMU on OSDC, which is also the total effect, is 0.30, which is not high. SMU's indirect effects on OSR and organizational image, which are also the total effects, are 0.24 and 0.19 respectively, which are not high either. The direct effect of OSDC on OSR is 0.80 and the direct effect of OSR on organizational image, which is also its total effect, is 0.80. OSDC's direct effect on organizational image is only 0.003, but its indirect and total effects on it are 0.644 and 0.647 respectively, which indicates the mediating effect of OSR. The standardized direct, indirect, and total effects of SMU on OSDC, OSR, and organizational image are all smaller than .30, indicating SMU's effects on these variables are not high. The standardized direct effect of OSDC on organizational image is only .004, but its standardized direct, indirect, and total effects on OSR and its total effect on organizational image are all bigger than .90, which demonstrates

the mediating effect of OSR. The standardized direct and total effects of OSR on organizational

image are .97, which is high.

H7 stated that there is a relationship between organizational image and organization

reputation. To test H7, covariance analysis was conducted. The path diagram of the model to be

tested is displayed in Figure H5. The initial model does not fit well (*Chi-square* = 279.06, *df* =

53, *p* < .001., *GFI* = .60, *CFI* = .83, *RMSEA* = .21). In order to obtain better goodness of fit, the

researcher attempted to add some error covariances based on modification indices and found a

model where all fit indices are improved, with significantly reduced Chi-square, decreased

RMSEA, and increased GFI and CFI (*Chi-square* = 31.30, *df* = 21, *p* = .069, *GFI* = .95, *CFI* =

.99, *RMSEA* = .07). The path diagram of the new model with standardized estimates is exhibited

in Figure H6. Organizational image and organizational reputation are significantly positively

correlated (*Covariances estimate* = .94, *S.E.* = .17, *p* < .001, *correlation estimate* = .99); thus, H7

is supported for this case.

To summarize, the SEM analysis of the model only keeping organizational image and the

model only keeping organizational reputation demonstrates similar patterns when it comes to

hypotheses testing. For both models, SMU positively predicts OSDC and H1 is supported;

OSDC positively predicts OSR and H2a is supported; OSR positively predicts organizational

image and H5 is supported; and OSR positively predicts organizational reputation and H6 is

supported. Testing of both models indicates there is no direct relationship between OSDC and

organizational image or organizational reputation, and H3a and H4a are both rejected. The

relationship between OSDC and organizational image or organizational reputation is indirect

(mediated by OSR). Models with organizational reputation do not fit well, while models with

organizational image that fit well could be found. There is a positive relationship between

organizational image and organizational reputation, and H7 is supported.

Chapter 6

Results: The Case of Monsanto

Results of Phase 1

In this chapter, results of the semantic network analyses of messages collected from the Facebook page of Occupy Monsanto, the Facebook page of Monsanto, and the Twitter account of Monsanto are presented. For the Facebook page of Monsanto, the time period of data collection is July 1st, 2016 to June 30th, 2017, which resulted in a total of 177 posts in a year; for Monsanto's Twitter account, the time period of data collection is from January 1st, 2017 to June, 30, 2017, which totaled 485 posts in half a year; for the Facebook page of Occupy Monsanto, the time period of data collection is from July 1st, 2016 to June 30th, 2017, which resulted in a total of 245 posts in a year.

The following sections present the results of the semantic network analysis of the organizational social media sites and the counter-organizational social media sites of Monsanto. The presentation of results for each of the three sites is organized as follows. First, the interpretation of major network groups in each of the three overall network pictures corresponding to the three sites is provided. The researcher interprets the meanings of the links among nodes in those major network groups. Second, tables showing nodes ranked from the 1st to the 50th on frequency for each of the three semantic networks, the values of three centrality measures for the first 70 nodes in each semantic network, and nodes that are ranked from the 1st to the 100th on each of the three centrality measures are provided. Finally, major themes identifying the organizational images of Monsanto as presented on each social media platform, which are summarized by the researcher through integration of the images as shown by the network groups, frequency tables, and centrality measures, are presented.

Semantic Network Analysis of the Facebook of Occupy Monsanto

The semantic networks generated in ORA are based on the textual data collected from the Facebook page of Occupy Monsanto, including 245 posts from July 1st, 2016 to June 30th, 2017. The overall network picture is displayed in Figure A4 in Appendix A. Nodes in same colors belong to same groups, based on the Newman grouping algorithm. There is a total of 13 network groups as shown in the overall network picture, with each network picture displayed in Appendix E. All nodes in these pictures are sized by total-degree centrality values. In the following sections, the interpretation of 12 of the 13 network group pictures is presented. Network group 13 includes only three nodes and the images of BP demonstrated by this network group are also demonstrated in the 12 groups interpreted below.

Network Group 1. Network group 1 is displayed in Figure E1. It is not surprising that "monsanto" is the biggest node in Figure E1, because it is the company's name. A major theme demonstrated by nodes and links in network group 1 is Occupy Monsanto was making great effort on its Facebook page to call on people to occupy, defeat, and fight against Monsanto, and oppose the Bayer-Monsanto merger, as demonstrated by nodes around "monsanto" such as "oppose", "defeat", "occupy", and "fight", their links to "monsanto", and the link between "occupy" and "bayer". Bayer's acquisition of Monsanto is demonstrated by links among "bayer", "buy", and "monsanto". Another theme is about calling upon people to resist Monsanto's projects in Pima County, and keep the company out of Pima County and Arizona, as shown by nodes "oppose", "keep", "fight", "occupy", "monsanto", "frankenlab", "project corn", "gmo greenhouse", "call to action", "rally", and "marana high school", as well as links among them.

In summary, the following images of Monsanto are displayed by nodes and links in network group 1. First, as one of the big players in the GMO and agrochemical industry,

Monsanto engaged in extensive public relations, advertising, lobbying, propaganda and political campaigning to promote GMO. Nodes "monsanto", "bayer", "dow", and "dupont" represent the four big players in the GMO and agrochemical industry and links among them appeared in posts stating these big players were engaging in extensive public relations, advertising, lobbying and political campaigning to promote GMO.

Second, as one of the three big biotech companies, Monsanto controlled the majority of the world's GMO seed market along with DowDuPont, and Syngenta. The link between "fight" and "monsanto" appeared in posts depicting Monsanto fought to gain seed control; and the link between "giant" and "monsanto" refers to the global seed and chemical giant Monsanto and the multinational seed giant Monsanto. Third, Monsanto's glyphosate products could cause cancer, and California forced the company to label its weed-killer as a possible carcinogen and place a cancer threat label on its glyphosate products, as illustrated by the link between "force" and "monsanto". Studies also found pregnant women exposed to Monsanto weed killer experienced bad outcomes for their babies, as described in a post where the link between "expose" and "monsanto" appeared.

Fourth, the global seed and chemical giant Monsanto was sued and resisted in different countries. The link between "giant" and "monsanto" appeared in a post describing a lawsuit against Monsanto; and links among "multinational", "allow", "giant", and "monsanto" denote the Maharashtra government announced Monsanto would not be allowed to develop cotton seed varieties in the state. The company also quitted Malvinas Argentinas due to local people's resistance, as demonstrated by links among "monsanto", "quit", "malvinas", and "argentina". Fifth, the link between "giant" and "monsanto" also appeared in a post describing a mock trial at The Hague calling on the ICC (International Criminal Court) to take action against Monsanto.

The International Monsanto Tribunal in The Hague is an international civil society initiative to hold Monsanto accountable for human rights violations, crimes against humanity, and ecocide. Occupy Monsanto also called on people to help expose Monsanto's crimes, as shown by links among "expose", "monsanto", and "crime".

Other images of Monsanto demonstrated by network group 1 include poisoning and hurting people and the planet, fighting dirty to silence cancer scientists, the toxicity of GMOs and glyphosate, and causing environmental and health damages. The link between "monsanto" and "accountable" appeared in posts stating that Monsanto should be kept accountable for crimes against humanity, poisoning, harming people and planet, human rights violations, and ecocide; The link between "fight" and "monsanto" appeared in a post depicting Monsanto fighting dirty to silence cancer scientists. Additionally, the link between "fight" and "monsanto" appeared in a post describing two former Justice Department officials who bolstered warnings that the proposed merger between Bayer and Monsanto was a five-alarm threat to food supply and to farmers around the world.

Network Group 2. Network group 2 is displayed in Figure E2. Nodes "gmo" and "glyphosate" seem to be the two central nodes in Figure E2. The primary image demonstrated by nodes and links in network group 2 is Monsanto's products are not safe and will bring damage to the environment and human health. A major concern are glyphosate products, as denoted by the central node "glyphosate". Alarming levels of glyphosate contamination were found in popular American foods and glyphosate levels in pregnant women were found to lead to shorter pregnancies and smaller babies, as denoted by links among "alarming", "high", "level", "glyphosate", and "contamination". The link between "controversial" and "glyphosate" appeared in a post stating glyphosate was connected to Lake Erie's troubling algae blooms. Some studies

and the WHO's International Agency for Research on Cancer (IARC)'s review suggested glyphosate's potential links to cancer and report revealed that Monsanto had been covering up the carcinogenic effects of glyphosate, as depicted in posts where links among "potential", "carcinogenic", "effect", "link", "cause", and "cancer" appeared. A review of glyphosate pointed out adverse human impacts of glyphosate that included imbalances in the intestinal microbiome and intestinal functioning, cancer, genotoxicity, and endocrine disruption, as illustrated by links among "intestinal", "function", "cancer", "genotoxicity", and "endocrine". Italy moved to restrict many uses of carcinogenic glyphosate use and banned the spraying of glyphosate in many public places, as delineated in a post where the link between "public" and "space" appeared.

Several posts were about Roundup, a broad-spectrum glyphosate-based herbicide. Posts stated Roundup was proven to cause liver disease and caused cancer, as indicated by links among "cause", "cancer", and "liver disease". A California judge upheld the use of a cancer warning on Roundup and a California Congressman called for an investigation into Monsanto and a national boycott of Roundup herbicide, as denoted by the link between "national" and "boycott" and the link between "ban" and "completely". Another concern is with dicamba products. The EPA announced it had gotten an unusually high number of reports of crop damage that appeared related to misuse of herbicides containing the active ingredient dicamba, as described in a post where links among "contain", "herbicide" and "dicamba" appeared.

The final type is GMO products, as demonstrated by the central node "gmo". Monsanto's GMOs were rejected in China, as revealed by links among "China", "ne", and "gmo"; and American moms saw their children got better when they avoided GMOs and toxic pesticides, as delineated in a post where the link between "avoid" and "gmo" appeared. The link between

"gmo" and "contamination" appeared in some posts stating Monsanto could bring GMO contamination, pesticide drift, birth defects, loss of pollinators, and cancer.

Network Group 3. The network picture of network group 3 is displayed in Figure E3. No node is relatively bigger than any other node in Figure E3. GMO labeling movement and the relevant laws and people are the major themes as demonstrated by links among "mandatory", "labeling", "gmo labeling", "law", "bill", "nationwide", "movement", "prevent", and "non-labeling". As depicted in posts where these nodes and links appeared, there was an intense four-year battle to force mandatory GMO labeling; the intent of the Roberts-Stabenow bill was to overturn Vermont's mandatory GMO labeling law; and the US Senate and House passed a sham GMO labeling law (a.k.a. the "DARK Act") on behalf of the chemical-agri-biotech companies. These themes are indirectly related to Monsanto, as the company developed and produced GMO products.

The following images of Monsanto are directly shown in network group 3. First, Monsanto illegally pushed a form of Bt cotton, a genetically modified organism or genetically modified pest resistant plant cotton variety, into India and Africa more than a decade ago, as indicated by the link between "illegally" and "push". Second, Monsanto was resisted by Indian farmers who chose to plant indigenous seed, and the Maharashtra government announced that it would not allow Monsanto to develop cotton seed varieties in the state, as delineated in a post where links among "develop", "cotton seed", and "indigenous" appeared. Third, a complaint about Roundup herbicide against Monsanto was filed in a federal court in Wisconsin, as described in a post where the link between "federal" and "court" at the top of the picture appeared.

Network Group 4. Network group 4 is displayed in Figure E4. No node is relatively bigger than other nodes in Figure E4. To summarize, the following images of Monsanto are demonstrated by nodes and links of network group 4. First, glyphosate is harmful to people. High glyphosate levels in moms led to shorter pregnancies and shorter pregnancies with relatively lower birth weights had been linked to lower cognitive ability later in life and higher risk of metabolic syndrome, as illustrated by links among "low", "lower", "birth", "birth weight", "outcomes", and "cognitive ability" in the upper right of the picture. Second, Monsanto's products and activities would bring damage to the environment and human health. A post where the link between "birth" and "defects" appeared stated GMO contamination, pesticide drift, birth defects, loss of pollinators, and cancer would happen when Monsanto moved into Tucson. People living in Marana Unified School District (MUSD) and Pima County in Arizona were called upon to resist Monsanto, its new projects and business, and its GMO farm and GMO greenhouse, as indicated by nodes in the lower left of the picture including "marana unified school district", "pima community college", "marana municipal complex council members", "pcc board", "board meeting", "board members", "members", "email", and "attend", and links among them. Third, Monsanto was immoral and doing bad business. Rather than move away from toxic chemicals as millions of Americans had requested for years, Monsanto had invested heavily in Dicamba, continuing to feed a dependency on a toxic treadmill of chemical cocktails, which was stated in a post where the link between "bad" and "business" appeared.

Network Group 5. Network group 5 is displayed in Figure E5. No node in Figure E5 looks bigger than the other nodes in the picture. Nodes "food", "industry", and "company" seem to be the three central nodes in network group 5. To summarize, the following images of Monsanto are demonstrated by nodes and links of network group 5. First, Monsanto's GMO

crops were not safe. Links among "genetically engineered", "genetically modified", and "food" refer to genetically engineered food and genetically modified (GMO) food, which were dominant topics on Occupy Monsanto's Facebook page; links among "genetically engineered", "genetically modified", and "crop" represent genetically engineered crop and genetically modified crop, which were also popular topics on Occupy Monsanto's Facebook page. Occupy Monsanto argued Monsanto's GMO crops were not safe, stated GMO crops were banned in 38 countries, described Indian farmers rejected GMO crops, contended the glyphosate sprayed on GMO crops was linked to Lake Erie's Toxic algae bloom, and expressed concerns about Monsanto bringing GMO crops to Pima County.

Second, glyphosate could cause cancer and Monsanto attempted to hide the cancer-causing impact of glyphosate. The link between "cancer-causing" and "company" refers to cancer-causing company, phrases Occupy Monsanto used to depict Monsanto; the link between "hide" and "cancer-causing" appeared in a post delineating coffee farmers sued Monsanto for hiding the cancer-causing impact of glyphosate. Occupy Monsanto called upon people to avoid glyphosate-laced GMOs and glyphosate desiccated crops, as demonstrated in a post where the link between "desiccated" and "crop" appeared. Third, as one of the big players in the GMO and agrochemical industry, Monsanto engaged in extensive public relations, advertising, lobbying and political campaigning to promote GMOs, as depicted in a post where the link between "agrochemical" and "industry" appeared.

Fourth, Monsanto, along with other multinational food and agrochemical companies, funded a study that said not to trust studies warning to cut sugar, as contended in a post where the link between "agrochemical" and "company" appeared. Fifth, there would be negative effects of the Bayer-Monsanto merger. Food activists weighed in on how the merger could negatively

reshape food supply, as depicted in a post where the link between "food" and "activists" appeared. In posts where links among "marijuana", "industry", and "monopolize" appeared, Occupy Monsanto argued Monsanto and Bayer will take over the Marijuana Industry unless people fight back, in the same way they monopolize the seed.

Other images of Monsanto include maintaining surprisingly strong ties to the pharmaceutical industry as described in a post where the link between "pharmaceutical" and "industry" appeared, influencing the EPA along with other biotech companies in postponing important and necessary meetings regarding whether glyphosate caused cancer as portrayed in a post where the link between "biotech" and "company" appeared, controlling the majority of the world's GMO seed market along with DowDuPont and Syngenta as depicted in a post where the link between "biotech" and "industry" appeared, being the world's most hated company as illustrated by the link between "hate" and "company", conducting corporate propaganda to hide safety concerns about Roundup glyphosate and promote GMOs as shown by links among "big ag", "industry", "corporate", "propaganda", "hide" and "disguised", and environmental pollution caused by pesticide drift of Dicamba as contended in posts where the link between "pesticide" and "drift" appeared.

Network Group 6. Network group 6 is displayed in Figure E6. No node in Figure E6 looks bigger than the other nodes in the picture. To sum up, the following images of Monsanto are demonstrated by nodes and links of network group 6. First, glyphosate and Roundup are harmful to people. The link between "acute" and "poison" appeared in a post introducing a comprehensive review of Monsanto's glyphosate, which stated that adverse human impacts of glyphosate included acute poisoning, kidney and liver damage, imbalances in the intestinal microbiome and intestinal functioning, cancer, genotoxicity, endocrine disruption, reproductive

and developmental reduction, neurological damage, and immune system dysfunction. Millions of people in the EU protested extending Glyphosate License and EU member Italy became the 2nd to impose sharp limits on glyphosate use, as suggested by links among "millions", "protest", and "extending" at the lower left of the picture. Links among "azure standard", "organic farm", "certified", "organically", "land", and "oregon" at the upper left part of the picture appeared in posts describing Azure Farm, a certified organic farm in central Oregon, who was under threat from the local county government who wanted to spray the farm with Roundup and other toxic herbicides.

Second, Occupy Monsanto argued that Monsanto is a corporation that poisoned millions and poisoned for profit, as indicated by links among "poison", "millions" and "monsanto". Third, Monsanto's GM cotton was resisted in India and the company lost millions, as depicted in a post where the link between "lose" and "millions" appeared. Fourth, Occupy Monsanto contended Monsanto equals death as denoted by the link between "equals" and "death". Fifth, the production of Roundup caused damage to the environment. Links among "poison", "livestock", "piles", "groundwater", "pollute", "pollution", "mercury", and "emissions" appeared in posts arguing the cost of producing Roundup included radioactive waste piles, groundwater pollution, mercury emissions, and poisoned livestock. Fifth, the pesticide drift of dicamba was allegedly polluting neighboring lands and causing enormous damage, and Monsanto had refused to take any responsibility and was sued, as described in a post where links among "pollute", "neighboring", and "land" appeared. Lastly, Monsanto was sued by Washington state over PCB pollution, as illustrated by the link between "pcb" and "pollution".

Network Group 7. Network group 7 is displayed in Figure E7. The primary image of Monsanto demonstrated by this network group is the harmful effect of glyphosate on food

system. Links among "flavored", "oat", and "cereal" appeared in a post stating the residues of glyphosate were found in a variety of oat products, including plain and flavored oat cereals for babies; and links among "fda", "confirm", "baby food", and "oatmeal" indicate the FDA confirmed baby food and oatmeal contained residues of Monsanto weed killer glyphosate. The other links are only indirectly related to Monsanto's image. For example, the link between "environmentally" and "destructive" appeared in posts stating the agricultural industry promulgated the "feed the world" mantra as a way to deflect attention from their environmentally destructive practices.

Network Group 8. Network group 8 is shown in Figure E8. The following images of Monsanto are demonstrated by nodes and links of network group 8. First, Monsanto received resistance from citizens in Arizona. Nodes "board of supervisors", "meeting", "protect", "pima county", "Arizona", "follow", "join", "occupy monsanto", and "gmo free Arizona" and links among them are all related to Occupy Monsanto's calling upon people to keep Monsanto out of Pima County and Arizona and follow GMO Free Arizona. Occupy Monsanto called on people to rise up and attend the Pima County Board of Supervisors Meeting to resist against Monsanto to build a "Frankenlab" in Tucson. And the link between "concerned" and "citizens" indicates concerned citizens opposed the special tax deal for Monsanto's proposed Tucson area facility and took actions to keep Monsanto out of Pima County. Second, glyphosate is harmful and could cause cancer. The link between "protect" and "americans" appeared in a post expressing thanks to California activists and officials for protecting Americans by officially adding Glyphosate to the Prop 65 Carcinogen list. Third, Monsanto's product had killed people, as contended in a post where the link between "kill" and "people" appeared. Additionally, nodes such as "insecticides", "clothianidin", "harm", "bee" "killer", and "butterflies" indicate bees and butterflies were

harmed by pesticides, insecticides, and GMOs; however, the image of harming bees and butterflies is indirectly related to Monsanto, as the company was not directly addressed in posts including links among these nodes.

Network Group 9. Network group 9 is displayed in Figure E9. No node in Figure E9 looks bigger than the other nodes in the picture. Nodes and links in network group 9 present the following images of Monsanto. First, glyphosate had bad influence on the environment and human health, as argued in posts where the link between "human" and "health" appeared. Glyphosate has possible impact on fertility and fetus development, as discussed in posts where the node "fetus" appeared. The adverse human impacts of glyphosate included reproductive and developmental reduction and neurological damage, as denoted by links among "reduction", "neurological" and "damage". Links among "disturbing", "environmental", "human", "health", and "concern" appeared in a post stating disturbing environmental and human health concerns at the beginning, not just at the end, of Roundup's life cycle. As stated in a post where the link between "acceptable" and "excuse" appeared, ignorance is not ever an acceptable excuse when the food system is being poisoned by glyphosate. The link between "health" and "hazard" refers to the hashtag #HealthHazard, which was placed alongside #glyphosate, #herbicide, #weedkiller, #desiccant, #carcinogen, #cancer, #gmofreecanada, and #gmofreeusa.

Second, the pesticide drift of dicamba was allegedly polluting neighboring lands and causing enormous damage and Missouri's largest peach farmer sued Monsanto claiming massive damage from illegal pesticide drift, as delineated in posts where links among "enormous", "massive", and "damage" appeared. Third, the International Monsanto Tribunal was held to hold Monsanto accountable for human rights violations and ecocide, as indicated by links among "monsanto tribunal", "international", "civil society", and "initiative". Fourth, Monsanto's

products caused massive environmental damage as contended in a post where the link between "environmental" and "damage" appeared.

Additionally, a major theme discussed in network group 9 is the negative influence of GMOs. The link between "biggest" and "lie" in the left part of the picture appeared in posts stating the two biggest lies of the corporate GMO food system were that GMOs increase yields, and that people need GMOs to "feed the world". The rate of allergies, autism and ADHD in children skyrocketed since the introduction of GMOs into the food supply, and the exposure to pesticide-laden GMOs increased babies' risks of allergies, autism, cancer, decreased cognitive function and behavioral problems, as discussed in posts where links among "allergy", "autism", and "adhd" appeared. Though Monsanto was not directly addressed in these statements regarding GMOs, the indirect image of producing harmful GMOs was insinuated.

Network Group 10. Network group 10 is displayed in Figure E10. No node in Figure E10 looks bigger than the other nodes in the picture. Nodes and links in network group 10 present the following images of Monsanto. First, lawsuits were filed against Monsanto about the safety of glyphosate, the claimed cancer-causing effects of glyphosate, the claimed carcinogenic effects of Roundup, the claimed inaccurate and misleading statements made by Monsanto regarding glyphosate, and the pesticide drift of dicamba and the crop destruction brought by the drift, as portrayed in posts where links among "file", "lawsuit", "face", "allege", and "complaint" appeared. More than 700 lawsuits had been filed against Monsanto claiming that the company's popular weed-killer Roundup is carcinogenic. EPA got 117 complaints in Missouri alone, which alleged misuse of pesticide products containing dicamba affected more than 42,000 acres of crops, including peaches, tomatoes, cantaloupes, watermelons, rice, peas, peanuts, alfalfa, cotton, and soybeans.

Second, the negative influences of glyphosate on food supply, water, and human health were displayed by nodes and links in network group 10. Glyphosate contaminated the entire food supply and Monsanto's moving into Tucson would result in sick kids and contaminated water, as contended in several posts where the nodes "contaminate" and "kid" appeared. A study showed pregnant women with relatively higher levels of glyphosate were more likely to have shorter pregnancies and deliver babies with lower birth-weight, as described in the link between "pregnant" and "mother". Links among "kid", "children", and "play" appeared in posts calling upon people to stop their local schools and parks from spraying glyphosate-based herbicides/Roundup and stop spraying carcinogenic Roundup in their yard where their children play. Third, Roundup ready GMOs' harmful effects on Children were discussed. The link between "American" and "children" appeared in a post stating one in three American children had autism, allergies, ADHD, or asthma, which might be due to Roundup ready GMOs. Fourth, Monsanto and Bayer, two corporations controlling people's food and medicine, could monopolize marijuana, as stated in a post where the link between "corporations" and "control" appeared.

Network Group 11. Network group 11 is displayed in Figure E11. Node "chemical" seems to be a central node in this picture and no node in Figure E11 looks bigger than the other nodes in the picture. The following images of Monsanto are presented by nodes and links of network group 11. First, Monsanto quietly funneled money to think tanks such as the Genetic Literacy Project and American Council on Science and Health, organizations intended to shame scientists and highlight information helpful to Monsanto and other chemical producers, as contended in a post where the link between "chemical" and "producers" appeared.

Second, Monsanto had monopoly over the seed and chemical market. The link between "chemical" and "market" appeared in a post arguing the merger of Monsanto and Bayer should be blocked and the department of justice should reopen its investigation of Monsanto's monopoly over the seed and chemical market. Monsanto also controlled the majority of the world's GMO seed market along with DowDuPont and Syngenta, as stated in a post where the link between "gmo seed" and "market" appeared.

Third, Monsanto was portrayed as colluding with the EPA. Links among "investigate", "obvious", "collusion" at the upper left of the picture appeared in a post asking whether Congress must investigate the collusion between Monsanto and the EPA and a post contending this obvious collusion must be investigated. The link between "legal" and "efforts" appeared in a post depicting Monsanto and officials within the EPA fighting legal efforts to explore Monsanto's influence over regulatory assessments of the key chemical in the company's Roundup herbicide.

Fourth, Monsanto, Bayer, Dow, Syngenta, DuPont, the big players in the GMO and agrochemical industry, engaged in extensive public relations, advertising, lobbying and political campaigning to promote GMO, as shown by links among "extensive", "public relations", "advertising", and "lobby". The link between "lobby" and "efforts" appeared in a post describing a report which claimed Monsanto's political influence and lobbying efforts had contributed to a global erosion of democracy, environmental chaos, and social injustice. The link between "lobby" and "payment" appeared in a post stating Hillary Clinton suffered a Monsanto bombshell on the eve of the US election and her presidential campaign Chairman John Podesta was linked to lobbying payments.

Fifth, how the Monsanto-led chemical farming system failed the people was asked in a post where the link between "chemical" and "farming" appeared. Six, Monsanto poisoned for profit, as stated in a post where links among "chemical", "intensive", and "farming" appeared. Seventh, Monsanto encountered resistance in Argentina and abandoned the construction of a factory for producing GMO seed due to social pressure, as delineated in a post where the link between "gmo seed" and "produce" appeared. Eighth, Monsanto's activities polluted life. As argued in a post where the link between "create" and "life" appeared, inserting a gene taken from bacteria into a seed could not create life but pollute it. Lastly, California officially added glyphosate to the Prop 65 Carcinogen list, as described in a post where the link between "legal" and "action" appeared.

Network Group 12. Network group 12 is displayed in Figure E12. No node in Figure E12 looks bigger than the other nodes in the picture. The following images of Monsanto are demonstrated by nodes and links of network group 12. First, the cancer-causing effect of glyphosate and Roundup was presented. The California EPA officially listed glyphosate, the main ingredient in Monsanto's Roundup on the California Prop 65 Carcinogen list, as indicated by links among "prop 65 carcinogen list", "California", "hearing", "batter", "categorized", "judge", and "issue" at the lower part of the picture. Links among "California", "public health", and "official" indicate the California public health officials and activists were celebrated for going forward with this action. The link between "congressman" and "call" at the bottom of the picture indicates a California congressman called for an investigation into Monsanto and a national boycott of Roundup herbicide. The Azure Standard's organic farm in Oregon was under threat from the local county government who demanded forced spraying of Monsanto Roundup, as stated in posts where links among "organic", "farm", "county", and "government" appeared.

Second, Monsanto faced lawsuits. As described in posts where the link between "federal judge" and "denied" appeared, a California federal judge denied Monsanto's motion to dismiss separate public nuisance lawsuits filed by some cities; and a federal judge struck down Monsanto Claims and ordered trial for massive environmental damage. Third, five renowned judges heard 30 witnesses' testimonies describing Monsanto's crimes against humanity at the Monsanto Tribunal, as delineated in a post where the link between "judge" and "hear" appeared. Fourth, a US Congressman called for Department of Justice investigation into the EPA-Monsanto glyphosate collusion, as portrayed in a post where the link between "department of justice" and "investigation" at the top of the picture appeared. Links among "epa", "deputy", "official", and "accused" appeared in posts depicting EPA deputy was accused of working with Monsanto to kill cancer study.

Fifth, Monsanto encountered resistance in India. The company lost millions as Indian farmers rebelled and planted indigenous cotton seed, as depicted in a post where the link between "rebel" and "plant" appeared. Complaints from farmers also made the Maharashtra government announce that Monsanto would not be allowed to develop cotton seed varieties in the state, as described in posts where the link between "government" and "announce" appeared. Sixth, the EPA announced it had gotten an unusually high number of reports of crop damage that appeared related to misuse of herbicides containing dicamba, as described in a post where the link between "epa" and "announce" in the middle of the picture appeared. Seventh, Moms Across America released a movie, Community Rising, as denoted by the link between "movie" and "community rising" at the right side of the picture, which exposed the stated devastating toxicity of GMOs and glyphosate. Lastly, a report claimed that it was not just Monsanto's products that had been harmful, but also that its political influence and lobbying efforts had contributed to a global

erosion of democracy, environmental chaos, and social injustice, as introduced in a post where the link between "political" and "influence" appeared.

Frequency Table and Centrality Measures. Table E1 lists 50 nodes that are ranked relatively high. Tables E2, E3, and E4 list the total-degree centrality, betweenness centrality, and closeness centrality of the nodes that are ranked from 1st to 70th on the three centrality measures. The values and unscaled values of the three centrality measures are also presented in the three tables. Values in each table are standardized values scaled to go between 0 and 1, in such a way that networks of different sizes can be compared. Table E5 lists the top scoring nodes ranked from 1st to 100th side-by-side for the three centrality measures.

It is not surprising the node "Monsanto" is ranked #1 on frequency and all of the three centrality measures, as this is the company name. As shown in Table E1, the three nodes that are also ranked very high in the frequency table—glyphosate (#2), gmo (#3), and roundup (#4)—represent Monsanto products, which were criticized and resisted in a majority of posts collected from the Facebook page of Occupy Monsanto. Similarly, in Table E5, "gmo" is ranked #2 on all of the three centrality measures and "glyphosate" is ranked #3 on total-degree centrality. Nodes in Table E1 such as "stop" (#5), "no" (#9), "fight" (#23), and "ban" (#30) demonstrate the opposing attitudes towards Monsanto, its products, and GMOs. Occupy Monsanto's call for resisting Monsanto is also demonstrated by nodes in Table E5 such as "ban", "boycott", "fight", "occupy", "defeat", "never", and "no".

The cancer-causing effects of glyphosate and Roundup and their other negative influences on the environment and human health of Monsanto's products and activities are demonstrated by nodes in Table E1 including "california" (#11), "cancer" (#16), "pesticide" (#18), "herbicide" (#24), "weedkiller" (#25), "spray" (#30), "health" (#31), "toxic" (#33),

"ingredient" (#38), "human" (#40), "poison" (#42), "cause" (#46), "expose" (#47), and "safety" (#48). Likewise, in Table E5, the cancer-causing effects are denoted by nodes such as "glyphosate", "cancer", "carcinogen", "cancer-causing", "carcinogenic", and "california"; the negative influence on human health is illustrated by nodes such as "autism", "kid", "degenerative", "liver disease", "public health", "birth weight", "kill", "harm", and "health"; and the environmental damage is reflected by nodes such as "biopiracy", "groundwater", "contamination", "poison", "mercury", "pesticide-soaked", "pesticide drift", and "pollution".

Occupy Monsanto's call for resistance against Monsanto in Pima County, Tucson, and Arizona is displayed by "out" (#6), "pima county" (#12), "keep" (#13), "arizona" (#19), and "tucson" (#34) in Table E1 and "pima county", "Arizona", "marana unified school district", "marana high school", "marana municipal complex council chambers", and "pcc board" in Table E5. The resistance Monsanto received around the world is demonstrated by nodes such as "malvinas", "argentina", "lawsuit", "citizen", and "farmers" in Table E5; and farmers' resistance to the company for its control of seed market is somewhat indicated by nodes such as "farmers" (#17) and "seed" (#21) in Table E1.

Monsanto's corporate propaganda, lobbying efforts, and collusion with the governments are displayed by nodes such as "propaganda", "lie", "lobby", "conspiracy", "epa", and "collusion" in Table E5 and the node "epa" (#10) in Table E1. The International Monsanto Tribunal held to judge Monsanto's crimes against humanity is denoted by "monsanto tribunal" (#28) and "crime" (#50) in Table E1 and the same nodes in Table E5. The merger of Monsanto and Bayer and call for resistance against this merger are represented by nodes such as "bayer", and "bayer-monsanto merger" in Tables 1 and 5. Moreover, Monsanto as a member of the big

AG and the big Biotech is shown by nodes such as "biotech", "giant", "big ag", "agrochemical", and "industry" in Table E5.

Summary of Monsanto's images. To summarize, the analysis of the dominant nodes and the 13 network group pictures shows the following images were presented on the Facebook page of Occupy Monsanto.

First, Monsanto's products are not safe and brought damages to the environment and human health. Monsanto's glyphosate products and the broad-spectrum glyphosate-based herbicide Roundup could cause cancer, and reports revealed that Monsanto had been covering up the carcinogenic effects of glyphosate. Glyphosate was listed on the California Prop 65 Carcinogen list and was stated to be connected to Lake Erie's troubling algae blooms. Alarming levels of glyphosate contamination were found in popular American foods. Moreover, posts stated Monsanto's GMO crops were not safe and GMOs may bring possible harm to children.

Second, as a global seed and chemical giant, Monsanto was sued and resisted in different countries. Indian farmers rejected GMO crops and the Maharashtra government prohibited Monsanto from developing cotton seed varieties in the state. The company also quitted Malvinas Argentinas due to local people's resistance. Monsanto was sued by coffee farmers for hiding the cancer-causing effect of glyphosate, sued by Washington state over PCB pollution, and sued for refusing to take any responsibility for crop damage and land pollution resulting from pesticide drift of dicamba. In addition, a complaint about Roundup herbicide was also filed in a federal court in Wisconsin.

Third, Monsanto was portrayed as being immoral and doing bad business. Rather than move away from toxic chemicals, Monsanto had invested heavily in Dicamba, continuing to feed a dependency on a toxic treadmill of chemical cocktails. The company also illegally pushed a

form of Bt cotton into India and Africa more than a decade ago. Posts also stated Monsanto poisoned and harmed people and the planet, and fought dirty to silence cancer scientists. The International Monsanto Tribunal was held in The Hague to hold Monsanto accountable for human rights violations, crimes against humanity, and ecocide. Occupy Monsanto argued that Monsanto is a corporation that poisoned millions, poisoned for profit, and equals death.

Fourth, Monsanto maintained monopoly over the seed and chemical market and controlled the majority of the world's GMO seed market along with DowDuPont and Syngenta. The merger of Bayer and Monsanto could possibly hurt people and farmers through an enlarged monopoly. Two former Justice Department officials bolstered warnings that the proposed merger between Bayer and Monsanto was a five-alarm threat to the food supply and to farmers around the world. Food activists weighed in on how the merger could negatively reshape the food supply and Occupy Monsanto argued Monsanto and Bayer would take over the marijuana industry, in the same way they monopolize the seed industry, unless people fight back.

Fifth, as one of the big players in the GMO and agrochemical industry, Monsanto engaged in extensive public relations, advertising, lobbying and political campaigning to promote GMOs. Posts stated Monsanto colluded with the regulatory agencies, maintained surprisingly strong ties to the pharmaceutical industry, influenced the EPA in postponing important and necessary meetings regarding whether glyphosate caused cancer, conducted corporate propaganda to hide safety concerns about Roundup and glyphosate, funded think tanks to highlight information helpful to chemical producers, and funded studies with findings beneficial to food and agrochemical companies.

Other images presented on the Facebook of Occupy Monsanto include the world's most hated company, leading chemical farming system that failed the people, attempt to dismiss

separate public nuisance lawsuits being denied, bringing massive environmental damage, killing bees, and contributing to a global erosion of democracy, environmental chaos, and social injustice. Lastly, Occupy Monsanto was making great effort on its Facebook page to call on people to occupy, defeat, and fight against Monsanto; oppose the Bayer-Monsanto merger; avoid glyphosate-laced GMOs and glyphosate desiccated crops; resist Monsanto's projects in Pima County; and keep Monsanto out of Pima County and Arizona. A post stated GMO contamination, pesticide drift, birth defects, loss of pollinators, and cancer would happen when Monsanto moved into Tucson, and thus it should be resisted.

Semantic Network Analysis of the Facebook of Monsanto

The semantic networks generated in ORA are based on the semantic network analysis of the textual data collected from the Facebook page of Monsanto, including 177 posts posted from July 1st, 2016 to June 30th, 2017. The overall network picture is displayed in Figure A5 in Appendix A. The overall semantic network includes 12 network groups, with nodes in same colors belonging to same groups, based on the Newman grouping algorithm. The pictures of these 12 network groups are displayed in Appendix F. All nodes in these pictures are sized by total-degree centrality values. In the following sections, the interpretation of each network group picture is presented.

Network Group 1. Network group 1 is displayed in Figure F1. No node in the picture is bigger than the others. The following images of Monsanto are demonstrated by nodes and links of network group 1. First, Monsanto expressed the urgent need to feed an increasing world population. By 2050 farmers will be tasked with feeding 9 billion people on the same amount of land that they utilized, as indicated by links among "feed", "9", "billion", "billionth", and "people". The link between "billion" and "people" also appeared in posts discussing a

miraculous fact that modern farming and agriculture had evolved to support a world population in excess of 7 billion people.

Second, Monsanto gave back to the society through collaboration with NGOs to provide meals to children and feed the hungry. The company was proud to be a leadership partner to Feeding America, a hunger organization with a nationwide network of food banks feeding the hungry, which provided 4 billion meals to 46 million Americans in need, as depicted in posts where the link between "billion" and "meal" and the link between "feed" and "food bank" appeared. And links among "provide", "nutritious", and "meal" denote Monsanto was proud to team with the American Heart Association & Nemours to provide nutritious meals to children in need in the St. Louis region.

Third, Monsanto enabled and encouraged its employees to make a positive impact through volunteer work. Links among "provide", "free", and "camping" appeared in a post depicting a Monsanto employee who volunteered for the Camp Rainbow Foundation, whose mission is to provide free camping experiences to children undergoing treatment for, and survivors of, cancer and blood-related diseases and disorders.

Network Group 2. Network group 2 is displayed in Figure F2. It is not surprising that "monsanto" is the biggest and central node in this picture, as it is the company name. The following images of Monsanto are demonstrated by nodes and links of network group 2. First, Monsanto Fund, American Heart Association and Nemours announced joint effort to improve food access and promote nutrition, as illustrated by links among "American heart association", "nemours", "announce", "joint", and "effort" at the lower part of the picture. Second, Monsanto announced $1.6 million investment in developing system to help agriculture quantify greenhouse gas reductions, as denoted by the link between "monsanto" and "announce".

Third, Monsanto earned national recognition for its diverse workforce, was named to DiversityInc's 2017 List of Top 50 Companies for Diversity, was named to the @GPTW_US @FortuneMagazine Best Multinational Workplaces list by its employees, and was named one of Fortune World's Most Admired Companies, a Best Place to Work for LGBT Equality by Human Rights Campaign (HRC), and one of the World's Best Multinational Companies for 2016 by Great Place To Work®, as depicted in posts where links among "monsanto", "name", "earns", "national", "great place to work", and "employee" appeared.

Fourth, a Monsanto's Sustainable Agriculture Lead thought Monsanto could help farmers grow food with a lower impact on the environment and help agriculture and the food sector deliver sustainable goals, as described in a post where the link between "monsanto" and "sustainable agriculture lead" appeared. Fifth, Monsanto's employees innovated, inspired and worked hard to solve some of the world's most pressing challenges, as delineated in a post where the link between "employee" and "innovate" appeared. The link between "monsanto" and "employee" appeared in a post describing how a Monsanto employee was inspired to become a scientist. Sixth, Monsanto's Honey Bee Health Lead explained the reason he came to Monsanto was he cared about bees, as depicted in a post where the link between "monsanto" and "begin" appeared. Lastly, Monsanto also provided information about the Bayer-Monsanto merger, as demonstrated by links among "proposed", "merger", "transaction", "involve", "monsanto", "bayer", "operating", "cost", "customer", and "employee".

Network Group 3. Network group 3 is displayed in Figure F3. The biggest node in this picture is "farming" and the second biggest is "change", which implies one of the major themes of this network group is how farming had been changed by modern technology. The following images of Monsanto are demonstrated by nodes and links of network group 3. First, Monsanto

valued reduced or no-till farming, the farming practice of minimally disturbing the soil or not disturbing it at all, as indicated by the link between "no-till" and "farming". Reduced tillage farming or no-till farming technique delivers benefits to farmers and ecosystems alike, as introduced in a post where links among "farming", "technique" and "deliver" appeared. Second, Monsanto valued smart and sustainable farming, as denoted by links among "smart", "sustainable", and "farming", which appeared in a post describing technology made smart and sustainable farming and the five trends in smart farming. Third, Monsanto helped agriculture and the food sector deliver sustainable goals, as stated in a post where the link between "deliver" and "sustainable" appeared.

Fourth, Monsanto valued modern farming technology. As stated in posts where links among "farming", "technology", "idea", and "change" appeared, modern farming technology strived to help reduce carbon emissions; technology had significantly changed farming; and building a low-carbon future requires more than a single idea, technology, or practice. Fifth, Monsanto's employees innovated, inspired and worked hard to solve some of the world's most pressing challenges and the company was proud to honor them on Employee Appreciation Day, as depicted in a post where the link between "pressing" and "challenge" at the right side of the picture appeared.

Sixth, Monsanto's innovative products helped farmers around the world address on-farm challenges and reduce agriculture's overall impact on the environment, as contended in a post where links among "address", "on-farm", and "challenge" appeared. Seventh, Monsanto introduced the benefits of GMOs. Monsanto's Executive Vice President and Chief Technology Officer wrote that genetic modification boosted crop yields by 21% and cut pesticides by 37% and were therefore good for farmers, as described in a post where the link between "cut" and

"pesticide" appeared. Lastly, Monsanto shared content about how agriculture helped with addressing climate change, as indicated by links among "address", "climate", and "change".

Network Group 4. Network group 4 is displayed in Figure F4. Nodes "first aid app" and "American red cross" are the only two nodes in this network group, which appeared in a post describing Monsanto was the exclusive sponsor of the American Red Cross First Aid App aiming to provide lifesaving information access to rural communities. This network group demonstrates Monsanto's image of caring about farm safety.

Network Group 5. Network group 5 is displayed in Figure F5. The three biggest nodes are "modern", "agriculture", and "ag", which suggests modern agriculture is a primary theme shown by this network group. The following images of Monsanto are demonstrated by nodes and links of network group 5. First, Monsanto valued modern agriculture and technologies that help farmers grow more using less, conserve energy, reduce carbon emissions, and adapt to climate change, as introduced in posts where links among "modern", "agriculture", "ag", and "practice" appeared. Second, the link between "modern" and "agriculture" also appeared in a post stating a big focus for many modern agriculture companies, including Monsanto, was helping farmers protect their crops from troublesome weeds. Third, Monsanto made effort to explain agricultural terms to the audience on its Facebook page, as indicated by links among "ag", "agriculture", and "terms". Fourth, Monsanto was a great company that was named one of Fortune World's Most Admired Companies, an agricultural company, and a great place to work, as portrayed in posts where links among "great", "agricultural", "company", and "place" appeared. Fifth, Monsanto announced $1.6 million investment in developing system to help agriculture quantify greenhouse gas reductions, as delineated in a post where links among "agriculture", "quantify", "greenhouse", "gas", and "reductions" appeared.

Network Group 6. Network group 6 is displayed in Figure F6. The primary image of Monsanto demonstrated by network group 6 is valuing the importance of bees. As stated and described in posts where links among the only four nodes in the picture "commercial", "honey", "bee", and "expert" appeared, commercial beekeeping is crucial for farmers and helps to increase crop yields; honey bees are important in pollinating a variety of plants; and Monsanto provided live videos about its resident bee expert on Facebook, and celebrated Honey Bee Day and the Honey Bee Festival.

Network Group 7. Network group 7 is displayed in Figure F7. The three biggest and central nodes are "gmo", "crop", and "plant", which suggests GMO crop and GMO plant are the central topics shown by network group 7. The following images of Monsanto are demonstrated by nodes and links of network group 7. First, Monsanto discussed the benefits of GMOs on its Facebook. The company's Executive Vice President and Chief Technology Officer wrote that genetic modification boosted crop yields by 21% and cut pesticides by 37% and were therefore good for farmers, as delineated in a post where the link between "boost" and "crop" appeared. GMO seeds were helping farmers sustainably grow enough for a growing world, as stated in a post where the link between "gmo" and "seeds" appeared. Millions of farmers had chosen to plant GMOs and it had been 20 years since farmers first planted GMO corn, as depicted in posts where the link between "plant" and "gmo" appeared. And the link between "no" and "gmo" appeared in a post stating "No, GMOs are not scary".

Second, Monsanto was thrilled to open 36 greenhouses that would help its scientists continue to research crops for farmers around the world, as depicted in a post where the link between "research" and "crop" appeared. Third, Monsanto's R&D platforms spanned five areas of ag tech: data science, plant breeding, plant biotechnology, crop protection, and ag biologicals,

as portrayed in a post where links among "plant", "biotechnology", "crop", and "protection" appeared. Fourth, Monsanto stated glyphosate had no negative effect in safety studies based on EPA criteria, as denoted by the link between "no" and "negative". Lastly, links among "fortune magazine", "best multinational workplaces", and "list" indicate Monsanto's employees named the company to the @GPTW_US @FortuneMagazine Best Multinational Workplaces list.

Network Group 8. Network group 8 is displayed in Figure F8. The three biggest nodes in the picture are "corn", "harvest", and "use". Much information presented by network group 8 is only indirectly linked to Monsanto's images. For instance, on its Facebook, Monsanto displayed a 360-degree view of corn harvest in central Nebraska, a 360-degree tour of wheat harvest in Tennessee, and a panorama of a soybean field nearing harvest in Cameron, Missouri, as demonstrated by links among "corn", "wheat", and "harvest" and the link between "soybean" and "field". This action implies Monsanto cared about farmers, farmland, and farming. The link between "harvest" and "use" appeared in a post explaining how a field untouched by human hands was being harvested using only robots and drones, which suggests the company valued modern farming technology.

Monsanto emphasized the safety of glyphosate and denied its cancer-causing effect. The link between "safe" and "use" appeared in a post stating glyphosate was one of the most extensively studied agriculture products on the market that had a 40-year history of safe use, and EPA reaffirmed glyphosate is not a carcinogen. Monsanto also responded to the Arkansas Plant Board decision to ban in-crop dicamba use by posting a full statement on its Facebook page, as indicated by links among "in-crop", "dicamba", and "use". Furthermore, Monsanto introduced a few modern agriculture practices farmers were using to grow more using less, argued reduced or no-till farming brings less carbon into the atmosphere, and stated modern agriculture had evolved

to help farmers reduce carbon emissions and adapt to climate change, as described in posts where links among "more", "use", "less", "carbon", and "emission" appeared.

Network Group 10. Network group 10 is displayed in Figure F10. There is no node that is bigger than other nodes in this picture. The following images of Monsanto are demonstrated by network group 10. First, Monsanto supported STEM education. On its Facebook page, Monsanto described how 4-H students got active participation and a passion for ag by mixing a CSI approach with STEM skills to conquer a real-world ag challenge, students worked to optimize their 1:64 scale no-till planter as part of 4-H's Ag Innovator Experience, and a Monsanto employee spent her time in the classroom with future STEM leaders, as shown by links among "4-h", "students", "work", "future", "stem", and "skills".

Second, Monsanto valued science, technology, innovation and their roles in modern agriculture and farming. In posts where links among "data", "science", "scientists", "drive", "innovation", "next-generation", and "work" appeared, Monsanto stated every innovation worked to make farming more efficient and computer science drives innovation in agriculture, announced it would be combining with Bayer to drive next-generation solutions in farming, introduced how the latest technologies in modern agriculture were helping farmers conserve energy through the help of data science and software, and depicted how data scientists and software developers were helping conserve natural resources and feed a growing population.

Third, Monsanto enabled and encouraged its employees to make a positive impact through volunteer work, as indicated by the between "volunteer" and "work". Fourth, as stated in a post where the link between "women" and "work" appeared, women made Monsanto a great place to work. Fifth, Monsanto was a nice employer. As depicted in a post where the link between "love" and "work" appeared, some Monsanto scientists wanted to celebrate Monsanto

being named a Science magazine Top Employer with reasons why they loved working in the company, which shows a high level of employee identification.

Sixth, Monsanto valued sustainability. As portrayed in posts where links among "sustainability", "goals", "drive", and "highlights" appeared, Monsanto made big strides on its sustainability goals in 2016; and data science and analytics drove sustainability in agriculture. Additionally, Monsanto highlighted African-American scientists who had made an impact on science, food and agriculture in Black History Month, as denoted by links among "highlight", "African-American", and "scientist".

Network Group 11. Network group 11 is displayed in Figure F11. There is no node that is bigger than others in this picture. The following images of Monsanto are demonstrated by network group 11. First, Monsanto marked substantial progress against sustainability goals in its 2016 report, as indicated by links among "marks", "substantial", and "progress" in the upper right of the picture. Second, Monsanto made effort to enhance farm safety, as described in a post where the link between "farm" and "safety" appeared. Third, farmers around the world used Monsanto's innovative products to address on-farm challenges and reduce agriculture's overall impact on the environment, as stated in a post where the link between "innovative" and "products" appeared.

Fourth, Monsanto emphasized the safety of glyphosate. Monsanto's glyphosate-based products, including its Roundup® brand products, were registered in more than 160 countries throughout the world, as described in a post where links among "herbicide", "glyphosate-based", "brand", and "products" appeared. Monsanto also stated glyphosate is safe according to the EPA criteria in a post where the link between "level" and "find" appeared. Fifth, Monsanto's veggie

brand Seminis donated seeds to an assisted-living facility, as denoted by links among "seminis", "brand", and "donate".

Sixth, Monsanto emphasized the role of collaboration among the most unlikely industries to find innovative solutions for more sustainable agriculture, as illustrated by links among "find", "innovative" and "solutions". Lastly, monsanto valued technology and modern agriculture. The link between "farm" and "solutions" indicates modern agriculture provides farm solutions for climate change; and the link between "new" and "solutions" appeared in a post stating modern agriculture is dependent on curious and creative minds working together on new solutions.

Network Group 12. Network group 12 is displayed in Figure F12. The relatively bigger nodes in this picture include "help", "farmers", "grow", "food", "soil", "reduce", and "tillage", which suggests major themes shown by network group 12 might be helping farmers grow food, helping farmers maintain soil, and helping reduce emissions. The following images of Monsanto are demonstrated by network group 12. First, Monsanto made effort to help farmers grow food with a lower impact on the environment, as indicated by links among "help", "farmers", "grow" and "food". Second, consistent with other modern agriculture companies, a big focus of Monsanto was helping farmers protect their crops from troublesome weeds, as stated in a post where the link between "farmers" and "protect" appeared. Third, Monsanto valued modern agriculture that helps farmers reduce carbon emissions and adapt to climate change, as denoted by links among "help", "farmers", and "reduce". Fourth, Monsanto discussed the benefits of GMOs on its Facebook page. In posts where links among "help", "farmers", "sustainably", "grow", and "world" appeared, Monsanto attempted to explain how GMOs help farmers and stated GMO seeds help farmers sustainably grow enough for a growing world.

Fifth, Monsanto introduced the benefits of reduced tillage farming, cover crops, and conservation tillage. In posts where links among "reduce", "tillage", "healthy", "soil", "erosion", "conservation", "improve", "water", and "quality" appeared, Monsanto emphasized the importance of healthy soils for a better planet, stated reduced tillage farming delivers benefits to farmers and ecosystems alike, and contended that cover crops and conservation tillage can minimize soil erosion, hold water during a rainfall, protect water quality, and even regenerate the soil. Sixth, Monsanto offered to help explain common agriculture terms to the audience on its Facebook page, as represented by the link between "help" and "explain". Seventh, Monsanto made donations to food banks, as described in a post where the link between "fresh" and "produce" appeared, which stated people who rely on food banks rarely get fresh produce.

Eighth, students visited the Monsanto booth at the First Innovation Fair, which showed Monsanto took technology to the field, as delineated in a post where the link between "robots" and "help" appeared. Ninth, Monsanto focused on innovation that helps farmers grow sustainably and the company was a part of a collaboration focusing on helping farmers have a smaller impact on the environment while growing food, as stated in posts where links among "help", "farmers", "sustainably", "grow", and "food" appeared. Tenth, Monsanto celebrated International Women's Day and five women leading teams at Monsanto shared what it meant to be a working woman and how Monsanto had supported them professionally as well as personally, as depicted in a post where the link between "happy" and "international womens day" at the left side of the picture appeared. Eleventh, in posts where links among "grow", "food", and "world" appeared, Monsanto emphasized the need for food for a growing population, contended land available to grow food is less than people think, and used cross-breeding technique to help nourish a growing world. The link between "world" and "population"

appeared in posts stating farming had evolved to support a world population in excess of 7 billion people. Additionally, Monsanto also stressed the role of healthy and productive soils in fighting climate change, as delineated in posts where links among "farmers", "build", "healthy", "soil", "help", "fight", "mitigate", and "climate change" appeared.

Frequency Table and Centrality Measures. Table F1 lists 50 nodes that are ranked relatively high. It is not surprising "monsanto" is ranked 1st in Table F1 as it is the company name. Tables F2, F3, and F4 list the total-degree centrality, betweenness centrality, and closeness centrality of the nodes that are ranked from 1st to 70th on the three centrality measures. Values in each table are standardized values scaled to go between 0 and 1, in such a way that networks of different sizes can be compared. Table F5 lists the top scoring nodes ranked from 1st to 100th side-by-side for the three centrality measures.

Nodes "farmers" (#2) and "help" (#5) are both ranked very high in Table F1, which indicates a major image Monsanto attempted to present on its Facebook page is helping farmers. Similarly, Monsanto's image of helping farmers address challenges, combat weeds and pests, and protect crops is demonstrated by nodes "help", "farmers", "address", "challenge", "combat", "weeds", "pests", "crop", and "protection" in Table F5. Monsanto's image of making effort to feed an increasing world population and help farmers grow more using less is shown by nodes "more" (#4), "grow" (#6), "food" (#7), "world" (#10), and "less" (#41) in Table F1 and nodes "grow", "food", "billion", "people", "world", "population", and "feed" in Table F5.

Modern agriculture, modern farming and modern technology are major themes conveyed by Monsanto's Facebook posts and Monsanto valued science and technologies, as denoted by nodes "agriculture" (#3), "farming" (#8), "ag" (#18), "modern" (#20), "technology" (#21), "new" (#23), "science" (#24), "robots" (#32), "data" (#36), and "scientist" (#33) in Table F1 and

nodes such as "modern", "ag", "agriculture", "innovation", "farming", "high", "tech", "science", "data", "robots", "technique", "solutions", "new", "technology", "smart", and "biotechnology" in Table F5. Monsanto's commitment to environmental protection, its sustainability goals and the substantial progress it made towards the goals, and its effort to reduce carbon emissions, improve water quality, conserve the soil, and mitigate climate change are demonstrated by nodes "soil" (#11), "cover crop" (#28), "reduce" (#31), "climate change" (#35), "planet" (#42), "climate" (#46), "sustainability" (#47), and "carbon neutral" (#48) in Table F1 and nodes "sustainable", "sustainability", "marks", "substantial", "progress", "goals", "reduce", "carbon", "climate", "mitigate", "fight", "climate", "improve", "water", "protect", "better", "planet", "carbon neutral", "soil", "tillage", "healthy", "no-till", "healthy", "productive", "erosion", "conserve", "conservation", and "build" in Table F5. Nodes "gmo" (#16) "no" (#30), and "seeds" (#44) in Table F1 and nodes "gmo", "crop", "seeds", and "biotechnology" in Table F5 indicate GMOs were discussed on the Facebook page of Monsanto, in a positive way.

Nodes in Table F5 also demonstrate other images of Monsanto. For instance, the company's support of STEM education is reflected by nodes such as "next generation" and STEM; nodes "agriculture" and "company" denote Monsanto portrayed itself as an agriculture company, rather than an agrochemical company; Monsanto's image of a great place to work is represented by nodes such as "best multinational workplaces", "list", "earns", "receive", "name", and "great"; and the effort Monsanto made to give back to the society is reflected by nodes such as "donate", "provide", "free", "nutritious", "nutrition", "support", "information" and "access".

Summary of Monsanto's Images. To summarize, the following images are demonstrated by the 12 network groups, nodes in the frequency table, and centrality measures. First, Monsanto was a great company to work for and was liked by its employees. The company

was named to DiversityInc's 2017 List of Top 50 Companies for Diversity, named one of Fortune World's Most Admired Companies, named by Human Rights Campaign (HRC) as a Best Place to Work for LGBT Equality, named by Great Place To Work® as one of the World's Best Multinational Companies, named by its employees to the Fortune Magazine's Best Multinational Workplaces list, and named a Science magazine Top Employer for scientists. Second, Monsanto was a company with great employees. Monsanto's employees innovated, inspired and worked hard to solve some of the world's most pressing challenges and the company was proud to honor them on Employee Appreciation Day.

Third, Monsanto helped farmers in multiple ways. As a modern agriculture company, Monsanto researched crops for farmers around the world and valued latest technologies in modern agriculture that help farmers conserve energy, reduce carbon emissions, and adapt to climate change. The company helped farmers protect their crops from troublesome weeds, grow food with a lower impact on the environment, improve water quality, reduce soil erosion, and grow more using less. Monsanto also produced GMO seeds that as contended help farmers sustainably grow enough for a growing world.

Fourth, Monsanto made great effort to feed a growing world population. Some posts discussed that by 2050 farmers will be tasked with feeding 9 billion people and the land available to grow food is less than people think. Some posts depicted modern farming and agriculture had evolved to support a world population in excess of 7 billion people. Monsanto led in genetic modification that had boosted crop yields and cut pesticides, valued modern agriculture that helps farmers grow more using less, and utilized cross-breeding technique to help nourish a growing world.

Fifth, Monsanto made efforts to protect the environment. The company announced a $1.6 million investment in developing system to help agriculture quantify greenhouse gas reductions, helped farmers grow food with a lower impact on the environment, helped agriculture and the food sector deliver sustainable goals, valued the importance of healthy soils for a better planet and healthy soil conservation, made big strides on its sustainability goals in 2016, shared on its Facebook page content about how agriculture helped with addressing climate change, and made efforts to reduce erosion and protect water quality with cover crops, conservation tillage, and reduced tillage farming.

Sixth, Monsanto made effort to give back to the society. Monsanto served as a leadership partner to Feeding America that provided 4 billion meals to 46 million Americans in need, teamed with the American Heart Association & Nemours to provide nutritious meals to children in need in the St. Louis region, and encouraged employees to make a positive impact through volunteer work. Monsanto's employee volunteered for the Camp Rainbow Foundation, whose mission is to provide free camping experiences to children undergoing treatment for, and survivors of, cancer and blood-related diseases and disorders. Monsanto's veggie brand Seminis also donated seeds to an assisted-living facility.

Seventh, Monsanto considered itself as a modern agriculture company valuing science, innovation, modern technology, modern agriculture, and modern farming. Monsanto's R&D platforms spanned five areas of ag tech: data science, plant breeding, plant biotechnology, crop protection, and ag biologicals. Posts from the Facebook page of Monsanto discussed how farming had been changed by modern technology. The company constantly improved farming techniques, employed modern technology to develop smart, sustainable, and efficient farming, developed modern farming technology to help reduce carbon emissions, announced it would be

combining with Bayer to drive next-generation solutions in farming, and supported STEM education.

Eighth, Monsanto produced great products and their products are safe. Monsanto defended the legitimacy of genetically modified crop and stated GMOs are not scary. A Monsanto executive wrote that genetic modification boosted crop yields by 21% and cut pesticides by 37% and were therefore good for farmers. Monsanto argued that millions of farmers had chosen to plant GMOs and GMO seeds were helping farmers sustainably grow enough for a growing world. Monsanto also claimed that glyphosate is not a carcinogen and had no negative effect in safety studies based on EPA criteria.

Other images of Monsanto conveyed on the company's Facebook page include caring about and valuing the importance of bees and butterflies, caring about farm safety, making effort to explain agricultural terms, defending cross-breeding, caring about farmers, farmland, and farming, responding to the Arkansas Plant Board decision to ban in-crop dicamba use, and supporting women personally and professionally.

Semantic Network Analysis of the Twitter of Monsanto

The semantic networks generated in ORA are based on the textual data collected from the Twitter page of Monsanto, including 485 posts posted from January 1st, 2017 to June, 30, 2017. The overall network picture is displayed in Figure A6 in Appendix A. The overall semantic network includes 12 network groups, with nodes in same colors belonging to same groups, based on the Newman grouping algorithm. The pictures of these 12 network groups are displayed in Appendix G. All nodes in these pictures are sized by total-degree centrality values. In the following sections, the interpretation of 11 of the 12 network group pictures is presented, as the image demonstrated by network group 12 is displayed in other network groups.

Network Group 1. Network group 1 is displayed in Figure G1. Most of the content

shown by network group 1 only indirectly addresses images of Monsanto. Monsanto launched

the Monsanto Creative Impact Fund to support the arts and education in Greater St. Louis and

being the epicenter of agriculture technology makes St. Louis great, as described in tweets where

the link between "great" and "St. Louis" appeared. Monsanto also celebrated Black History

Month by introducing some of the African-Americans who made an impact on

science/food/agriculture, an employee who was inspired to become a scientist, and a research

chemist who was a pioneer in developing medicine from plants, as depicted in tweets where the

node "black history month" appeared.

Others images that are indirectly demonstrated by network group 1 include valuing

modern agriculture technology and energy conservation, as indicated in tweets where the link

between "energy" and "conservation" appeared; emphasizing biotech crops had reduced

agriculture's environmental impact, as stated in tweets where the link between "environmental"

and "impact" appeared; and stressing precision farming can improve time management, reduce

water and chemical use, and produce healthier crops, as indicated in a tweet where the link

between "produce" and "healthier" appeared.

Network Group 2. Network group 2 is displayed in Figure G2. Nodes "bee", "health",

and "pollinator" seem to be the three central nodes in this picture. The primary image of

Monsanto demonstrated by network group 2 is that Monsanto emphasized the importance of

honey bees and other pollinators in food supply and food growing and made efforts to protect

and improve bee health. The importance of honey bees, how the work of Monsanto's Honey Bee

Health Lead improved bee health, and how Monsanto supported bee health and worked to help

honey bees were described in tweets where links among "honey", "bee", "expert", and "health"

appeared. Monsanto also celebrated National Pollinator Week to honor the busy bees keeping the food supply going, as indicated by the link between "bee" and "keep" and the node "national pollinator week". Links among "pollinator", "key", and "role" appeared in tweets discussing the important role pollinators play in food supply and food growing.

In addition, Monsanto emphasized the importance of healthy soils. In tweets where links among "keep", "soil", "healthy", "health", "expert", "live", and "ecosystem" appeared, Monsanto stated keeping soil healthy is a constant process for farmers, cover crops were planted in between growing seasons of a primary crop (corn or soybeans) to keep soil healthy, soil experts used underwear to help with crop growth, science and technology could save soils, farmers used tools and technologies to ensure healthy soil, and earthworms are important to soil health and help maintain its interconnected living ecosystem. Monsanto also discussed the benefits of farming with GMOs and the critical role science plays in feeding an upcoming population of 9 billion people using fewer resources and conserving cropland, as shown in a tweet where the link between "critical" and "role" appeared.

Network Group 3. Network group 3 is displayed in Figure G3. Node "modern ag" refers to the hashtag #ModernAg, which seems to be the central node in this network group picture. The primary image of Monsanto demonstrated by network group 3 is valuing modern agriculture and modern farming technology. Examples of tools, technologies, and innovations in modern agriculture and modern farming include unmanned aerial vehicles, as indicated by the link between "unmanned" and "aerial" at the left side of the picture; cover crops and conservation tillage that can minimize soil erosion and even regenerate the soil, as described in a large number of tweets where the node "cover crop" around "modern ag" appeared; top seven technologies in precision agriculture that some farmers found useful, as introduced in a tweet where the node

"useful" around "modern ag" appeared; and crossbreeding techniques, as suggested by the link between "modern ag" and "technique".

As depicted in tweets where links among "modern ag", "crossbreeding", and "technique" appeared, Monsanto stated modern ag techniques enabled breeders to create the ideal onions for onion rings, helped farmers protect soil, stated the radically faster crossbreeding technique was changing agriculture, and created "new" all-natural vegetables and fruits through crossbreeding techniques. In a tweet where the link between "future" and "modern ag" appeared, Monsanto also stated the future of farming and technology grow together. Moreover, a tweet where the node "incredibly" around "modern ag" appeared described being incredibly proud to work at a company committed to inclusion and diversity.

Network Group 4. Network group 4 is displayed in Figure G4. The four biggest nodes in this picture are "technology", "new", "farming", and "drone", which suggests new farming technology as a major theme. The following images of Monsanto are demonstrated by network group 4. First, Monsanto valued new farming technologies. In tweets where links among "new", "trend", "farming", "shape", and "technology" appeared, Monsanto stated a new trend was technology found a place in farmers' fields and in conferences; access to new technology was shaping the future of farming; and farming technology was rapidly evolving and helping reduce emissions. In tweets where the link between "drone" and "technology" appeared, Monsanto discussed the next generation of drone technologies for agriculture; and described how drone technology took off in agriculture, aided data collection for efficient maize breeding in Southern Africa, gave farmers better tools to fight diseases and monitor the health of their crops, and were used by some farmers for imaging purposes to determine a number of factors in their fields. Other technologies Monsanto introduced and discussed on its Twitter page include NemaStrike

technology, data-driven tracking technology, digital technology, and UAV (unmanned aerial vehicles) technology, as indicated by links among "agricultural", "nemastrike", "track", "digital", "tool", "emerging", "new", "uav", and "technology".

Second, Monsanto accentuated the value of precision farming. As stated in tweets where the link between "precision" and "farming" appeared, precision farming can improve time management, reduce water and chemical use, produce healthier crops and more, and is going to become even more important in the future to increase yields. Links among "precision agriculture", "agricultural", and "technology" also indicate precision agriculture and agricultural technology had come a long way. Third, Monsanto valued efficient agriculture/farming and smart farming, as denoted by links among "smart", "farming", and "efficiency".

Network Group 5. Network group 5 is displayed in Figure G5. There are only a few nodes in this network group. One of the images of Monsanto demonstrated by network group 5 is Monsanto valued sustainability and made big strides on its sustainability goals in 2016, as indicated by the link between "sustainability" and "goal". Monsanto also stated data science and analytics are driving sustainability in agriculture and collaboration is essential in driving agriculture's sustainability goals, as described in a tweet where links among "drive", "sustainability", and "goal" appeared. Another image of Monsanto is the company valued innovation in agriculture. In tweets where links among "drive", "innovation", and "ag" appeared, Monsanto depicted mixed reality and machine learning drove innovation in farming, explained how computer science drives innovation in agriculture, discussed sustainability in the age of ag innovation, and introduced a crash course on ag innovation. Lastly, Monsanto supported STEM education in agriculture. As depicted in tweets where links among "real-world", "ag", and

"challenge" appeared, 4-H students dug into 4th annual Monsanto Ag Innovator Experience and mixed a CSI approach with STEM skills to conquer a real-world ag challenge.

Network Group 6. Network group 6 is displayed in Figure G6. The node "data" is the biggest and the central node in this network picture. The primary image of Monsanto as demonstrated by network group 6 is Monsanto valued the role of big data and data science in modern agriculture. Modern agriculture was using big data to optimize crop yields and reduce waste; big data was transforming how scientists created better seeds; Monsanto's CEO saw big data as a way for farmers to lower costs and increase efficiency; and data science was applied in the agriculture industry, was driving sustainability in agriculture, was helping farmers, and was one of the five areas of ag tech spanned by Monsanto's R&D platforms, as depicted in tweets where links among "big", "data", and "science" appeared.

Second, Monsanto valued science and technologies that are used in modern agriculture such as drone technologies, satellite technology, and computer science. Satellite images were portrayed as a new weapon against desert locust plagues; satellite data helped farmers find drought and disease stresses on their crops more quickly; and real-time satellite data were used in agriculture to track water productivity, as delineated in tweets where links among "real-time", "satellite", "image", and "data" appeared. Robotics, machine learning and data analytics were the latest agriculture tech tools farmers needed to feed a world of billions, as stated in a tweet where the link between "data" and "analytics" appeared. The link between "computer" and "science" represents computer science, which appeared in tweets stating computer science drove innovation in agriculture, and the collaboration between agriculture and computer science grew. Links among "deliver", "powerful", "data", and "insight" indicate emerging drone technologies make powerful data insights more accessible to farmers. Another image of Monsanto is earning

the third Consecutive CIO 100 Award for supply planning analytics platform, as described in a tweet where the link between "analytics" and "platform" appeared.

Network Group 7. Network group 7 is displayed in Figure G7. The biggest node in this network picture is "more", followed by "grow", "food", "learn", and "sustainable". The following images of Monsanto are demonstrated by network group 7. First, Monsanto valued efficiency and sustainability in farming. In tweets where links among "grow", "food", "more", "efficient", and "sustainable" appeared, Monsanto stated biotech crops help farmers be more efficient by reducing land needed to grow food, depicted it helped farmers grow food with a lower impact on the environment, and introduced technologies and innovations in modern agriculture working to make growing food more efficient and making farmers do business more sustainably and efficiently.

Second, Monsanto discussed the benefits of GMOs and biotech. The link between "grow" and "enough" appeared in a tweet stating GMO seeds help farmers sustainably grow enough food and GMO seeds were just one of the many ways Monsanto was helping farmers sustainably grow enough for a growing world; and the link between "more" and "acres" appeared in a tweet stating farmers would have needed 48 million more acres to grow the same amount of food without the availability of biotech in 2015. Third, Monsanto valued technologies in modern farming and agriculture. In tweets where links among "grow", "more", and "quick" appeared, Monsanto introduced that drone use in agriculture grew more quickly, and satellite data helped farmers find drought and disease stresses on their crops more quickly. In addition, Monsanto cared about monarchs and no-till farming, as implied nodes such as "monarch", "population", and "no-till".

Network Group 8. Network group 8 is displayed in Figure G8. The two biggest nodes in this network group picture are "help" and "farmers", and the link between them suggests helping farmers is a major theme and the primary image of Monsanto. As depicted in tweets where links among "help", "farmers", "reduce", "carbon", and "land" appeared, modern agriculture had evolved to help farmers reduce carbon emissions and adapt to climate change; biotech crops reduce lands needed to grow food and help farmers be more efficient; Monsanto used data to help farmers; innovations like satellites help farmers protect the planet; and GMOs have the potential to help farmers ensure a good harvest. In a tweet where the link between "gmo" and "seed" appeared, Monsanto also stated GMO seeds help farmers sustainably grow enough food and was only one of the many ways it helped farmers sustainably grow enough for a growing world.

Second, Monsanto accentuated the benefits of cover crops, no-till practices, and conservation tillage. Cover crops' ability to reduce erosion, inputs, and nitrogen leaching was discussed in tweets where links among "reduce", "erosion", "inputs", and "nitrogen" appeared; and cover crops can be used to help mitigate and adapt to climate change, as stated in a tweet where links among "help", "mitigate", and "climate change" appeared. No-till practices help minimize erosion, build healthy top soil, and manage weeds, as denoted by links among "help", "minimize", and "erosion"; and conservation tillage helped conserve water, as indicated by the link between "help" and "conserve".

Third, Monsanto emphasized the need to feed a growing world population and the critical role science plays. Science plays a critical role in feeding an upcoming population of 9 billion people, while using fewer resources and conserving cropland, as stated in a tweet where the link between "fewer" and "resources" at the right side of the picture appeared. Farmers produced 262

percent more food with 2% fewer inputs (labor, seeds, feed, fertilizer, etc.), compared with 1950, as described in a tweet where links among "fewer", "inputs", and "labor" appeared. Links among "less", "carbon", and "resource" at the lower right of the picture appeared in a tweet portraying a vision of a world where agriculture makes smarter use of fewer resources, providing more food with less carbon.

Other images of Monsanto demonstrated by network group 8 include introducing how agriculture can help mitigate climate change, as shown by nodes "mitigate", "fight", and "climate change"; introducing modern farming technologies that help farmers fight diseases, monitor the health of their crops, and help conserve energy, as denoted by nodes "fight", "diseases", "help", and "conserve"; and coming up with an innovative solution to solve the problem of accessing and analyzing data, as indicated by the link between "innovative" and "solution".

Network Group 9. Network group 9 is displayed in Figure G9. This network group seems to be composed of two parts, and "monsanto" and "plant" are the central nodes in the two parts, respectively. The following images of Monsanto are demonstrated by network group 9. First, Monsanto scientist helped to save honey bees and Monsanto scientists did not ghostwrite a glyphosate paper, as stated in tweets where the link between "monsanto" and "scientist" appeared. Second, in tweets where the link between "congrats" and "monsanto" at the left part of the picture appeared, congratulations were expressed to the CIO of Monsanto, who was a 2017 Technology Executive; to Monsanto's St. Louis bosses, who were among Glassdoor's highest-rated CEOs; and to Monsanto's Hawaii team who was awarded the "Wildlife at Work" certification by the Wildlife Habitat Council. Third, Monsanto's NemaStrike received EPA approval and the company created seed chipper technology that wasn't connected to genetic

modification, as described in tweets where links among "monsanto", "company", and "create" appeared.

Fourth, Monsanto is a company with good employees. Links among "monsanto", "employee", and "inspire" appeared in tweets portraying an employee sharing her experience in joining passion for environmental awareness with her career, an employee volunteering @CampRainbow_STL for nearly two decades to help children who have been diagnosed with cancer or blood-related disorders, and an employee inspired to become a scientist. Fifth, Monsanto stressed the importance of conserving monarch butterfly habitat in a tweet where the link between "monarch butterfly" and "habitat" appeared.

Sixth, Monsanto valued modern technologies and modern agriculture techniques. In tweets where links among "maize", "breeding", "breeders", "benefit", "enable", and "plant" appeared, Monsanto delineated how maize breeders in Africa benefited from using drones, described how modern agriculture techniques enabled breeders to create the ideal onions for onion rings, and stated drones are what's next for plant breeders. Monsanto especially focused on breeding techniques, with plant breeding being one of the five areas of ag tech spanned by its R&D platforms and maintaining a vegetable breeding program, as denoted by tweets where links among "plant", "vegetable", and "breeding" appeared. Monsanto also honored a person's impact on corn breeding through a corn-breeding scholarship at Iowa State University, as portrayed in a tweet where the link between "corn" and "breeding" appeared. The other technology introduced was GPS enabled tractors that can be used by farmers to program routes, as denoted by the link between "gps" and "enable" at the upper right of the picture.

Network Group 10. Network group 10 is displayed in Figure G10. The biggest and central node in this network picture is "crop", which indicates the primary image of Monsanto as

an agricultural company focusing on crops. The following images of Monsanto are demonstrated by network group 10. First, Monsanto donated a facility to UW-Madison, which was turned into a crop research center—the Wisconsin Crop Innovation Center, where UW continued to research genetically modified crops, as described in a tweet where the link between "genetically modified" and "crop" appeared. Second, Monsanto's R&D platforms spanned five areas of ag tech: data science, plant breeding, plant biotechnology, crop protection, and Ag biologicals, as stated in a tweet where links among "biotechnology", "crop", and "protection" appeared. Third, Monsanto accentuated the importance of bees and commercial beekeeping, which helps to increase crop yields, as stated in a tweet where the link between "crop" and "increase" appeared.

Fourth, Monsanto valued crop protection, crop growth, and technologies that can improve crop management and boost crop production such as drones and unmanned air systems, as denoted by links among "crop", "protect", "protection", "growth", "management", and "boost". In tweets where the link between "crop" and "protection" appeared, Monsanto described crop protection was always evolving, biotech and crop protection products had worked together to support sustainable agriculture; farmers could use crop protection products more efficiently when using biotech crops; and new waves of crop protection innovations had allowed farmers to be more efficient.

Fifth, Monsanto discussed the advantages of biotech crops. biotech crops increased planting to 185.1 million hectares in 2016, and can lower agriculture's carbon footprint, help farmers lower the environmental impact of crop protection products, and boost income for smallholder farmers, as stated in tweets where links among "crop", "increase", "lower", and "boost" appeared. Lastly, Monsanto highlighted big data and computer modeling that can help farmers lower costs, increase efficiency, and improve yield. Links among "lower", "cost", and

"increase" at the lower right of the picture indicate Monsanto CEO saw big data as a way for farmers to lower costs and increase efficiency; and the link between "control" and "cost" appeared in a tweet describing how computer modeling helps farmers harvest a better crop, as farmers will have critical information to control cost and improve yield with more field data collected.

Network Group 11. Network group 11 is displayed in Figure G11. Node "agriculture" is the biggest and central node in this network picture, which suggests the image of Monsanto primarily demonstrated by this picture is an agricultural company focusing on agriculture. The following images of Monsanto are demonstrated by network group 11. First, Monsanto valued modern science and technologies that can transform and improve agriculture and farming practices such as sensors, robotics, artificial intelligence, computer science, data mining, and space agriculture technology. In tweets where links among "high-tech", "sensors", "artificial", "apple", "pick", "robot" "space", "station", "nasa", and "agriculture" appeared, Monsanto depicted data-driven tracking technology helps to cut down on food waste in transit; sensors, robotics, and artificial intelligence will transform agriculture; researchers worked on bringing artificial intelligence to small and developing world farms; apple picking robots could be coming to orchards; a new plant habitat was on its way to the space station; and NASA betted the farm on the long-term viability of space agriculture.

Second, Monsanto valued modern agriculture, modern farming technology that helps reduce emissions, and innovations in modern agriculture. In tweets where links among "modern", "agriculture", and "farm" appeared, Monsanto discussed emerging technologies aiding energy conservation in farming; modern agriculture had evolved to help farmers reduce carbon emissions and adapt to climate change; and innovations in modern agriculture helped

farmers make the variety of major crops from different regions around the world accessible across the globe. The link between "improve" and "agriculture" appeared in tweets explaining how big data and tech will improve agriculture. Additionally, Monsanto discussed the explosive growth of STEM careers in agriculture, as shown in tweets where links among "high-tech", "career", "stem", and "tech" appeared. Another image of Monsanto is doing good to feed the world with global collaboration, as denoted by the link between "global" and "collaboration".

Frequency Table and Centrality Measures. Table G1 lists 50 nodes that are ranked relatively high. Tables G2, G3, and G4 list the total-degree centrality, betweenness centrality, and closeness centrality of the nodes that are ranked from 1st to 70th on the three centrality measures. Values in each table are standardized values scaled to go between 0 and 1, in such a way that networks of different sizes can be compared. Table G5 lists the top scoring nodes ranked from 1st to 100th side-by-side for the three centrality measures.

Nodes that are ranked very high in Table G1 include "agriculture" (#1), "farmers" (#2), "technology" (#4), "farming" (#5), and "help" (#7), suggesting agriculture, technology, farming, and helping farmers are primary topics discussed on the Twitter page of Monsanto. Nodes related to agriculture also include "crop" (#9), "food" (#10), "grow" (#12), "farm" (#14), "plant" (#15), and "ag" (#34) in Table G1. The theme of helping farmers is also denoted by nodes in Table G5 such as "help", "farmers", "benefit", "breeders", "better", "ensure", and "harvest". The company name "monsanto" is not ranked 1st as in Table G1, but it is still ranked high (#6).

Monsanto's images of protecting the environment, valuing sustainable agriculture, reducing soil erosion, making effort to maintain soil health and lower carbon emissions, and helping fighting and mitigating climate change are demonstrated by nodes such as "soil", "healthy", "health", "cover crop", "habitat", "conserve", "energy", "mitigate", "fight", "climate

change", "lower", "impact", "carbon", "climate", "minimize", "erosion", "sustainable", "future", and "environmental" in Table G5 and "soil" (#27), "water" (#28), "reduce" (#42), and "cover crop" (#45) in Table G1.

Monsanto's image of valuing science, technology, innovations, change, modern agriculture, and modern farming are demonstrated by nodes such as "agriculture" (#1), "technology" (#4), "farming" (#5), "modern ag" (#13), "scientist" (#19), "science" (#22), "innovation" (#26), "researchers" (#30), "research" (#31), "change" (#25), "new" (#11), "future" (#20), "tech" (#39), and "modern" (#41) in Table G1 and a large number of nodes in Tables G2, G3, G4, and G5 such as "new", "technology", "modern", "innovation", "science", "innovative", "improve", "tech", "high-tech", "agriculture", "modern ag", "ag", "agricultural", "farming", "industry", and "farm". Specific technologies Monsanto introduced and stressed on its twitter page include drones, data mining, robotics, space agriculture, biotechnology, and UAV, as demonstrated by nodes in Table G1 including "drone" (#16), "data" (#17), "robot" (#21), "space" (#36), and "biotechnology" (#50) and "big", "data", "drone", "robot", "biotechnology", "space", "digital", "satellite", "sensors", "computer", "unmanned", and "uav" in Table G5.

The emphasis Monsanto made on more efficient and sustainable farming is manifested by nodes including "more" (#3), "farming" (#5), "efficient" (#37), and "sustainable" (#44) in Table G1 and "increase", "efficiency", "efficient", "lower", "cost", "improve", "farming" in Table G5. The company's image of helping feed a growing world population is implied by nodes "food" (#10), "grow" (#12), "world" (#18), "feed" (#35) in Table G1 and "grow", "more", "food", "produce", "production", "global", "population", "feed", "boost", and "farmland" in Table G5. The importance of bees and the effort Monsanto made to support bee health are displayed by nodes "bee" (#23) and "health" (#38) in Table G1 and "protect", "protection", "honey bee",

"pollinator", "health", and "national pollinator week" in Table G5. The company's support of

STEM education and STEM careers in agriculture is demonstrated by "students" (#43) and

"stem" (#46) in Table G1 and "tech", "career", and "stem" in Table G5. Monsanto also

emphasized biotechnology and GMOs are good and herbicides help farmers combat weeds, as

suggested by nodes "develop" (#47), "gmo" (#48), "weed" (#49), and "biotechnology" (#50) in

Table G1 and "gmo", "biotechnology", "seed", "improve", and "better" in Table G5. In addition,

Monsanto's image of being a great company with great employees is shown by nodes such as

"great", "company", "thank", "monsanto", "provide", "support", "top", and "inspire" in Table

G5.

Summary of Monsanto's Images. To summarize, the dominant nodes listed in Tables

G1, G2, G3, G4, and G5, and the 12 semantic network groups generated in ORA based on the

messages collected from the Twitter account of Monsanto demonstrate the following images of

Monsanto.

First, Monsanto valued science, technology and innovation and emphasized their role in

modern agriculture and modern farming. The node "modern ag" is the central node in network

group 3; nodes "technology", "new", "farming", and "drone" are prominent nodes in network

group 4; and nodes "data", "big", and "science" are salient in network group 6. Examples of

tools, technologies, and innovations in farming and agriculture that were introduced and

discussed on the Twitter page of Monsanto included UAV, drone technology, cover crops and

conservation tillage, precision farming, crossbreeding techniques, data-driven tracking

technology, big data, data mining, robotics, machine learning, computer science, artificial

intelligence, digital technology, and space agriculture. The five areas of ag tech spanned by

Monsanto's R&D platforms included data science, plant breeding, plant biotechnology, crop protection, and ag biologicals.

Second, Monsanto made effort to protect the environment and promote sustainable agriculture. The company emphasized the importance of healthy soils; developed cover crops, no-till practices, and conservation tillage to help reduce soil erosion, conserve water, and maintain healthy soil; developed biotech crops that could help reduce agriculture's environmental impact; and introduced tools and technologies farmers used to ensure healthy soils and protect the land and its biodiversity. Monsanto also made effort to help farmers grow food with a lower impact on the environment, valued modern agriculture that had evolved to help farmers reduce carbon emissions and adapt to climate change, valued data science and analytics that drive sustainability in agriculture, and made big strides on its sustainability goals in 2016.

Third, Monsanto accentuated the importance of bees and other pollinators and made effort to protect bees. This image of Monsanto is primarily displayed by network group 2, in which nodes "bee", "health", and "pollinator" appear to be central nodes. Tweets described how the work of Monsanto's Honey Bee Health lead improved bee health, and how Monsanto emphasized the importance of honey bees and pollinators in food supply and food growing, introduced pollinator species, supported bee health, tried to find the cause or a solution to the bee problem, worked to help save honey bees, and celebrated National Pollinator Week.

Fourth, helping farmers appeared to be a major theme on Monsanto's Twitter page. As shown by Figure G8, nodes "help" and "farmers" are the two biggest and central nodes in network group 8. Monsanto valued modern agriculture that had evolved to help farmers reduce carbon emissions and adapt to climate change, developed biotech crops that help reduce lands needed to grow food and help farmers be more efficient, valued innovations in agriculture and

sustainable farming methods and technology that helped farmers protect the planet and conserve energy, and developed GMOs that have the potential to help farmers ensure a good harvest. Monsanto also used data to help farmers, produced herbicides to help farmers combat weeds, and helped farmers sustainably grow enough for a growing world.

Fifth, Monsanto stressed efficient farming and made great effort to help feed a growing world population. As displayed by Figure G7, nodes "grow", "more", and "food" are the biggest and central nodes in network group 7, which also includes nodes "efficient", "enough", and "population". Monsanto discussed land available to grow food was less than people may think, introduced technologies working to make growing food more efficient and innovations that had made farmers do business more sustainably and efficiently, valued the vital role science plays in feeding a growing world population with fewer resources, and developed biotech crops that help farmers grow more efficiently to feed a growing world population by reducing land needed to grow food.

In addition to the above-mentioned images that are relatively predominant, there are other images Monsanto attempted to present on its Twitter account. Monsanto supported the arts and education in Greater St. Louis, valued inclusion and diversity in its workplace, protected monarch butterflies, supported STEM education and STEM careers in agriculture, developed crossbreeding techniques, uplifted community with the Monsanto Fund, denied ghostwriting a glyphosate paper, hired great employees, donated a facility to UW-Madison, and cherished a culture of change. In addition, Monsanto's CIO was awarded as a 2017 Technology Executive; its CEOs were among Glassdoor's highest-rated CEOs; the company's Hawaii team was awarded the "Wildlife at Work" certification by the Wildlife Habitat Council; and Monsanto had been named to @DiversityInc's 2017 List of Top 50 Companies for Diversity for the 10th year.

Comparison of Monsanto's Images as Demonstrated by the Three Sites

It is not surprising that images of Monsanto presented on the Facebook page of Occupy Monsanto and the official social media accounts of Monsanto are totally different. Occupy Monsanto showed Monsanto's products are not safe and brought damage to the environment and human health. The cancer-causing effects of glyphosate products and Monsanto's glyphosate-based herbicide Roundup were emphasized by Occupy Monsanto. On the contrary, glyphosate, cancer, and roundup were rarely discussed in the official social media sites of Monsanto.

GMOs were discussed on the two official social media sites of Monsanto and the Facebook page of Occupy Monsanto. The official social media sites of Monsanto only emphasized the positive aspects of GMOs and contended the company helped farmers sustainably grow enough for a growing world through producing GMO seeds, while Occupy Monsanto underscored Monsanto maintained a monopoly over the seed and chemical market and controlled the majority of the world's GMO seed market along with DowDuPont and Syngenta, which could possibly hurt farmers. Messages from Facebook of Occupy Monsanto also display warnings that the merger between Monsanto and Bayer could bring a possible threat to the food supply and to farmers around the world. Moreover, messages from the Facebook page of Occupy Monsanto suggest Monsanto was immoral and doing bad business. On the contrary, images Monsanto tried to build and convey on the two official social media sites included protecting the environment and the planet, giving back to the society, and producing safe and great products.

Another difference of images of Monsanto presented on the two organizationally-sanctioned social media sites and the counter-organizational social media site is that Monsanto was primarily delineated as an agricultural company on the two official sites, while on the Facebook account of Occupy Monsanto, Monsanto was portrayed as a company not only

producing agriculture related products but also producing chemical products. According to the semantic network analysis of the Facebook messages of Monsanto, the node "farming" is the biggest and central node in network group 3; similarly, according to the semantic network analysis of the Twitter messages of Monsanto, the node "modern ag" is the central node in network group 3. In a word, semantic network analyses of the Facebook messages and the Twitter messages of Monsanto both show nodes related to farming and agriculture are central nodes in network groups and ranked high on frequency and centrality measures, which implies Monsanto was mainly presented as an agricultural company on its social media sites.

By contrast, according to the semantic network analysis of the Facebook messages of Occupy Monsanto, the node "glyphosate" is the central node in network group 2. Results of semantic network analysis of the Facebook messages of Occupy Monsanto demonstrate glyphosate and GMOs are central topics on the site. Salient nodes ranked high on frequency and centrality measures denote the cancer-causing effect of glyphosate and Occupy Monsanto called on people to resist Monsanto. Unlike the two official social media sites portraying Monsanto as an agricultural company, the Facebook page of Occupy Monsanto delineated Monsanto as a seed and chemical giant, and emphasized the harmful effects of products of Monsanto such as glyphosate and GMO products. Both the organizationally-sanctioned and the counter-organizational sites discussed GMOs, but the former stressed the positive aspects, while the latter accentuated the negative aspects of GMOs.

Moreover, node "monsanto" is ranked 1st on frequency and all of the three centrality measures and is the central node in network group 1 based on the semantic network analysis of the Facebook messages of Occupy Monsanto, while semantic network analyses of the Facebook and Twitter messages of Monsanto does not show equal importance of this node, which might be

because Monsanto is the object of discussion and target of criticism on the Facebook page of Occupy Monsanto. Occupy Monsanto also contended Monsanto engaged in extensive public relations, advertising, lobbying and political campaigning to promote GMOs, which was not mentioned on the two official sites, but messages on the two official sites themselves indeed show the company was making extensive effort to promote GMOs.

Images of Monsanto presented on the two official social media sites are generally consistent. Both sites portrayed Monsanto as a company helping farmers, making great effort to feed a growing world population, protecting the environment, giving back to the society, valuing science/innovation/technology and modern agriculture/farming, producing safe products, protecting bees, valuing inclusion and diversity in its workplace, and supporting STEM education. Both sites depicted Monsanto as a great company with great employees. The only difference is the two sites showed different levels of emphasis on those images. For example, network groups 3, 4, 6, and 11 based on the semantic network analysis of Twitter messages of Monsanto are all related to the image of valuing science and technology and how they are applied in modern farming and agriculture.

Measuring the Organizational Image of Monsanto

As discussed in Chapter 4, 7-point Likert scales to measure the organizational images of Monsanto are designed based on the results of semantic network analyses of the two organizationally-sanctioned social media sites and the counter-organizational social media site. Eight dimensions are formulated to describe the organizational images of Monsanto conveyed by the three social media sites, based on the integration of images summarized from the results of semantic network analyses of the three sites. These eight dimensions are: feeding the world, protecting the environment, social responsibility, good workplace/great company, leader in

modern agriculture, helping farmers, harmful products, and extremely profit-driven/greedy.

Indicators to measure each dimension are displayed in Table 9 below.

Table 9

Statements in the 7-Point Likert Scale to Measure the Organizational Image of Monsanto

Dimensions	Measurement items
Feeds the World	1. Monsanto is dedicated to feeding a growing world population. 2. Monsanto develops new agricultural technology to increase the efficiency of food production. 3. Monsanto makes contributions to meet increasing global food needs. 4. The 'Feed the World' mantra used by Monsanto is admirable.
Protects Environment	1. Monsanto is a company committed to environmental protection. 2. Monsanto cares about healthy soils and water. 3. Monsanto helps promote biodiversity. 4. Monsanto helps reduce carbon emissions.
Social Responsibility	1. Monsanto actively engages in activities to benefit the society. 2. Monsanto enables and encourages its employees to make a positive impact through volunteer work. 3. Monsanto benefits local communities. 4. Monsanto prioritizes social responsibility over profits.
Good Workplace/Great Company	1. Monsanto is a great place to work. 2. Monsanto is a company committed to inclusion and diversity. 3. Monsanto supports working women professionally and personally. 4. Monsanto is one of the world's most admired companies.
Leader in Modern Agriculture	1. Monsanto plays a leading role in developing modern agricultural technology. 2. Monsanto brings innovative solutions in farming. 3. Monsanto is at the forefront of efforts to modernize agriculture. 4. Monsanto is a leading agricultural company.

Table 9 (cont'd)

Statements in the 7-Point Likert Scale to Measure the Organizational Image of Monsanto

Dimensions	Measurement items
Helps Farmers	1. Monsanto helps farmers address challenges in farming. 2. Monsanto protects farmers' interests. 3. Monsanto produces tools and products farmers really need. 4. Monsanto helps farmers increase income.
Harmful Products	1. Monsanto's products do harm to human health. 2. Monsanto's products do harm to the environment. 3. Monsanto's products endanger food security. 4. Monsanto's products are dangerous.
Extremely Profit-driven/Greedy	1. Monsanto conducts propaganda to hide safety concerns about its products. 2. Monsanto attempts to influence policy makers to promote unsafe products. 3. Monsanto considers corporate profit to be more important than human and environmental health. 4. Monsanto considers corporate profit to be more important than food safety.

The dimensions of "harmful products" and "extremely profit-driven/greedy" are deduced from the results of the semantic network analysis of the messages collected from the Facebook page of Occupy Monsanto. Other dimensions covered the images summarized from the analyses of all of the three sites. There are seven levels of agreement in the Likert scales, including "strongly disagree", "disagree", "somewhat disagree", "neither agree nor disagree", "somewhat disagree", "agree", and "strongly agree". Thus, each statement can be answered positively or negatively. For example, the Facebook page of Occupy Monsanto conveyed Monsanto hurt farmers, while the two official sites presented Monsanto made great effort to help farmers; Monsanto was depicted as a company hurting the environment on the Facebook page of Occupy Monsanto, whereas it was portrayed as a company making effort to protect the environment on

the two official social media sites. All the statements measuring "harmful products" are negative, but the participants can choose "1" (strongly disagree) if they think Monsanto's products are good; similarly, all the statements measuring "protecting environment" are positive, but the participants can also choose "1" (strongly disagree) if they think Monsanto harmed the environment.

Results of Phase 2

In Phase 2 of the study, relationships among social media use (SMU), organization-stakeholder dialogic communication (OSDC), organization-stakeholder relationship (OSR), organizational image, and organizational reputation were examined through SEM analysis. Amazon MTurk workers were recruited to fill out an online questionnaire. Prior to completing the survey, they were instructed to review posts and comments between July 15, 2019 and September 21, 2019 on the Facebook page of Occupy Monsanto (https://www.facebook.com/occupymonsanto) to answer the questions in the survey. There were three attention check questions in the survey and workers had to answer the first attention check question and at least one of the other two attention check questions correctly; otherwise, their HITs (Human Intelligence Tasks) would be rejected. There were a total of 100 eligible responses ($N = 100$). The online survey was conducted between September 18, 2019 and October 18, 2019.

Among 100 respondents, 34 (34%) followed a social media site about Monsanto and 66 (66%) did not; 19 (19%) followed Monsanto's Facebook page and 81 (81%) did not; 12 (12%) followed Monsanto's Twitter account and 88 (88%) did not; and 19 (19%) followed Occupy Monsanto's Facebook page and 81 (81%) did not. These statistics indicate that most participants were not fans or followers of the three social media sites examined. Since respondents were recruited through Amazon MTurk system, this result is not surprising.

Among 100 respondents, 76 (76%) had seen Monsanto in the news or seen its advertising and 43 (43%) had used/purchased Monsanto products. When answering whether they or anyone in their family ever worked for Monsanto, 12 (12%) respondents chose "Yes"; and 14 (14%) chose "Yes" when answering whether they or anyone in their family ever worked for a different company in the agriculture or chemical industries. In terms of prior familiarity with the organization, 33 (33%) respondents answered they were very familiar with Monsanto prior to this study, 51 (51%) were somewhat familiar, and only 16(16%) were not familiar with the company. In terms of their relationships to Monsanto, among 100 respondents, six (6%) were farmers, 28 (28%) were consumers other than farmer, six (6%) identified themselves as activists, five (5%) were shareholders, seven (7%) were current employees, seven (7%) were former employees, four (4%) were regulators, four (4%) were veterans, five (5%) were residents living around Monsanto's plants, and 78 (78%) identified themselves as the general public. These statistics demonstrate that most participants had ever seen Monsanto in the news or seen its advertising and had some knowledge of Monsanto. Some participants had ever used/purchased Monsanto products and a small number of participants and their families ever worked in Monsanto or other companies in the agriculture or chemical industries. Most respondents expressed varied levels of familiarity with Monsanto. Most of them fell into the categories of the general public, but the composition of stakeholders is rather diversified.

Among the respondents, 61 (61%) were male, 38 (38%) were female, and one (1%) answered "non binary". In terms of education, only one (1%) chose "less than high school degree", 11 (11%) received a high school degree or equivalent (e.g., GED), 17 (17%) attended some college without receiving a degree, nine (9%) received an associate degree, 46 (46%) received a bachelor degree, and 16 (16%) received a graduate degree. As for age, no respondent

was less than 21 years old, 23 (23%) were between 21 and 29 years old, 49 (49%) respondents

were between 30 to 39 years old, 17 (17%) were between 40 and 49 years old, seven (7%) were

between 50 and 59 years old, and four (4%) were 60 years old or older.

When it comes to respondents' SMU, statistics show participants were more involved in

consuming SMU than contributing SMU. More specifically, only the first item measuring

consuming SMU, "I have seen information about Monsanto on social media (e.g., Facebook,

Twitter, YouTube, Instagram, etc.)", has a moderately high mean ($M = 4.90$, $SD = 1.92$). All

other items measuring both consuming and contributing SMU have mean scores less than 3.52,

as shown in Table I1. Overall, these statistics demonstrate respondents in this study were

somewhat involved in consuming SMU regarding Monsanto, i.e., seeing information about

Monsanto on social media; however, they did not proactively search for information about

Monsanto, clicked "like" to a post about Monsanto, made comments on a post about Monsanto,

shared a post about Monsanto, or discussed Monsanto with others on social media.

Exploratory Factor Analyses

As introduced in Chapter 4, measurements of SMU, OSDC, and organizational image

were mostly designed by the researcher, while measurements of OSR and organizational

reputation were modified based on established measurements. Thus, before proceeding to the

SEM analysis, the researcher conducted a series of exploratory factor analysis to determine

whether the dimensions and the related items to measure SMU, OSDC, and organizational image

are reasonable. In order to best assess this, multiple analyses were tried using varied extraction

methods and rotations. If factor extraction based on eigenvalues did not provide clear results,

efforts were made to fix the number of factors to try and achieve clearer results.

First, factor analyses were performed on the six items that measure consuming and contributing SMU. Only one factor was extracted with the various extraction and rotation methods based on eigenvalues. Effort was made to fix the number of factors extracted to two to see whether better results could be achieved. Some combinations of extraction and rotation methods, such as principal axis factoring extraction with direct oblimin rotation and alpha factoring extraction with equamax rotation, generated results showing the first and second items of consuming SMU loaded on one factor; and other combinations, such as generalized least squares extraction with equamax rotation and generalized least squares extraction with varimax rotation, generated results showing the second and third items loaded on one factor. Considering these inconsistent results and the rationale behind the design of the original scale, the researcher chose to keep the original scale and not make any change. Reliability analysis of the three items of consuming SMU shows acceptable internal consistency (*Cronbach's α* = .80). Reliability analysis of the three items of contributing SMU demonstrates excellent internal consistency (*Cronbach's α* = .90).

Second, factor analyses were performed on the 27 items measuring the nine dimensions of OSDC. In order to simplify items to measure each factor, the researcher deleted items with loadings less than .60 on all factors. Principal components factoring extraction with varimax rotation generated five factors, which are the best results. Attempts were made to fix the number of factors to three and four to see whether the dimensions can be further reduced. When four factors were fixed, some factors only include one or two items, which are not ideal; and when three factors were fixed, items that are not closely related to each other are loaded on a single factor, which makes some factors too complex, and it is hard to assign reasonable meanings to these factors. Therefore, the five factors based on the criterion of eigenvalues were selected. The

results of factor analysis are displayed in Table I2, which also summarizes each factor and its

items. It seems that the results of factor analysis do not support measuring OSDC in behavioral

and attitudinal dimensions, as in the case of BP. Two items of transparency, which belong to the

behavioral dimension, and three items of genuineness, which belong to the attitudinal dimension,

loaded on factor 2. Some items of responsiveness and openness, which belong to the behavioral

dimension, and two items of commitment, which belong to the attitudinal dimension, loaded on

factor 1.

Table I2 demonstrates that there are five factors to measure OSDC. Factor 1 includes all

items of responsiveness, the first item of openness, and the second and third item of

commitment. The first item of openness is about Occupy Monsanto being easy to talk on its

Facebook, which is clearly related to responsiveness. Because all items loading on factor 1 relate

to responsiveness and commitment, factor 1 is named "responsiveness and commitment".

Reliability analysis of the six items of factor 1 indicates excellent internal consistency

(*Cronbach's α* = .95). Factor 2 includes two items of transparency, all items of genuineness, and

the first item of commitment. The first item of commitment is about Occupy Monsanto's always

providing useful information to people on its Facebook, which is clearly related to genuineness.

Because all items loading on factor 2 relate to transparency and genuineness, factor 2 is named

"transparency and genuineness". Reliability analysis of the six items of factor 2 indicates

excellent internal consistency (*Cronbach's α* = .91). Factor 3 includes the first item of empathy

and the second and third items of respect, and is thus named "empathy and respect". Reliability

analysis of the three items of factor 3 demonstrates acceptable internal consistency (*Cronbach's*

α = .80). Factor 4 includes the second and third item of interactivity, and the third item of

openness. The third item of openness is about Occupy Monsanto's giving people opportunities to

share their opinions on its Facebook, which is clearly related to interactivity. Thus, factor 4 is named interactivity. Reliability analysis of the three items of factor 4 shows acceptable internal consistency (*Cronbach's α* = .80). Factor 5 includes all items of equality and no other items are included. Thus, the name of factor 5 is "equality". Reliability analysis of the three items of factor 5 demonstrates acceptable internal consistency (*Cronbach's α* = .80). In summary, exploratory factor analysis generated five reasonable and reliable dimensions to measure OSDC: responsiveness and commitment, transparency and genuineness, empathy and respect, interactivity, and equality.

Third, factor analyses were performed on the 32 items measuring the eight dimensions of organizational image. Again, in order to simplify items to measure each factor, the researcher deleted items with loadings less than .60 on all factors. The best results were achieved when maximum likelihood factoring extraction with equamax rotation was performed. The results are displayed in Table I3, which also presents the summary of factors. Four factors were extracted based on eigenvalues. The researcher tried unsuccessfully to fix the number of factors to three to see whether the dimensions could be further reduced. Factor 1 includes all items of protecting environment and three items of social responsibility and is named "protecting environment and social responsibility". Reliability analysis of the seven items of factor 1demonstrates excellent internal consistency (*Cronbach's α* = .97). Factor 2 includes the second and third item of feeding the world, all items of leader in agriculture, and the first item of helping farmers. The two items of feeding the world, which are about Monsanto's developing new agricultural technology to increase the efficiency of food production and making contributions to meet increasing global food needs, also reflect Monsanto being a leader in agriculture. So does the first item of helping farmers, which is about helping farmers address challenges in farming. Therefore, factor 2 is

named "leader in agriculture". Reliability analysis of the seven items of factor 2 shows excellent internal consistency (*Cronbach's α* = .92). Factor 3 includes all items of harmful products and all items of being extremely profit-driven/greedy, and is thus named "harmful products and being extremely profit-driven/greedy". Reliability analysis of the eight items of factor 3 indicates excellent internal consistency (*Cronbach's α* = .94). Factor 4 only includes four items of good workplace/great company and is thus named "good workplace/great company". Reliability analysis of these four items shows excellent internal consistency (*Cronbach's α* = .90). In summary, exploratory factor analysis revealed four reasonable and reliable dimensions to measure organizational image of Monsanto: protecting environment and social responsibility, leader in modern agriculture, harmful products and being extremely profit-driven/greedy, and good workplace/great company.

Structural Equation Modeling (SEM)

After the factors of SMU, OSDC, and organizational image were determined based on exploratory factor analysis, SEM was conducted to examine the relationships among the five latent variables, which are SMU, OSDC, OSR, organizational image, and organizational reputation. The assumed relationships among these variables and the relevant hypotheses are displayed in the conceptual model in Figure 1 in Chapter 3. For consistency, items of harmful products and being extremely profit-driven/greedy, and the third item of control mutuality were reversely coded in the analysis, as these items are negative statements about Monsanto, while the rest of items are all positive statements. The mean of the values of respective items was calculated to represent the value of each dimension of the five latent variables. If there is a missing value for a specific item, the value of the corresponding dimension is still the mean of the values of the remaining items, which is the default setting in SPSS when the function of

mean is used to calculate values. Therefore, there is no missing value for SEM analysis in this study. SPSS AMOS was adopted to conduct SEM analysis.

As done in the analysis for the case of BP, organizational image, organizational reputation, and their dimensions do not appear simultaneously in the specified models to test H1, H2b, H3b, H4b, H5, and H6 to avoid negative variances and inadmissible solutions; and only organizational image, organizational reputation, and their dimension are kept in the specified model to test H7 for the same reason. H2a, H3a, and H4a were not tested for the case of Monsanto, as perceived OSDC on organizationally-sanctioned social media was not measured for this case. The path diagram of the model that removes organizational image and its dimensions is displayed in Figure I1. The model does not fit well (*Chi-square* = 29.70, *df* = 115, *p* = .000, *GFI* = .72, *CFI* = .88, *RMSEA* = .13). In order to obtain better goodness of fit, the researcher attempted to add some error covariances based on modification indices and found a slightly better model was achieved (*Chi-square* = 162.08, *df* = 100, *p* < .001, *GFI* = .85, *CFI* = .96, *RMSEA* = .08). All model fit indices are improved, with reduced Chi-square, decreased RMSEA, and increased GFI and CFI. It is worth mentioning that CFI is now greater than .95 and RMSEA is now less than .80, which meets the criteria of a good-fitting model. The path diagram of the new model with standardized estimates is exhibited in Figure I2.

Table I4 displays the regression weights and standardized regression weights. As demonstrated in Table I4, SMU positively predicts OSDC (*estimate* = 0.32, *standardized estimate* = .39, *p* < .001); thus, this part of H1 is supported for this case. OSDC positively, rather than negatively, predicts OSR (*estimate* = 0.40, *standardized estimate* = .46, *p* < .001), thus, H2b is rejected for Monsanto. OSR positively predicts organizational reputation (*estimate* = 1.77, *standardized estimate* = .98, *p* < .001), thus H6 is supported for this case. OSDC does not

significantly predict organizational reputation ($p = .142$); therefore, H4b is rejected for this organization. The results demonstrate that OSDC does not directly affect organizational reputation, but does so indirectly. The relationship between OSDC and organizational reputation is mediated by OSR.

Table I5 presents squared multiple correlations. Predictors of organizational reputation explain 90% of its variance, which indicates good selection of predictors. However, the predictor of OSDC (i.e., SMU) only explains 15% of its variance; this might be because participants were mostly not users of the three social media sites examined in the study. Predictors of OSR (i.e., SMU and OSDC) only explain 22% of its variances; this might be because OSDC in the case of Monsanto is the accessed communication between stakeholders and Occupy Monsanto, rather than Monsanto, on social media. Table I6 lists direct, indirect, and total effects and the corresponding standardized effects. The direct effect of SMU on OSDC, which is also the total effect, is 0.32, which is not high. SMU's indirect effects on OSR and organizational reputation, which are also the total effects, are 0.13 and 0.19 respectively, which are very low. The direct effect of OSDC on OSR, which is also the total effect, is 0.40. The direct effect of OSR on organizational reputation, which is also its total effect on it, is 1.77. OSDC's direct effect on organizational reputation is only -0.11, but its indirect and total effects on it are 0.70 and 0.59 respectively, which denotes the mediating effect of OSR and the negative relationship between OSDC and organizational reputation. As OSDC for the case of Monsanto is the communication between stakeholders and Occupy Monsanto, it is not surprising to see the negative relationship here. According to the statistics of standardized effects, SMU's effects on OSR and organizational reputation are very low and its effect on OSDC is not high, either; OSDC's effect

on OSR is moderate; OSDC's direct effect on organizational reputation is extremely low and negative and OSR's effect on organizational reputation is extraordinarily high.

To examine the effects on organizational image, similar steps were taken. In order to reduce the number of observed variables, organizational reputation and its dimensions were removed in the specified model to be tested, which is displayed in Figure I3. The initial model does not fit well (*Chi-square* = 204.88, *df* = 86, *p* = .000, *GFI* = .78, *CFI* = .91, *RMSEA* = .12). In order to obtain better goodness of fit, the researcher attempted to add some error covariances based on modification indices and found a model where all fit indices are improved, with significantly reduced Chi-square, decreased RMSEA, and increased GFI and CFI (*Chi-square* = 80.29, *df* = 71, *p* = .21, *GFI* = .91, *CFI* = .99, *RMSEA* = .04). The path diagram of the new model with standardized estimates is exhibited in Figure I4.

Table I7 displays the regression weights and standardized regression weights. As demonstrated in Table I7, SMU positively predicts OSDC (*estimate* = 0.34, *standardized estimate* = .41, *p* < .001.), thus supporting this part of H1 for Monsanto. OSDC positively predicts OSR (*estimate* = 0.44, *standardized estimate* = .50, *p* < .001), not supporting H2b for this case. OSR positively predicts organizational image (*estimate* = 1.61, *standardized estimate* = 1.00, *p* < .001), thus supporting this aspect of H5 for this company. OSDC does not significantly predict organizational image (*p* = .124); thus, this aspect of H3b is rejected for this case. The results show that OSDC does not directly affect organizational image, but does so indirectly. The relationship between OSDC and organizational image is mediated by OSR.

Table I8 presents squared multiple correlations. Predictors of organizational image explain 94% of its variance, which indicates good selection of predictors. However, the predictor of OSDC (i.e., SMU) only explains 17% of its variance and predictors of OSR (i.e., SMU and

OSDC) only explain 25% of its variance. Again, this might be because participants were mostly

not users of the three social media sites examined in the study and OSDC for the case of

Monsanto is the communication between stakeholders and Occupy Monsanto, rather than

Monsanto. Table I9 lists direct, indirect, and total effects and the corresponding standardized

effects. The direct effect of SMU on OSDC, which is also the total effect, is 0.34, which is not

high. SMU's indirect effects on OSR and organizational image, which are also the total effects,

are 0.15 and 0.20 respectively, which are not high either. The direct effect of OSDC on OSR is

0.44 and the direct effect of OSR on organizational image, which is also its total effect, is 1.61.

OSDC's direct effect on organizational image is only -0.11, but its indirect and total effects are

0.71 and 0.60 respectively, which indicates the negative relationship between OSDC and

organizational image and the mediating effect of OSR. Statistics of standardized effects

demonstrate moderate effects of SMU on OSDC, moderate effects of OSDC on OSR, low effects

of SMU on OSR and organizational image, and high effect of OSR on organizational image. The

direct effect of OSDC on organizational image is negative and extremely low, but its total effect

on organizational image is positive and moderate, denoting the mediating effect of OSR.

H7 stated that there is a relationship between organizational image and organization

reputation. To test H7, covariance analysis was conducted. The path diagram of the model to be

tested is displayed in Figure I5. The initial model does not fit well (*Chi-square* = 217.43, *df* = 34,

p < .001., *GFI* = .65, *CFI* = .82, *RMSEA* = .23). In order to obtain better goodness of fit, the

researcher attempted to add some error covariances based on modification indices and found a

model where all fit indices are improved, with significantly reduced Chi-square, decreased

RMSEA, and increased GFI and CFI (*Chi-square* = 15.56, *df* = 12, *p* = .212, *GFI* = .97, *CFI* =

.99, *RMSEA* =.06). The path diagram of the new model with standardized estimates is exhibited

in Figure I6. Organizational image and organizational reputation are significantly positively correlated (*Covariances estimate* = 3.10, *S.E.* = .47, p < .001, *correlation estimate* = .99); thus, H7 is supported for this case.

To summarize, the SEM analysis of the model only keeping organizational image and the model only keeping organizational reputation demonstrates similar patterns when it comes to hypotheses testing. For both models, SMU positively predicts OSDC and H1 is supported; OSR positively predicts organizational image and H5 is supported; and OSR positively predicts organizational reputation and H6 is supported. Testing of both models indicates there is no direct relationship between OSDC and organizational image or organizational reputation, and H3b and H4b are both rejected. And OSDC positively, rather than negatively, predicts OSR and H2b is rejected. The relationship between OSDC and organizational image or organizational reputation is indirect (mediated by OSR). Models with organizational reputation do not fit well, while models with organizational image that fit well could be found. There is a positive relationship between organizational image and organizational reputation, and H7 is supported.

Chapter 7

Discussion

This study examined organizational image and reputation construction on social media as a constructivist process involving more than just the organization's official efforts to use new media in the creation of a preferred image. Two companies, BP and Monsanto, were selected as cases. The corporate social media sites of the two companies, the Facebook and Twitter pages of BP America and Monsanto, as well as the two counter-organizational social media sites, the Facebook pages of Boycott BP and Occupy Monsanto, were selected for analysis. In Phase 1 of the study, semantic network analysis was conducted to analyze messages from these six social media sites to investigate what organizational images of BP and Monsanto were conveyed on corporate and counter-organizational social media. In Phase 2 of the study, online surveys were conducted to examine public perceptions of the communication between organizations and stakeholders on social media, the organization-stakeholder relationship, organizational image, and organizational reputation. This final chapter will discuss key findings/conclusions of the study, the theoretical and practical implications of the study, the limitations of the study, and the directions to future research.

Key Findings/Conclusions

Results of the study demonstrate social media provide opportunities for organizations to build preferred images and reputation, which is consistent with arguments and findings in the existing research (Erdoğmuş & Çiçek, 2012; Men & Tsai, 2015; Parveen et al., 2015). The Facebook and Twitter pages of BP America presented messages systematically describing BP as an industry leader and a company making great effort to give back to the society, protect the environment, assume social responsibilities, and support future scientists and STEM education.

Messages from corporate social media sites also suggest BP maintained good financial and operational performances, maintained outstanding infrastructures and exceptional capability to improve its infrastructures, made efforts to ensure safety in its operations, considered safety as its number one priority, attempted to maintain and increase efficiency, made big contributions to the American economy, made historic contribution to US energy security, maintained high production capacity, valued technology and innovation, and was technologically advanced. Similarly, the Facebook and Twitter messages of Monsanto systematically depicted Monsanto as a great company to work for and liked by its employees, a company making great effort to help farmers, feed a growing world population, protect the environment, and give back to the society, and a modern agriculture company valuing science, innovation, modern technology, modern agriculture, and modern farming, as well as promoting sustainable agriculture, and producing safe and great products. For both companies, the images conveyed by messages posted on the corporate Facebook and Twitter pages are rather consistent and were incorporated into the companies' everyday corporate communication and public relations activities. Both companies realized the importance of strategically using the two platforms to communicate with stakeholders and construct positive image and reputation, which echoes the previous research (Elefant, 2011; Rybalko & Seltzer, 2010).

However, findings of this study also show that social media could bring substantial risks and could significantly damage an organization's image and reputation, as also argued and found in the previous research (Aula, 2010; McCorkindale & DiStaso, 2013). As conveyed by messages on the Facebook page of Boycott BP, the negative effect of the 2010 Deepwater Horizon oil spill is massive, catastrophic, disastrous, and long lasting. The oil spill is the biggest offshore oil spill and the worst environmental and ecologic disaster in US history. It not only

severely harmed local businesses related to the oyster and sea food industry, but also brought

extensive environmental damage to the Gulf of Mexico. Safety problems and the negative

environmental impact of the relatively more recent operations of BP were also depicted on the

Facebook page of Boycott BP. The Facebook page of Occupy Monsanto presented messages

about Monsanto's unsafe products and their damage to the environment and human health, how

Monsanto was sued and resisted in different countries, and how Monsanto maintained a near-

monopoly over the seed and chemical market, and how they engaged in extensive public

relations, advertising, lobbying and political campaigning to promote GMO. On its Facebook

page, Occupy Monsanto argued that Monsanto is a corporation that poisoned millions for profit

and portrayed Monsanto as being immoral and doing bad business. The communication activities

of Boycott BP and Occupy Monsanto on their Facebook pages demonstrate social media provide

opportunities for stakeholders to systematically create user-generated messages that could harm

the target organizations' image and reputation. Organizations cannot control the communication

process on the social media sites maintained by most stakeholders, which brings risks for them to

maintain preferred images and reputations, as discussed by Aula (2010). To summarize, findings

of this study indicate social media can bring both opportunities and challenges for organizations

to construct positive images and reputation, as pointed out by researchers (e.g., Vecchio et al.,

2011). Indeed, the content of official and counter-organizational social media sites can present

very different pictures of an organization.

Boycott BP and Occupy Monsanto's activities on their Facebook pages also show that

social media provide platforms for stakeholders to express voices, unite people who intend to

make changes, and declare their resistance to the big corporate giants. In this respect, social

media do empower otherwise disadvantaged stakeholders to some extent by providing

communication channels to them that even large organizations are unable to control. The stakeholder liaisons pointed out by Aula (2010) were clearly shown on the Facebook pages of Boycott BP and Occupy Monsanto. People that were affected by the 2010 oil spill wrote comments on the Facebook page of Boycott BP and people who had concerns on Monsanto joined discussion on the Facebook page of Occupy Monsanto. A type of online community was built around those pages and stakeholders communicated with each other in conversations on these pages. The concept of "creative consumers" (p. 262) was proposed by Berthon et al. (2012) to describe customers who can creatively produce content and messages regarding a company on various social media platforms and the concept of "consumer-generated media (CGM)" (p. 263) was proposed by them to refer to social media. Findings of this study reinforce the idea that social media should not be called "consumer-generated media," as corporations evidently are active players on social media; however, the concept of "creative consumers" could be modified to "creative stakeholders" to represent those who established the counter-organizational social media sites and those who actively participated in discussions. Both the Facebook page of Boycott BP and the Facebook page of Occupy Monsanto show stakeholders creatively produced content and messages regarding BP and Monsanto and this creation process was not sporadic, but continuous and systematic. The systematic communication activities of these two counter-organizations, especially Occupy Monsanto, reveal that in the era of social media, organizational image and reputation are co-created/co-constructed by both organizations and stakeholders, rather than solely constructed by organizations. Both organizations and their stakeholders can be important sources of information regarding the organization. When it comes to organizational image and reputation construction on social media, organizations no longer hold a superior position through monopolizing communication channels and messages. This research echoes the

finding that nonprofit advocacy organizations' use of Facebook, Twitter, and YouTube fostered

democracy by contributing to the democratic marketplace of ideas (Auger, 2013).

Findings also reveal that the two case companies and their corresponding activist

organizations both strategically selected to post messages that were either favorable to

themselves or consistent with their communication objectives on social media, which makes

images displayed on corporate social media sites in stark contrast to images conveyed on

counter-organizational social media sites. The images of BP conveyed by the Facebook page of

Boycott BP are primarily negative images related to the 2010 Deepwater Horizon oil spill and its

devastating economic, environmental, and ecological impacts, which were completely absent on

the Facebook and Twitter pages of BP America. Similarly, Occupy Monsanto emphasized

Monsanto's unsafe products and the cancer-causing effects of glyphosate and Roundup;

however, glyphosate, cancer, and roundup were rarely even mentioned on the official social

media sites of Monsanto. The official social media sites of Monsanto only stressed the positive

aspects of GMOs and argued the company helped farmers sustainably grow enough for a

growing world through producing GMO seeds, while Occupy Monsanto underscored that

Monsanto maintained a monopoly over the seed and chemical market and controlled the majority

of the world's GMO seed market along with DowDuPont and Syngenta, which could possibly

hurt farmers. Moreover, Monsanto was primarily delineated as an agricultural company on the

two corporate social media sites, while on the Facebook page of Occupy Monsanto, it was

portrayed as a company not only producing agriculture related products but also producing

harmful chemical products. These findings again support the researcher's argument that

organizational image and reputation are co-created/co-constructed by both organizations and

stakeholders in the era of social media. Neither the two companies nor the two activist organizations provided whole and objective pictures to delineate BP or Monsanto.

This co-creation/co-construction of image and reputation on social media does not mean that stakeholders and organizations build reputation in a collaborative way, but mean that a variety of stakeholders participated in building images that reflect different aspects of an organization, which may affect the organization's reputation. As discussed by Dutot and Castellano (2015), reputation is co-created and co-managed when it goes online and all stakeholders can participate in building and influencing reputation, which makes reputation be not solely driven by firms but also by consumers and other stakeholders. This perspective of co-creation/co-construction emphasizes stakeholder participation in image and reputation construction on social media, which does not mean stakeholders and organizations consciously work together to build some consistent and collaborative images. In the reality, images built by stakeholders on social media are usually inconsistent with the positive images strategically built by organizations, as found in this study. Etter et al. (2019) also discussed how social media enable audiences to serve as both senders and receivers of evaluations about an organization, which allows for the existence of multiple, diverging media reputations in the public domain because media reputation is coproduced in multiple, partly interconnected interaction arenas.

Findings of this study support Etter et al.'s (2019) arguments about the coexistence of multiple reputations in interconnected interaction arenas. Social media become interaction arenas of organizational image and reputation construction, as demonstrated by the contrasting images of BP and Monsanto conveyed by their corresponding organizational and counter-organizational social media sites. The contrasting images of BP/Monsanto, which are co-created/co-constructed by the two companies and their stakeholders, coexist in the public domain on social media.

Multiple reputations of BP/Monsanto could result from multiple images, as the general public are exposed to those multiple images and their perceptions and evaluations of the two companies could be affected by the co-existence of multiple images.

Findings suggest that the respondents somewhat agreed that the communication on the Facebook pages of BP was two-way and dialogic, which is inconsistent with earlier findings of the previous research that found organizations' communication on social media was inclined to be one-way (Cho et al., 2017; Lovejoy et al., 2012; Rybalko & Seltzer, 2010; Yang & Kent, 2014; Waters & Jamal, 2011; Zeler & Capriotti, 2018). For example, in their content analysis of 46 corporate Facebook pages from Fortune's "World's Most Admired Companies", Cho et al. (2017) found corporations employed an informing strategy more often than an interacting strategy when communicating corporate social responsibility activities and corporations were likely unwilling to engage with publics in their effort to minimize public criticism; Rybalko and Seltzer (2010) found Fortune 500 companies failed to explore the dialogic features provided by Twitter to its full potential; Lovejoy et al. (2012) found nonprofit organizations were mainly involved in one-way information dissemination on Twitter; Yang and Kent (2014) found social media were used by organizations as one-way messaging tools, rather than as relationship building tools; Waters and Jamal found that non-profit organizations were more likely to engage in asymmetrical communication than symmetrical dialogue on Twitter; Zeler and Capriotti's (2018) content analysis of 4,456 Facebook posts by Argentinian companies found the communication conducted by these companies were not very interactive. The different findings here might be because the two companies selected as cases in this study were controversial in different aspects and had concerned stakeholders who had strong need and desire to let the

companies hear their voices, and thus actively posted comments or complaints on the corporate social media sites.

It is not surprising to find the respondents also somewhat agreed that the communication on the Facebook page of Occupy Monsanto was two-way and dialogic, which is consistent with findings of some research (e.g., Bortree & Seltzer, 2009). Bortree and Seltzer (2009) found environmental advocacy groups tried to adopt more dialogic strategies to promote greater dialogic communication on their social media sites. This might because the Facebook page of Occupy Monsanto was established by stakeholders who already had great concerns about the products of Monsanto and the company's activities. People who were fans of this Facebook page might also share similar concerns with the founders of this page and proactively participated in conversations on the page.

This study also found social media use (SMU) positively predicted the level of perceived organization-stakeholder dialogic communication (OSDC) on both the Facebook pages of BP and Occupy Monsanto, which may look consistent with the arguments or findings of the previous research (Kelleher & Sweetser, 2012; White, 2012); however, this finding could not be interpreted as stakeholders' social media use positively predicted the level of dialogic communication of organizations with them on the two Facebook pages, because very few respondents in this study were fans of the two Facebook pages and the OSDC measured in this study is how respondents for the case of BP evaluated the communication between BP and its stakeholders on the Facebook page of BP America, or how respondents for the case of Monsanto accessed the communication between Occupy Monsanto and participants on the Facebook page of Occupy Monsanto. Namely, the OSDC measured in this study is respondents' evaluation of communication between organizations and stakeholders other than themselves. Results show that

for both cases, SMU only explains small percentages of the variance of OSDC, which implies that the significant relationship between SMU and OSDC might be arbitrary due to reasons explained here. Although some respondents indeed were fans or followers of the six social media sites examined in the study and their social media use might exert great effects on OSDC, there are too few of them in this study to provide clear support for this argument.

Findings suggest that perceived OSDC positively predicted perceived organization-stakeholder relationship (OSR) for BP, which supports arguments made in previous research (e.g., Briones et al., 2011; Kelleher & Sweetser, 2012) that social media could promote effective two-way communication with organizational stakeholders to develop and maintain good organization-stakeholder relationships. Saffer et al. (2013) found that organizations' use of Twitter as a two-way communication tool resulted in better organization-public relationships. Men and Tsai (2015) also found a positive relationship between public engagement with organizations on corporate SNS pages and the quality of the organization-public relationship in their study of corporate Facebook users. Results of the current study are consistent with the findings of their research.

Findings also demonstrate that the perceived OSR positively predicted both the perceived organizational image and the perceived organizational reputation. The perceived OSDC did not have a direct effect on perceived organizational image or perceived reputation; and its effects on perceived image and perceived reputation were mediated by perceived OSR. Previous research found consumers' intensity of social media use positively affected their engagement in corporate social media activities, which was positively related to corporate reputation (Dijkmans et al., 2015). Dijkmans et al.'s (2015) research implies a direct effect of OSDC on corporate reputation. However, for both cases of the current study, direct effects of OSDC on organizational image or

organizational reputation were not found and the relationships were all mediated by OSR, which emphasized the vital role of good organization-stakeholder relationship in organizational image and reputation construction.

It is noticeable that for the case of Monsanto, the directions of relationships among SMU, OSDC, OSR, organizational image, and organizational reputation are exactly the same as the directions of relationships among these variables for the case of BP. It is not surprising that OSDC on the Facebook page of BP positively predicted OSR; however, it is unexpected to find OSDC on the Facebook page of Occupy Monsanto also positively predicted OSR. Hypotheses assume that OSDC on counter-organizational social media sites negatively predicts OSR, as stakeholders are exposed to negative content about the organization on counter-organizational sites. However, findings of this study demonstrate that OSDC on the Facebook of Occupy Monsanto positively predicts OSR. It is hard to explain why the directions of relationships among SMU, OSDC, OSR, organizational image, and organizational reputation are exactly the same for the two cases, as the OSDC for the case of BP was about the communication between the company and its stakeholders, but the OSDC for the case of Monsanto was about the communication between the activist organization and fans of its Facebook page. This might because the OSDC measured in this study is not about the communication between the respondents themselves and the organization or the activist organization, but all other variables in the SEM models are regarding the respondents' own behaviors. Therefore, as with the effect of SMU on OSDC, the effect of OSDC on OSR might also be arbitrary. Caution should be used when interpreting results concerning how OSDC was affected by its predictor or affected other variables in the SEM models.

It is interesting to find respondents' evaluation of OSR, organizational image, and organizational reputation was inclined to be positive for the case of BP, while their evaluation of these variables was inclined to be negative for the case of Monsanto. For the case of BP, respondents' evaluation of their relationship with BP was slightly positive and their evaluation of BP's image and reputation was generally inclined to be positive, though they indeed expressed some concerns about the negative impact of the 2010 Deepwater Horizon oil spill, BP's lack of care about social responsibility, and the negative environmental impacts caused by BP. For the case of Monsanto, respondents' evaluation of their relationship with Monsanto was generally negative; their evaluation of the organizational image of Monsanto was generally inclined to be negative, with the exception that they somewhat agreed that Monsanto played a leading role in developing new agricultural technology and was a leading agricultural company; similarly, their evaluation of the organizational reputation of Monsanto was also generally inclined to be negative, with the exception that they agreed Monsanto was a profitable company, recognized and took advantage of market opportunities, and tended to outperform its competitors. Since most respondents had little knowledge of BP or Monsanto before they filled out the online surveys, their perceptions of image and reputation of the two companies might be affected by the Facebook messages they were exposed to in this study, but this argument needs more statistical evidence. It is not unexpected to find that organizational image and organizational reputation are highly correlated for both cases.

Theoretical Implications

This study is among the first to examine organizational image and reputation construction on social media of both organizations and activist organizations. Findings of the study demonstrate that counter-organizational social media sites become independent sources of

information regarding an organization, which affect organizational image and reputation of an organization. The communication activities conducted on the Facebook page of Occupy Monsanto were strategic and the images of Monsanto that were delineated on this Facebook page were in stark contrast to images portrayed on the Facebook and Twitter pages of Monsanto. The Facebook page of Boycott BP was not updated regularly, but most of messages on this page revolved around the 2010 Deepwater Horizon oil spill, which were completely missing on the Facebook and Twitter pages of BP America. These two counter-organizational social media sites also served as places for stakeholders such as those who were concerned about the safety of Monsanto's products or who were affected by BP's oil spill to talk with each other. The current findings resonate with Leitch and Neilson's (2001) call for a public-centered approach to public relations. Leitch and Neilson criticized that public relations theories view publics solely from the perspective of the organization, rather than the perspective of publics themselves. They pointed out that public relations theories stress organizational perspective by focusing on the nature of organization-public relations that solely meet organizations' needs and totally ignore the publics' demand. Publics are subordinate to organizations and they are treated as publics only when organizations identify them to be. Findings of this study support Leitch and Neilson's suggestion of reconceptualizing publics, adopting a public-centered approach in public relations, and not marginalizing publics in public relations theory. Concerned stakeholders who actively participated in conversations on the Facebook pages of Boycott BP or Occupy Monsanto could easily find people who shared similar concerns and communicate with them. Unconcerned stakeholders who did not realize the problems of BP or Monsanto could be easily reminded of the problems if they participated in discussions or even just read comments on the counter-organizational sites. On these counter-organizational social media sites, publics can be

constructed by themselves through interactions among themselves, in which they develop their own identities and own perceptions of organizations.

Similarly, findings of this study also echo Friedman and Miles's (2004) call for a decentralized view of organizations in stakeholder theory and building stakeholder theory from the perspective of stakeholder/organization relations. Rowley (1997) also called upon moving beyond the dyadic relationship between individual stakeholders and a focal organization and building a stakeholder theory that incorporates social network theories. This study found disgruntled stakeholders established social media sites to consistently and strategically convey messages to remind the public of the long-lasting detrimental impact of BP's 2010 oil spill, cancer related to Monsanto's products, and the environmental impact of these companies' operations—information that the two companies intentionally neglected on their corporate social media sites. In the communication activities of Occupy Monsanto, the activist organization itself became a focal organization intending to influence Monsanto and stakeholders of Monsanto.

Findings of the current study denote the significant implications of the two-way symmetrical model proposed by Grunig and Hunt (1984), the dialogic public relations theory proposed by Kent and Taylor (2002), the concept of dialogic communication (Kent & Taylor, 1998), the dialogue strategy (a two-way symmetrical model of communication) of stakeholder communication (Cornelissen, 2008), and the concept of organization-public dialogic communication (OPDC) (Yang et al., 2015). Although these concepts, models, and theories are mostly from a managerial perspective that emphasizes a focal organization, they all stressed the two-way communication between organizations and stakeholders and attempted to not marginalize publics and stakeholders in their conceptualization and theorization. These concepts, models, and theories have special implications in the era of social media. Since stakeholders and

publics are able to establish their own social media sites to express their voices and concerns as demonstrated by the findings of this study, organizations should not just view them as targets of their communication activities. Organizations should also consider stakeholders and publics as sources of information and consider themselves as targets of stakeholders' communication in the context of social media. Therefore, even though the two-way symmetrical model (Grunig & Hunt, 1984) was proposed way before social media became popular, this model and the conceptual and theoretical streams that were influenced by this model have extraordinary implications today. There is an overall trend to re-conceptualize publics in public relations theory and public relations research, in which publics are no longer treated as marginalized entities. Findings of the current study support this trend. Moreover, the communication between organizations and the relevant stakeholders is not necessarily two-way, but becomes multiple-way on social media, as stakeholders with different backgrounds participate in the communication and become significant information sources.

Chapter 3 summarizes the influences of affordances (Gibson, 1979; Hutchby, 2001a; Hutchby, 2001b) of social media on organizational image and reputation on social media, including higher frequency and intensity of organization-stakeholder conversations, outside stakeholders as significant information sources, the enhanced significance of unintended communication, reduced control of organization, and faster alliances of stakeholders and easier emergence of publics. Findings of this study indicate that organizations and activist organizations both realized social media provide the affordance of interactivity and explored this affordance. Respondents somewhat agreed that the organization-stakeholder communication on the Facebook pages of BP America and Occupy Monsanto was dialogic. The existence of the Facebook page of Occupy Monsanto and its extensive communication activities conducted on

this page indicate that outside stakeholders became significant sources of information regarding an organization. Neither BP nor Monsanto could control how they were portrayed on the two counter-organizational social media sites examined, indicating the reduced control of organization. Lastly, the Facebook page of Boycott BP attracted stakeholders who were affected by BP's 2010 oil spill; and the Facebook page of Occupy Monsanto attracted stakeholders who were concerned about the safety of Monsanto's products, the environmental impact of the company's operations, and/or the possible negative effect of GMOs. On these counter-organizational social media sites, stakeholders found places to discuss issues they were concerned about, which may foster faster alliances among them. The communication activities of counter-organizational social media sites also enabled stakeholders lacking knowledge of the two companies to realize the negative aspects of the companies, which accelerates stakeholders' transformation to publics (Cozier & Witmer, 2001; Vasquez & Taylor, 2001).

This study found organizations and activist organizations appropriated social media similarly but for different purposes. Adaptive Structuration Theory (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990; Poole & DeSanctis, 1992) discusses the duality between types of structures inherent in technologies and the other structures emerging as they interact with people's action, interaction or use of these tools. AST pointed out that people can actively choose how to use technology structures for different purposes and a given technology structure may be appropriated quite differently depending in part on the internal system of the group, which is the nature of group members and their relationships. This study found that BP, Monsanto, Boycott BP, and Occupy Monsanto all realized the affordances of message posting and interactivity provided by Facebook and explored these affordances. BP and Monsanto both realized the affordance of short message posting provided by Twitter and explored it. Boycott BP

did not update its Facebook page as regularly as BP, Monsanto, and Occupy Monsanto did, possibly due to limited budget and resources. BP and Monsanto's purposes of appropriating Facebook and Twitter were similar in the aspect of building positive image and reputation by posting messages acclaiming their products, services, operations, and performances. However, Occupy Monsanto and Boycott BP's purposes of appropriating Facebook were drawing attention from the publics and the targeted companies, expressing voices, and making changes. Messages posted on the Facebook pages of Boycott BP and Occupy Monsanto indeed harmed the image and reputation of BP and Monsanto among those exposed to such messages, but the ultimate objective was to make changes.

To summarize, the technological affordances of social media enable stakeholders to be independent sources that could systematically convey negative information about organizations. Both organizations and activist organizations in this study explored the affordances of social media, and appropriated them similarly, but for different purposes. Organizations, similar to human beings, could be considered as actors using technology and the inner nature of organizations determines their purposes of using technology. Both affordances and AST could be applied in the context of organizational image and reputation construction on social media. Findings of the study suggest that when modeling or theorizing organizational image and reputation construction in the era of social media, it is important to consider the affordances of social media and how organizations and activist organizations appropriate social media. The existence of counter-organizational social media sites, stakeholders' social media use, and stakeholder communication on counter-organizational social media sites should be incorporated into future model or theory building. The organization-centered approach to organizational image and reputation construction is not applicable anymore and it is vital to reconsider the role

of stakeholders/publics in organizational image and reputation construction. Researchers have attempted to take the stakeholders' perspective to investigate corporate reputation construction on social media. For example, Ji et al. (2017) sought to shift the research paradigm from the organization-oriented approach to a stakeholder orientation to study stakeholders' Facebook engagement on corporate reputation. In the era of social media, organizational image and reputation are co-created/co-constructed by organizations and stakeholders, which should be considered in the theorization of the construction of organizational image and reputation. Dutot and Castellano (2015) argued the traditional model of reputation management, which stressed firms sending signals to their customers, has been challenged and attempted to build a model of e-reputation. In their model, the role of consumers and other stakeholders is emphasized. However, this model only includes one-way or two-way arrows between the only two elements: firm and consumer, along with a self-pointing arrow for the consumer. The part of model with the one-way arrow from firm to consumer represents reputation and the part of model with the two-way and self-pointing arrows indicates e-reputation. The model does not include any details about the categories of stakeholders, the patterns of communication among stakeholders, how the communication among stakeholders and the communication between an organization and its stakeholders are affected by different media types, and the different attributes of media. Dutot and Castellano took constructive attempt to conceptualize and theorize e-reputation, but to theorize image and reputation construction on social media, it is important to contemplate the affordances provided by social media, how stakeholders appropriate social media, the stakeholder communication on social media, and the existence of counter-organizational social media sites.

Practical Implications

This study has several practical implications. First, for corporate communication and public relations practitioners, results of this study show that social media bring both opportunities and challenges to them to construct positive images and reputation. Social media provide platforms for organizations to directly communicate with stakeholders and gain feedback from them. Both BP and Monsanto made great effort to construct positive images and reputation on Facebook and Twitter. However, communication professionals need to pay special attention to the influence of counter-organizational social media sites established by concerned stakeholders. Messages posted on these sites might compromise their effort and threaten organizational image and reputation. Corporate communication and PR practitioners may need to think about how to effectively communicate with these concerned stakeholders to solve the possible issues or problems and constantly monitor various social media platforms to see whether there are negative messages regarding their companies and weigh up how these negative messages would affect the image and reputation of their organizations.

Second, practitioners need to realize the importance of conducting two-way dialogic communication on social media and cultivating good organization-stakeholder relationships to construct positive organizational images and reputation. Findings of this study demonstrate that organizational image and reputation were directly affected by organization-stakeholder relationships and indirectly affected by organization-stakeholder dialogic communication on social media. In their communication with stakeholders on social media, it is important for organizations to be interactive, responsive, open, and transparent and show empathy, genuineness, respect, and commitment, which helps to win trust and satisfaction from stakeholders and foster good relationships with them.

Third, activist groups such as Occupy Monsanto may need to consider the effectiveness of their communication activities on the counter-organizational social media sites they establish. This study found the OSDC on the Facebook page of Occupy Monsanto positively predicted OSR, which subsequently positively predicted organizational image and reputation. Most participants of this study were MTurk workers who identified themselves as the general public. Findings suggest the communication activities conducted by Occupy Monsanto on its Facebook page may not have the intended effect on how the general public views Monsanto and the influence might be limited to fans of the page. If the ultimate goal of the counter-organizational social media sites is to make changes through influencing the public, they may need to contemplate how to effectively promote the sites to the public and enhance the communication effectiveness of the sites.

As demonstrated by the findings of the study, some counter-organizational social media sites such as the Facebook page of Occupy Monsanto become hubs of negative information regarding the targeted organizations. The public searching for information about organizations could not only find information sent by organizations and news media, but also find information sent by these counter-organizational social media. In order to obtain a more complete picture of an organization, the public searching for information about an organization should pay special attention to the counter-organizational social media, as the negative information about the targeted organization might be hidden from other information sources. Users of third-party review sites could also use information from the counter-organizational social media as references when they post comments about organizations. They might also find people who share similar opinions with them on the targeted organizations on social media.

Limitations and Future Research

This study has several limitations. First, participants in the second phase of this study were Amazon MTurk workers and most of them were not fans/followers of the social media sites examined in the study. Their perception of OSDC may be significantly different from the real fans/followers' perceptions, as most of them may not be interested in the two case companies at all or lack the experience of communicating with the companies before they participated in this research. The primary objective for them to participant in this research was to finish the HITs to get paid. However, the actual fans/followers of the social media sites examined were interested in the case organizations, which was the reason why they spent their time on these corporate and counter-organizational social media sites. The actual fans/followers' evaluation of OSDC, OSR, organizational image, and organizational reputation is affected by their experience with the companies on social media. As they have actual communication with the company, their evaluation of OSDC is potentially more valid. However, in this study, the participants' evaluation of OSR, organizational image, and organizational reputation may be mostly affected by their pre-existing perceptions of the companies, rather than their evaluation of OSDC, which was about other people's communication with the two case companies. Namely, their pre-existing perceptions of the OSR, organizational image, and organizational reputation of the case companies mostly affected how they answered questions about these three variables when they took the online surveys, which might not be significantly affected by browsing the Facebook pages of BP America or Occupy Monsanto. Due to lack of resources, the researcher was blocked in several efforts to approach actual fans/followers of the social media sites examined in the study and was left with general public members as recruited through MTurk workers as a less than ideal option. Future research could make effort to recruit the fans/followers of social media

sites to be studied to acquire first-hand information to gain a better and deeper understanding of the relationships among OSDC, OSR, organizational image, and organizational reputation on social media.

Second, respondents in Phase 2 of the study only browsed Facebook messages that were posted within a short time period (slightly more than 2 months). The Facebook messages that were posted in such a short period of time may not reflect the reality of OSDC on social media. For instance, the communication between an organization and its stakeholders may be much more intense during an organizational crisis. Messages posted during a specific time period may be mostly information or news about the industry trends, which might generate less discussion, while messages posted in another time period may be mostly information about the companies themselves, which might generate more discussion. Thus, the levels of OSDC might be different depending on the selected time period. It is possible that the evaluation of OSDC that was largely based on messages posted during the time periods selected for this study does not reflect the communication between BP America/Occupy Monsanto and fans of their Facebook page in other and more extended time periods. Furthermore, since most of the respondents were not familiar with the two case companies and were not fans/followers of the social media sites examined in the study, quickly browsing a limited set of Facebook messages may have provided limited knowledge of the case companies. Thus, it is hard to conclude their perceptions of OSR, organizational image, and organizational reputation were affected significantly by the stimulus they received (i.e., browsing the Facebook pages)—though it is also possible that any observed influences would likely be enhanced with more regular and extended exposure. Future research could choose to ask subjects to browse posts posted during a longer period of time or invite

fans/followers of the social media sites to be studied to participate in the study to explore the communication between organizations and stakeholders on social media.

Third, in Phase 1 of this study, a total of six sites were investigated to identify organizational images constructed by both corporate social media sites and counter-organizational social media sites; however, in Phase 2 of the study, only two social media sites were selected for participants to browse. Due to unexpected reasons, the Facebook page of Boycott BP was no longer available when Phase 2 of the study was conducted; and both of the Facebook and Twitter pages of Monsanto were shut down at the time of Phase 2 of the data collection, sometime after Monsanto was acquired by Bayer. During Phase 2 of the data collection, the social media sites that were publicly available only included the Facebook and Twitter pages of BP and the Facebook page of Occupy Monsanto, and the participants were guided to browse posts on the Facebook page of BP and the Facebook of Occupy Monsanto. The researcher planned to examine the perceived OSDC between each case company and its stakeholders on their corporate social media sites; however, for the case of Monsanto, it is impossible to explore this because the company's corporate social media sites were shut down and it turned out that the perceived OSDC measured for the case of Monsanto was about the communication between Occupy Monsanto and its fans, rather than the communication between Monsanto and its stakeholders. Thus, for the reasons discussed above, participants for the case of BP were only exposed to messages from the corporate social media, while participants for the case of Monsanto were only exposed to messages from the counter-organizational social media. Since some participants in this study knew little about the case companies, messages they received might greatly affect how image and reputation of the case companies were perceived by this group of participants. It is ideal to incorporate both corporate and counter-organizational

social media sites in Phase 2 of the study, as the study intends to study how both sources of social media affect the perceived organizational image and reputation of stakeholders. In future studies, better case companies having both types of social media that are publicly available might be found to examine the effects of both corporate and counter-organizational social media.

Fourth, most participants in this study identified themselves as the general public and the types of stakeholders were not diversified. Especially for the case of BP, in terms of stakeholder category, no respondent indicated they were a shareholder, current employee, former employee, regulator, or journalist. For the case of Monsanto, only eight respondents selected farmers, activists, shareholders, current employees, former employees, regulators, veterans, or residents living around Monsanto's plants. Future studies could recruit participants to reflect wider representation of stakeholder groups to examine how different stakeholder groups use social media to communicate with organizations and activist organizations, and how they perceive the image and reputation of organizations.

Fifth, this study only examined the messages posted by organizations and activist organizations on their social media sites and did not examine comments from stakeholders. In this study, messages were analyzed to identify images conveyed by BP, Monsanto, Boycott BP, and Occupy Monsanto; however, the comments left by stakeholders on these Facebook and Twitter pages may also affect what and how images were presented. Moreover, the comments also provide straightforward and first-hand information about how stakeholders actually communicated with an organization or activist organization on social media and how they actually assessed the reputation of an organization. Considering the focus of this study is to explore organizational images conveyed by organizations and activist organizations on their social media accounts and RQ1 does not ask what images are conveyed by stakeholder

comments, only messages posted by organizations and activist originations were analyzed. This restriction was also done as a way to manage the large number of messages to analyze as well. To more broadly explore organizational image and reputation construction from a stakeholder perspective, future studies could make good use of comments that are left on the social media sites to be studied.

There are a few other limitations worth mentioning. For example, the sample size of the study is small. Due to limited resources in compensating respondents, there are only 102 cases for BP and 100 cases for Monsanto. It is better to recruit more respondents for SEM analysis in future studies. Also, as this study only studied two case companies, findings of the study cannot be generalized. Future studies could involve more companies from diverse industries to study social media's general impact on organizational image and reputation. Furthermore, this study only examined two social media platforms: Facebook and Twitter. Results of this study could not be applied to a variety of other social media platforms such as Instagram and YouTube. The communication effectiveness of textual messages, pictures, and videos may be quite different and the affordances of varied social media platforms are discrepant. Future studies could do more explorations to compare how different social media platforms differ in terms of their effect on organizational image and reputation construction.

In addition to addressing limitations, there are additional opportunities for future research in this important area of social media and organizational image/reputation. For example, it would be interesting to compare the communication effectiveness of corporate social media sites and counter-organizational social media sites of the same organization in terms of organizational image and reputation construction. This study found the two types of social media sites conveyed contrasting images and experimental designs could be adopted in future studies to explore how

the communication activities of two types of site affect how the general public perceive an organization's image and reputation. Experimental design has been adopted to study the effects of organizations' responses of complaints on social media. For example, Javornik et al. (2020) created fictional Facebook pages, consumer complaints, and company responses as stimuli in their experiment to examine how a company's complaint handling was perceived by the online audiences and found satisfaction with complaint handling positively impacted corporate image. Lappeman et al. (2018) created a fictious mobile phone manufacturing brand to study how a company's response policy to a sudden discharge of negative word-of-mouth communication that spread rapidly across social media platforms, which they called an online firestorm, influenced brand reputation among observers of the firestorm. Li et al. (2013) created a fictitious coffee company and a Fake Twitter account to study the effect of the characteristics of the corporate Twitter channel, user engagement, and user informedness on corporate reputation. Triantafillidou and Yannas (2020) created a fictious hotel company facing a racially-charged crisis to examine the effects of social media platforms and image restoration strategies on post-crisis reputation evaluations. These researchers all created fictitious companies and corresponding fictitious social media pages or accounts as the stimuli in their research, which does not reflect the natural communication flow in a real social media environment. In their study of the effects of BP's communication strategies when facing crisis and the level of consistency of its Facebook followers' comments and its Facebook posts on audiences' perceptions of its reputation, Ye and Ki (2018) revised BP America's responses to the Deepwater Horizon oil spill on its Facebook and the followers' comments to create four BP Facebook pages as the stimuli in their experiment. Compared with the other researchers cited in this paragraph, Ye and Ki studied a real company and their stimuli are partly authentic; however, they only

revised two posts and followers' comments to these two posts from BP America's Facebook page and split the comments based on whether they are consistent with the selected Facebook posts. Having only two posts and the corresponding comments on these two posts could not provide a vivid and complete picture of the corporate images BP intended to convey on its Facebook page and the effects of these posts and comments on the audiences' perception of BP's reputation are limited. Furthermore, Ye and Ki did not examine any messages from the counter-organizational social media sites of BP. Future research could employ experimental design and use actual organizational and counter-organizational social media sites as stimuli to study the effects of both types of sites on organizational image and reputation construction.

Future research could also investigate whether there are direct effects of organization-stakeholder dialogic communication on organizational image and reputation. This study found organization-stakeholder dialogic communication has no direct effect on organizational image and reputation for both cases. Findings suggest the indirect effects of organization-stakeholder dialogic communication on organizational image and reputation are mediated by organization-stakeholder relationship. Studies found dialogic communication on social media may boost stakeholder support and encourage relationship building (du Plessis, 2018), consumer engagement with brand communities on social media had a strong, positive association with corporate reputation (Ferreira & Zambaldi, 2019), engagement with social media content positively impacted organizational image (Syrdal & Briggs, 2016), and stakeholders' leaving positive and negative comments on corporate Facebook pages were significant predictors of the company's reputation score (Ji et al., 2017). It is believed that more engaging communication with customers on social media is positively related to corporate reputation (Floreddu & Cabiddu, 2016) and social media communication strategies affect the formation of firm

reputation (Floreddu et al., 2014). Although researchers and practitioners widely believe dialogic communication on social media is positively related to corporate image and reputation, limited empirical research has examined whether the direct effects of dialogic communication on social media on organizational image and reputation indeed exist or not. Future research could investigate this direct effect and explore whether the effect of dialogic communication on image and reputation must be mediated by organization-stakeholder relationships or other variables. Future research could also examine whether dialogic communication is effective in positive image and reputation building when there exists a large amount of negative information regarding an organization on social media, as conveyed by counter-organizational social media sites.

Future research could adopt a stakeholder perspective to study the resistance of stakeholders on social media and the dynamics of stakeholder communication on different social media platforms. Most of the existing research studied the effects of social media on organizations from an organizational perspective and considered the existence of counter-organizational social media sites as threats to organizational image and reputation. Prior research examined how large companies handled complaints on their Facebook and Twitter pages (Einwiller & Steilen, 2015), the effects of negative guest reviews on TripAdvisor on hotels (Fernandes & Fernandes, 2018), the influence of social media activism on the stock market performance of targeted companies (Gomez-Carrasco & Michelon, 2017), how observers' perceptions of complaint handling on social media were affected by the communication strategies adopted by companies (Javornik et al., 2020), whether a company's response policy during an online firestorm on social media influenced their brand reputation among observers of the firestorm (Lappeman et al., 2018), the potential harm of boycotts on social media on brand

equity (McGriff, 2012), why customers voiced their complaints on Facebook (Mei et al., 2019), how the publics' negative peer communication about companies on social media influenced organization-public relationships (Qin & Men, 2019), and the effects of corporate apologies on online sentiments towards the company on Twitter (Chung et al., 2019). All of these studies focused on how organizations were affected by the negative content on social media from an organizational perspective. Future research could adopt a stakeholder perspective to study questions such as what factors enable stakeholders to post negative comments about an organization on social media, what their objectives of posting complaints on organizations are, how stakeholders communicate with each other on different social media platforms to discuss issues regarding an organization, what the goals of the establishment of various counter-organizational social media sites are, and what the communication effectiveness of the counter-organizational social media sites on the general public is.

Stakeholder communication on counter-organizational social media sites is an interesting area for future research to explore. Counter-organizational social media sites attract stakeholders who share similar interests and attitudes towards the targeted organizations. For example, the Facebook page of Boycott BP attracted stakeholders who were affected by the 2010 oil spill; and the Facebook page of Occupy Monsanto attracted stakeholders who were concerned about the safety of Monsanto's products. It is interesting to study how stakeholders communicate with each other on counter-organizational social media sites, whether and how stakeholders develop various identities in their communication on counter-organizational social media sites, and how stakeholder communication on counter-organizational social media sites affects organizational image and reputation.

The focus of this study is organizational images that organizations and activist organizations intended to build with their own purposes. Namely, the communication examined in this study is the intentional communication of either organizations or activist organizations. Future research could study the effects of stakeholders' unintended communication on social media on organizational image and reputation construction. Moreover, the identities of the activist organizations and stakeholders who left comments on either organizational or counter-organizational social media sites examined in this study are public, which might affect how they shared feelings, thoughts, and opinions about the targeted organizations on these sites. Future research should study how stakeholders discuss organizations on anonymous social media and how anonymous social media influence organizational image and reputation. Additionally, future research could also study how content posted by stakeholders on third party review sites about an organization affect its image and reputation. Stakeholders participating in discussions on counter-organizational social media sites as examined in this study might hold pre-existing negative attitudes towards the targeted organizations and belong to specific stakeholder groups. For example, stakeholders leaving comments on the Facebook page of Boycott BP might be residents living around the Gulf who were harmed by the oil spill; and stakeholders leaving comments on the Facebook page of Occupy Monsanto might be people having special interests in environmental issues. Those leaving comments on third party review sites might form a more diversified categories of stakeholder groups and their comments may reflect organizational image and reputation perceived by a more general audience.

It might also be meaningful for future research to study whether organizations and counter-organizations use algorithms to explore the interests of the viewers of their social media sites and create corresponding content to tailor to their needs and interests. Social media

platforms use algorithms to serve tailored content to users and give some content preeminence over others by controlling when and in what order the content is posted (Cetina Presuel & Martínez Sierra, 2019). For example, using algorithms, Facebook selects potential friends and orders them for a user and Amazon orders potential products based on the products' perceived relevance (Hogan, 2010). Whether and how algorithms are used by organizations and counter-organizations to explore stakeholders' preferences to create relevant content to attract them is rarely investigated. If content is built based on algorithms, how organizational image and reputation are affected by algorithm-based content is an interesting area for future research to explore.

Summary

In conclusion, this study is among the first to study organizational image and reputation construction on both organizational and counter-organizational social media sites. Semantic network analysis was employed to examine what organizational images were built and conveyed on organizational and counter-organizational social media sites of BP and Monsanto. Relationships among stakeholders' social media use, organization-stakeholder dialogic communication on both types of social media sites, organization-stakeholder relationship, organizational image, and organizational reputation were explored. Findings suggest contrasting organizational images were built on organizational and counter-organizational social media sites and both types of social media sites strategically built and conveyed specific images of BP and Monsanto according to their goals. This study found stakeholders' social media use positively predicted organization-stakeholder dialogic communication on both types of social media sites, which positively predicted organization-stakeholder relationships. Organizational image and reputation were strongly and positively related, and both of them were positively predicted by

organization-stakeholder relationships. No direct effects of organization-stakeholder dialogic communication were found on organizational image and reputation. The effects of dialogic communication and organizational image/reputation were mediated by organization-stakeholder relationship. Participants in this study evaluated that the communication on the Facebook pages of BP and Occupy Monsanto was two-way and dialogic.

Findings of the study suggest that the affordances provided by social media empower stakeholders and enable them to be senders of information regarding an organization. Social media thus become interaction arenas for organizational image and reputation construction and organizations cannot control the multiple existence of organizational images and reputations on social media that are co-created/co-constructed by organizations and stakeholders. For organizations, social media provide both opportunities and risks to communicate with stakeholders, build relationships with them, and construct organizational image and reputation. For stakeholders, social media provide platforms for them to express voices and resistance, communicate with each other, and form alliances to make changes.

Findings of the study imply the need to adopt a public-centered approach to public relations (Leitch & Neilson, 2001) and a decentralized view of organizations to build stakeholder theory from the perspective of stakeholder/organization relations (Friedman & Miles, 2004), denote the significant implications of the two-way symmetrical model of public relations (Grunig & Hunt, 1984) and the dialogic public relations theory (Kent & Taylor, 2002) in the era of social media, and support a multiple-stakeholder approach to and a broader view of organizational resistance. Findings of the study also demonstrate the affordances provided by social media significantly impact organizational image and reputation construction on social media. The influences of affordances of social media on organizational image and reputation construction

proposed by the researcher such as higher frequency and intensity of organization-stakeholder conversations, outside stakeholders as significant information sources, and reduced control of organization are demonstrated by the findings of the study. Organizations and activist organizations appropriated social media similarly but for different purposes, which indicates social media's influences on image and reputation construction depend on the affordances provided by the technologies, as well as how the technologies are appropriated. Findings of the study suggest that when modeling or theorizing organizational image and reputation construction on social media, it is important to consider the affordances of social media, how the affordances are perceived by organizations and activist organizations, and how various users actually appropriate social media. The organization-centered approach to organizational image and reputation construction should be replaced with a stakeholder-centered approach. There is co-existence of multiple organizational images and reputations on social media that are co-created/co-constructed by organizations and stakeholders. Some images are built by stakeholders with intended purposes, as shown by images conveyed by the counter-organizational social media sites examined in this study; some images that are inclined to be positive are mostly strategically built by organizations, as demonstrated by images conveyed by the organizational social media sites examined in this study; and some images are built by stakeholders unintentionally, which are not investigated in this study. The existence of multiple images of an organization might affect how the general public perceive an organization, and thus result in the existence of multiple reputations. In short, there is a need to retheorize and remodel organizational image and reputation construction from stakeholders' perspective in the context of social media.

Results of the study show that social media bring both opportunities and challenges to corporate communication and public relations practitioners to build good organizational image and reputation. They could use social media to directly communicate with their stakeholders, gain feedback rapidly from them, and do not need to rely on news media to send messages to them. However, they have to pay special attention to the negative content posted by stakeholders on social media, especially the existence of counter-organizational social media sites. Social media serve as platforms for stakeholders to express their voices and empower them to some extent. Activist groups establishing counter-social media sites should consider the effectiveness of their communication activities and how to achieve their goals of making changes. In a word, the emergence and development of social media is revolutionary for organization-stakeholder communication, organization-stakeholder relationship building, and organizational image and reputation construction, and deserves attention and exploration from both researchers and practitioners.

Appendix A

Figure A1

Overall Network Picture: Facebook of Boycott BP
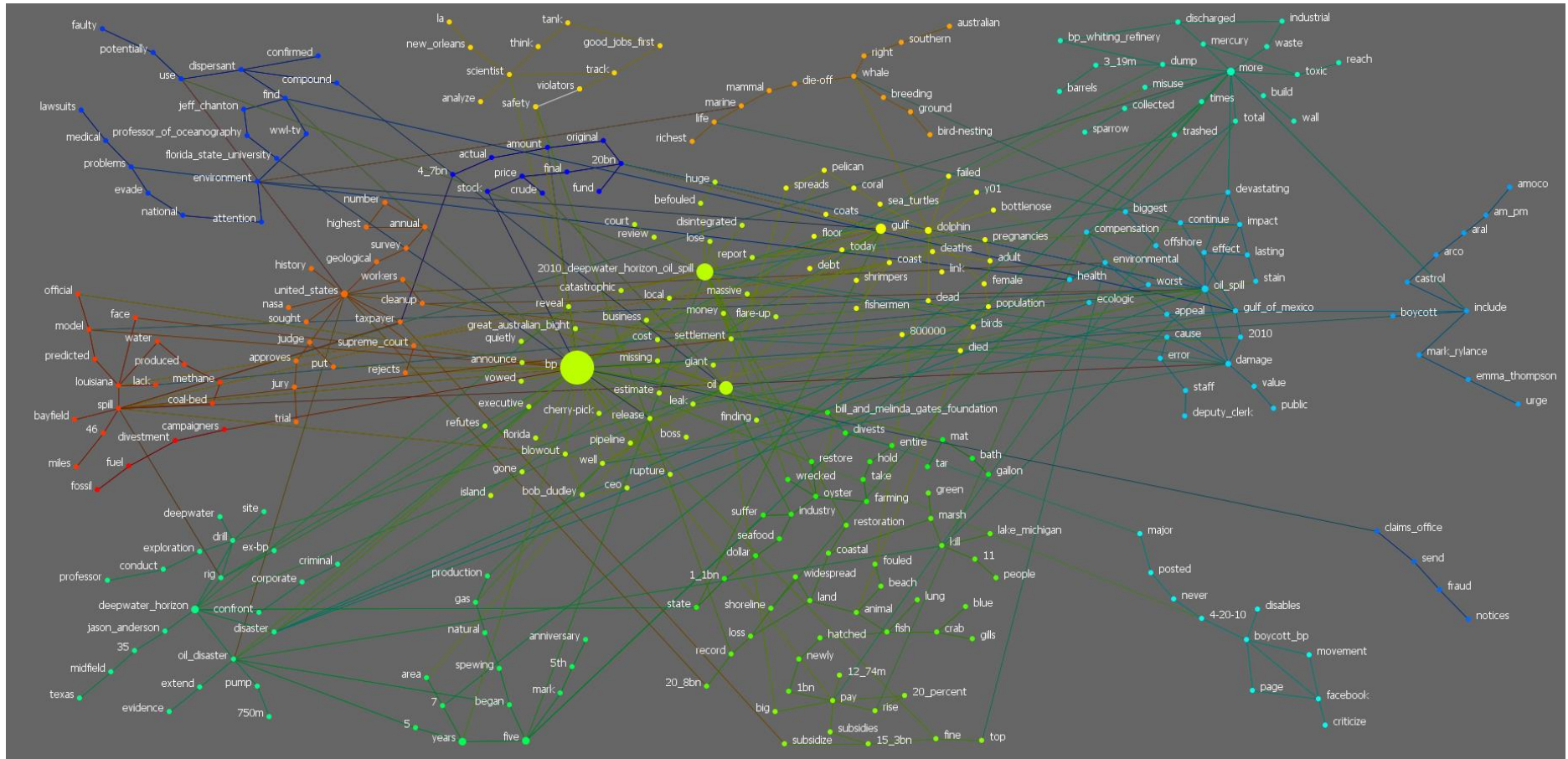
Figure A2

Overall Network Picture: Facebook of BP
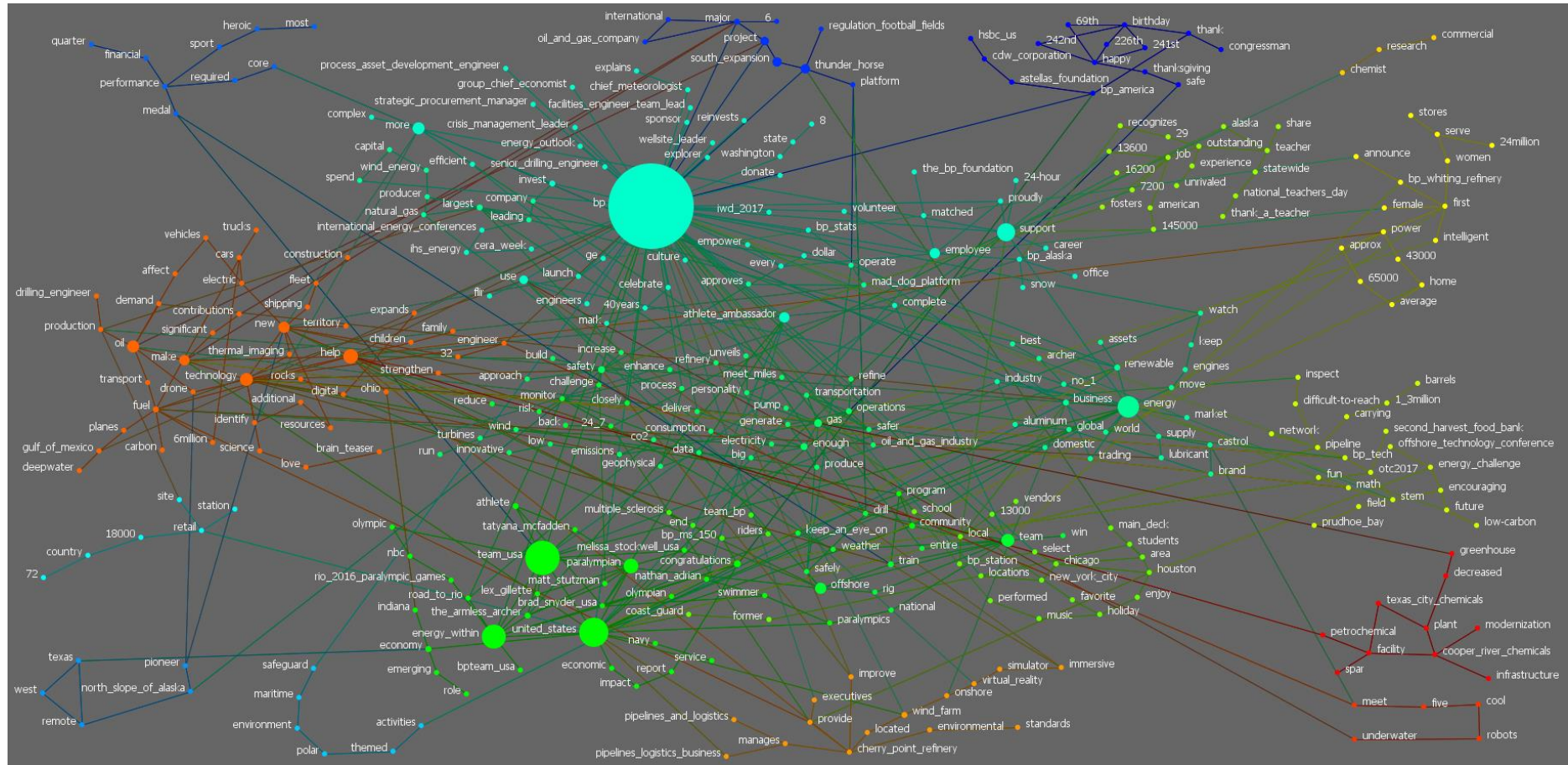
Figure A3

Overall Network Picture: Twitter of BP

Figure A4

Overall Network Picture: Facebook of Occupy Monsanto
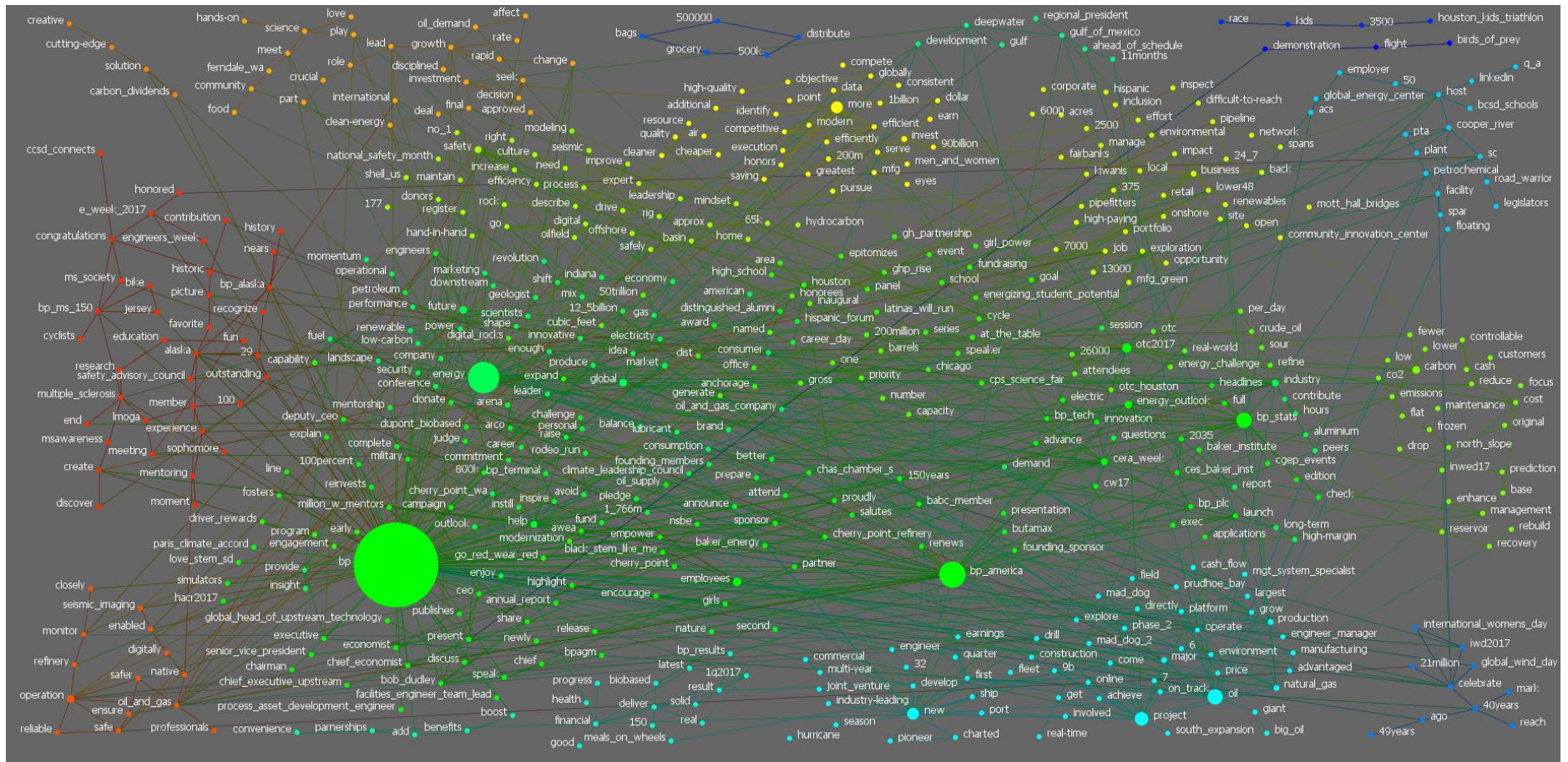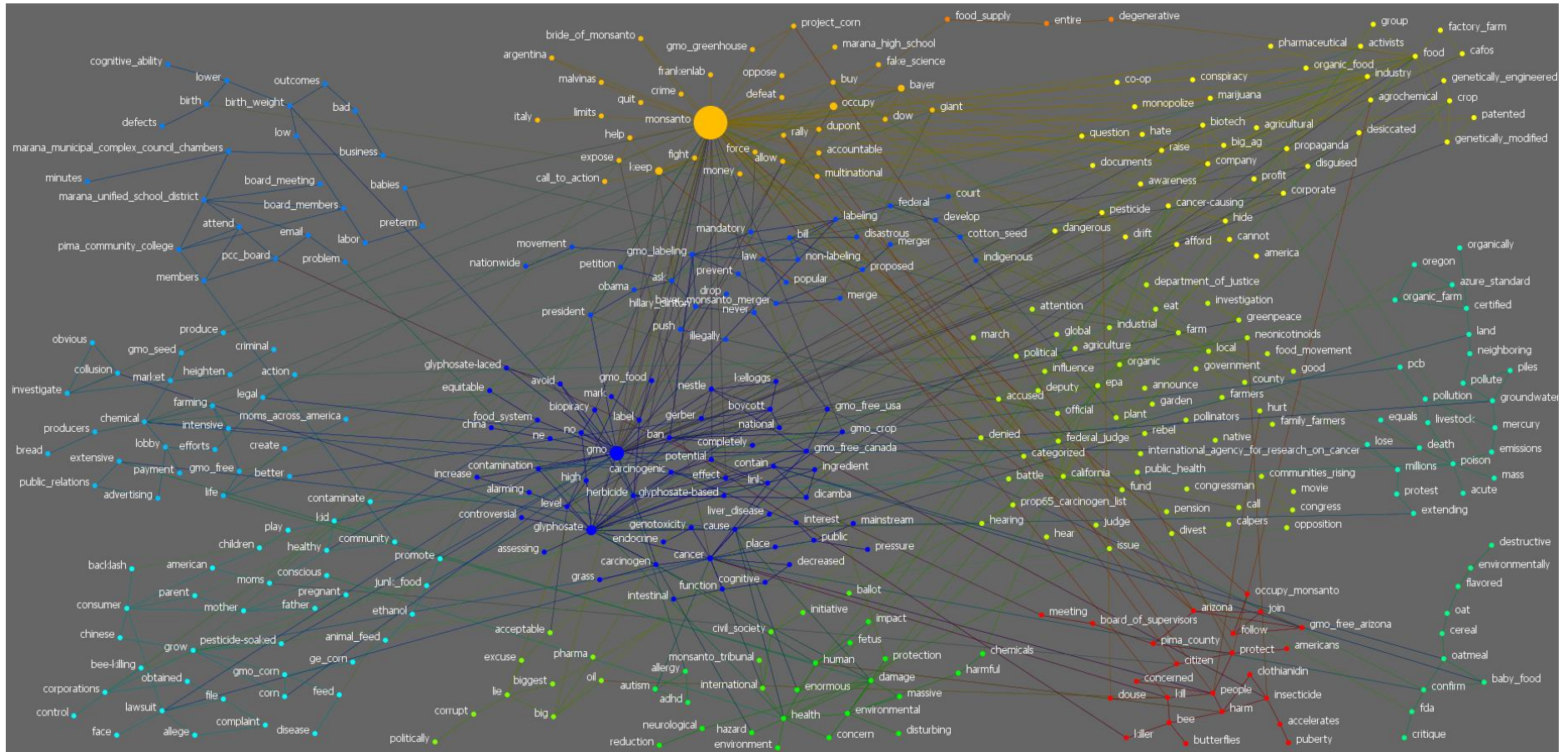
Figure A5

Overall Network Picture: Facebook of Monsanto

Figure A6

Overall Network Picture: Twitter of Monsanto

Appendix B

Figure B1

Network Group 1: Facebook of Boycott BP
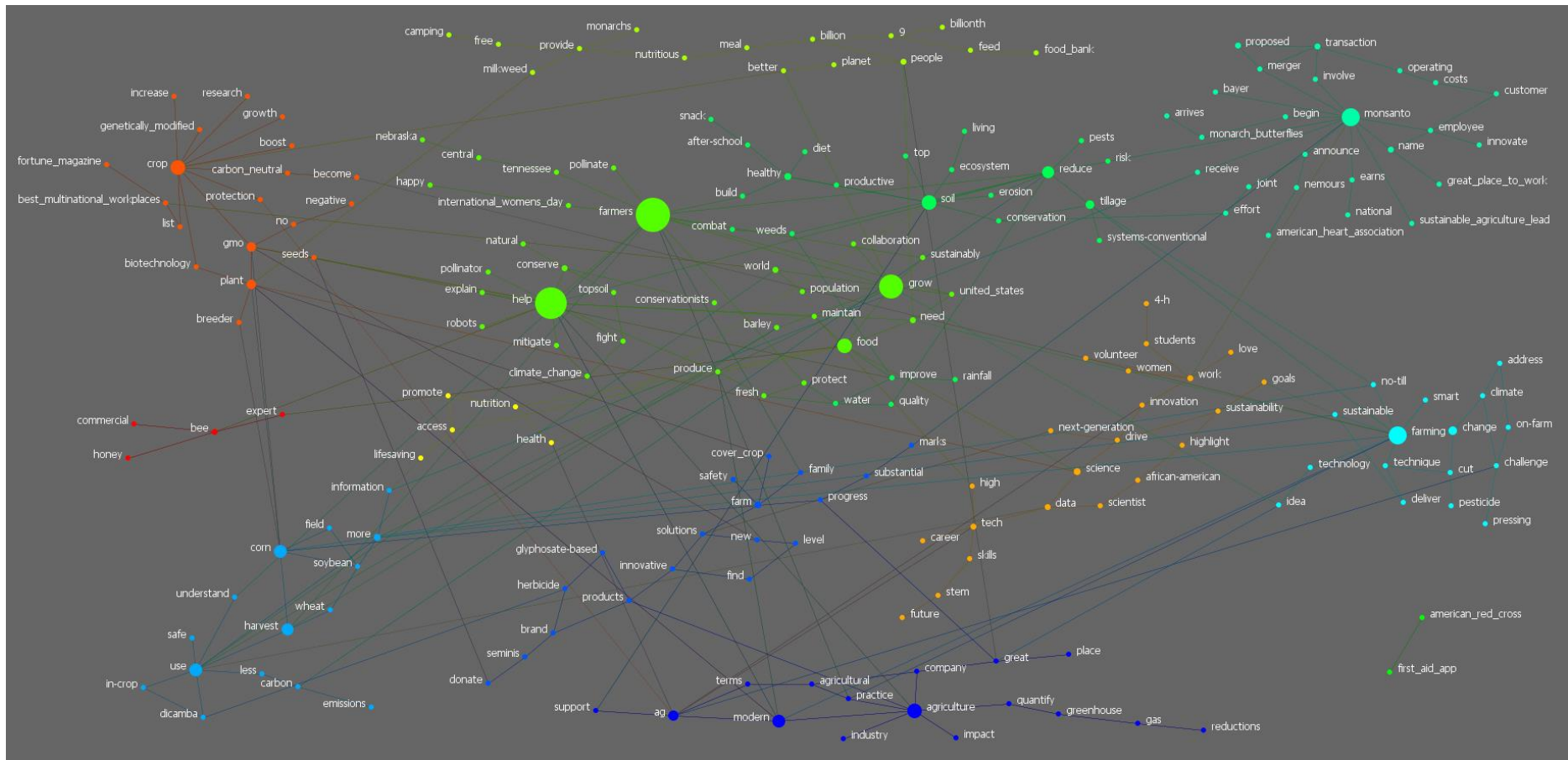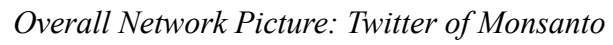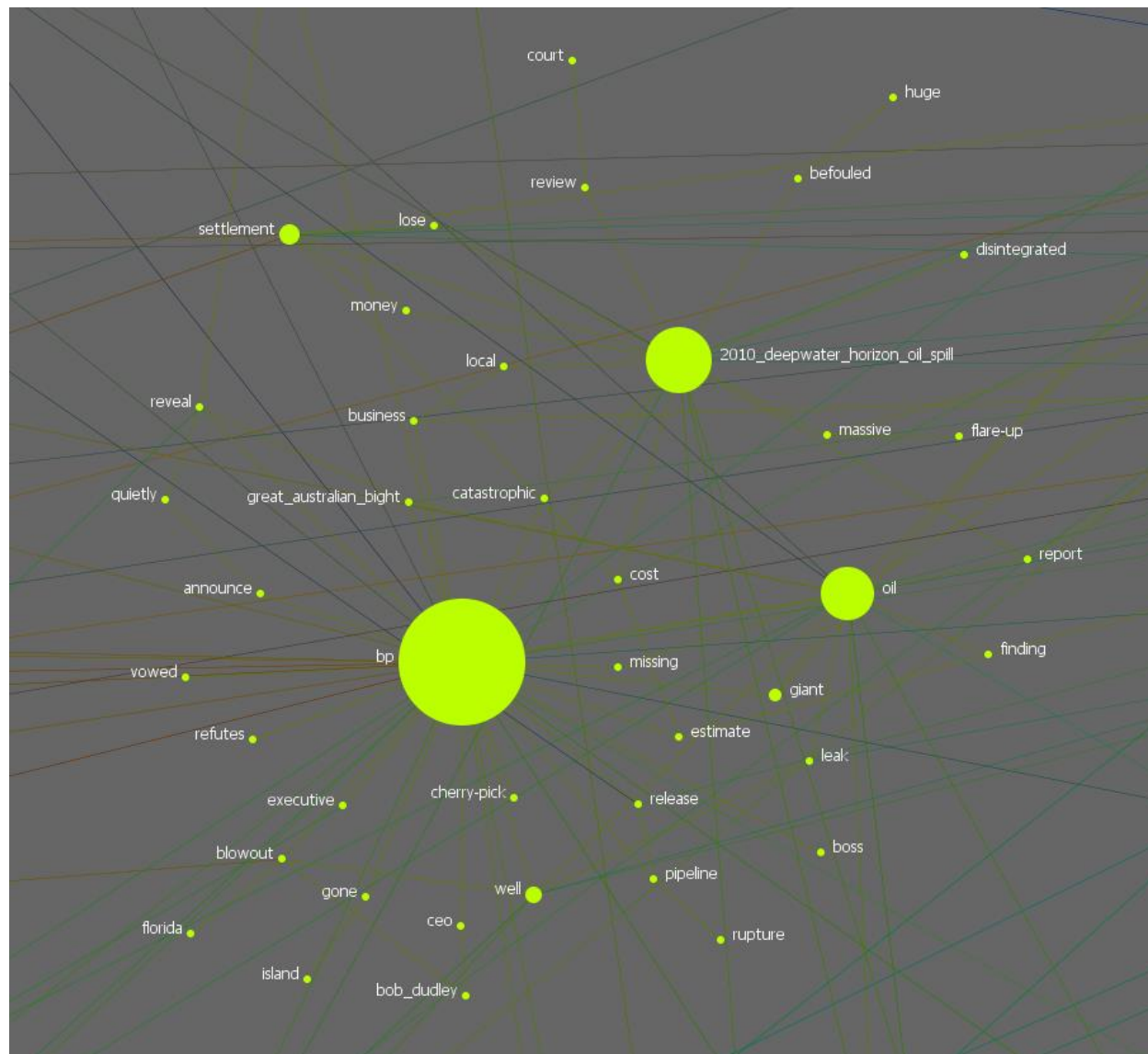
Figure B2

Network Group 2: Facebook of Boycott BP
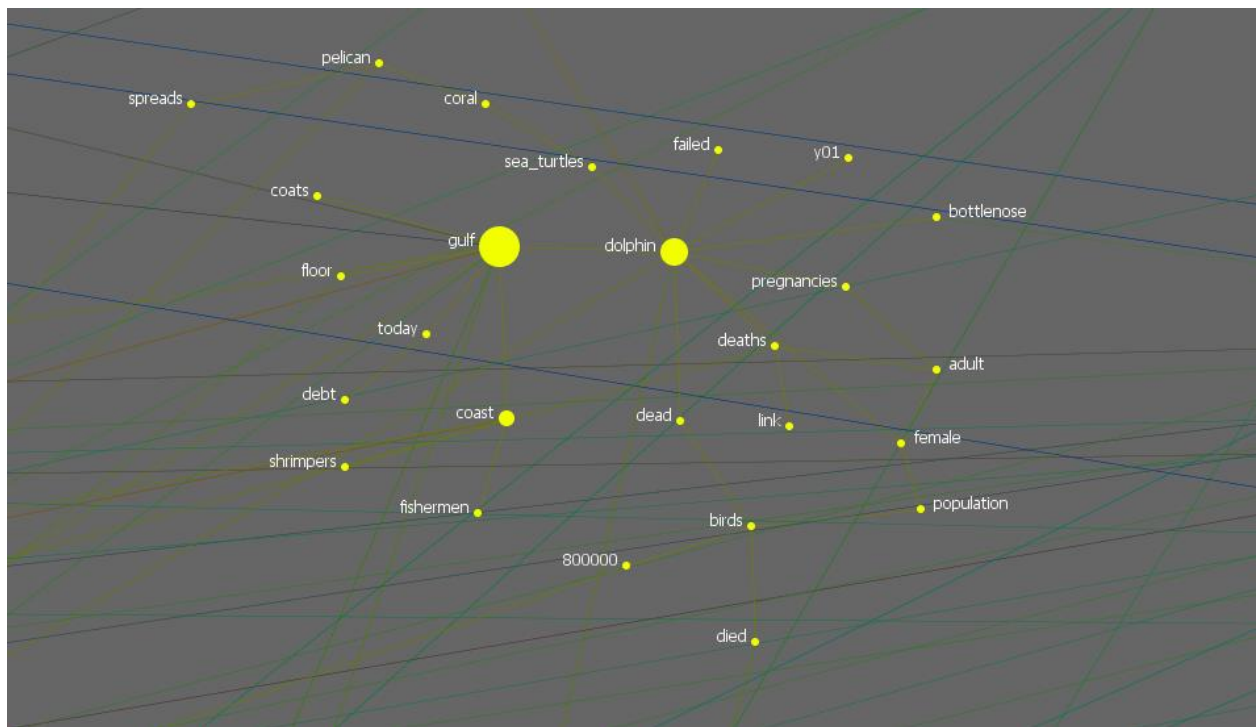
Figure B3

Network Group 3: Facebook of Boycott BP
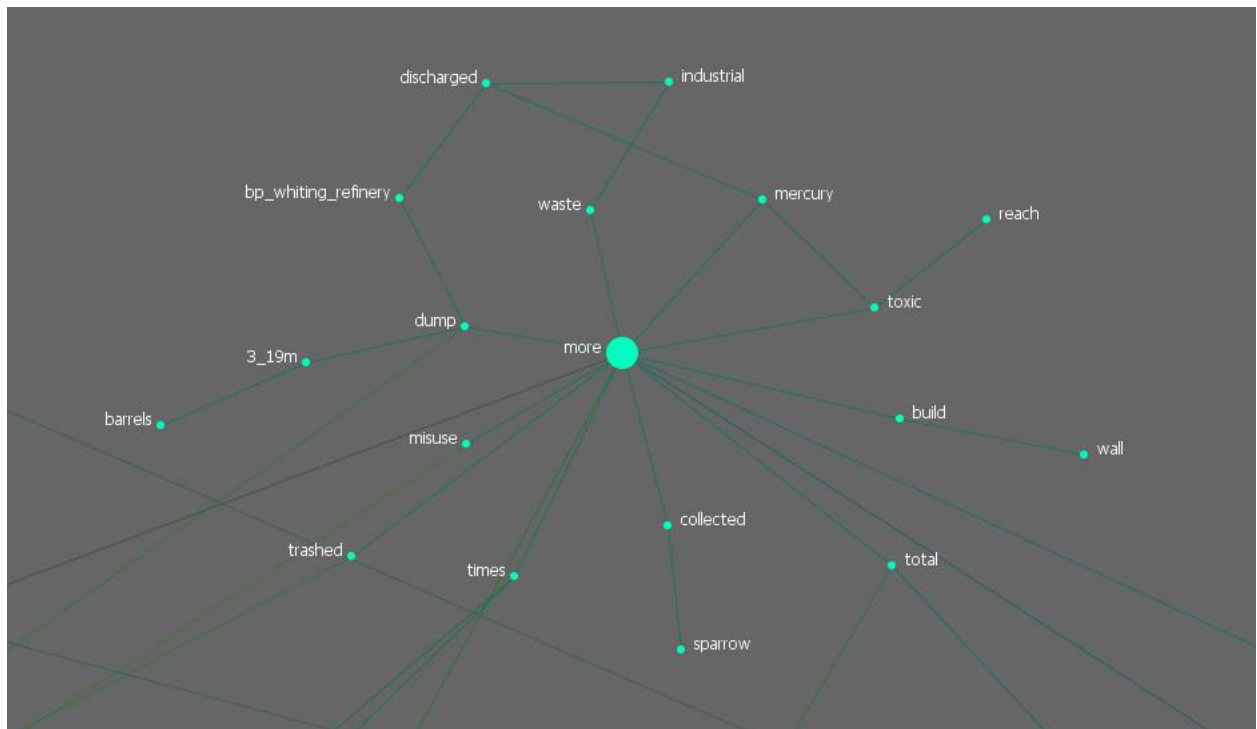
Figure B4

Network Group 4: Facebook of Boycott BP
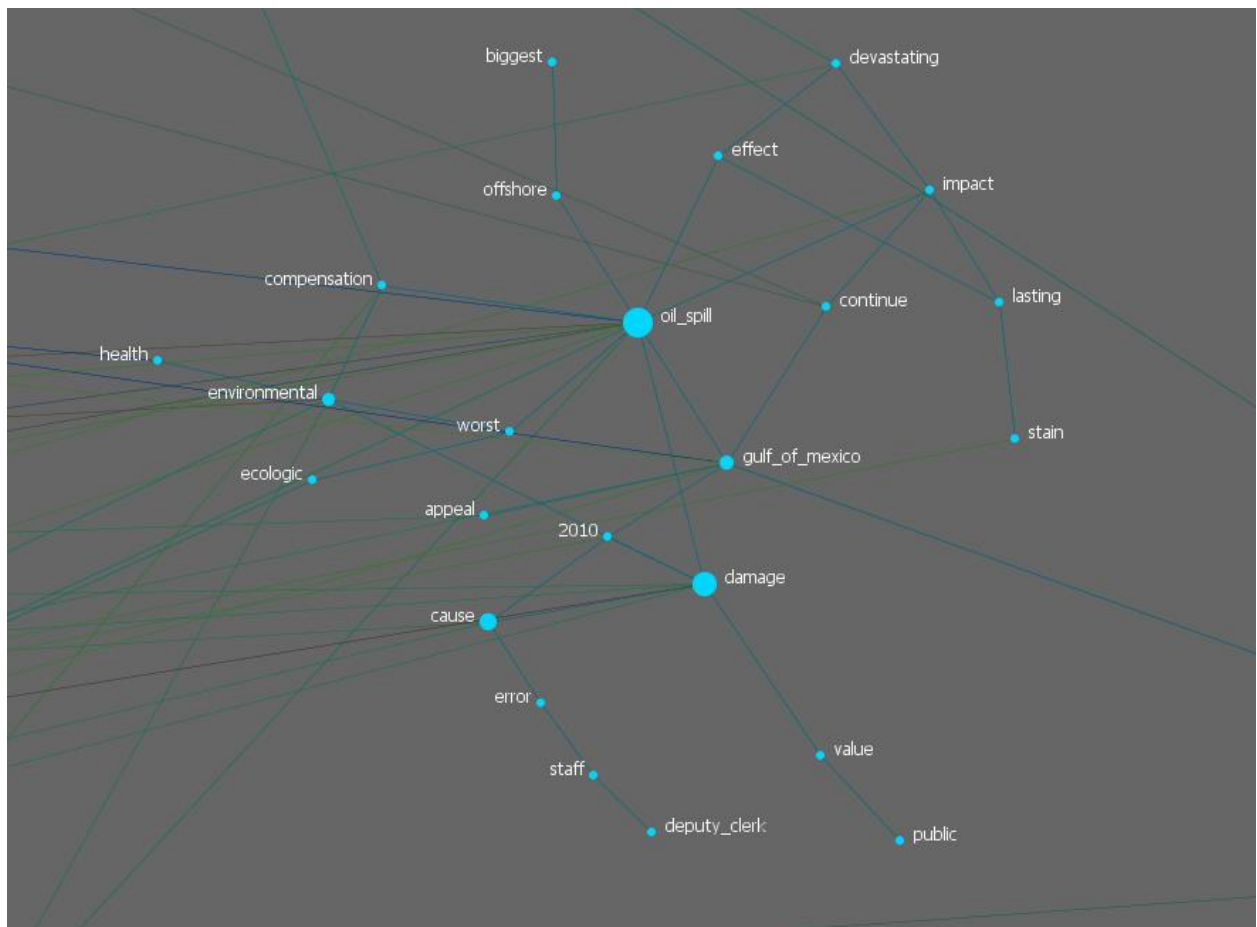
Figure B5

Network Group 5: Facebook of Boycott BP
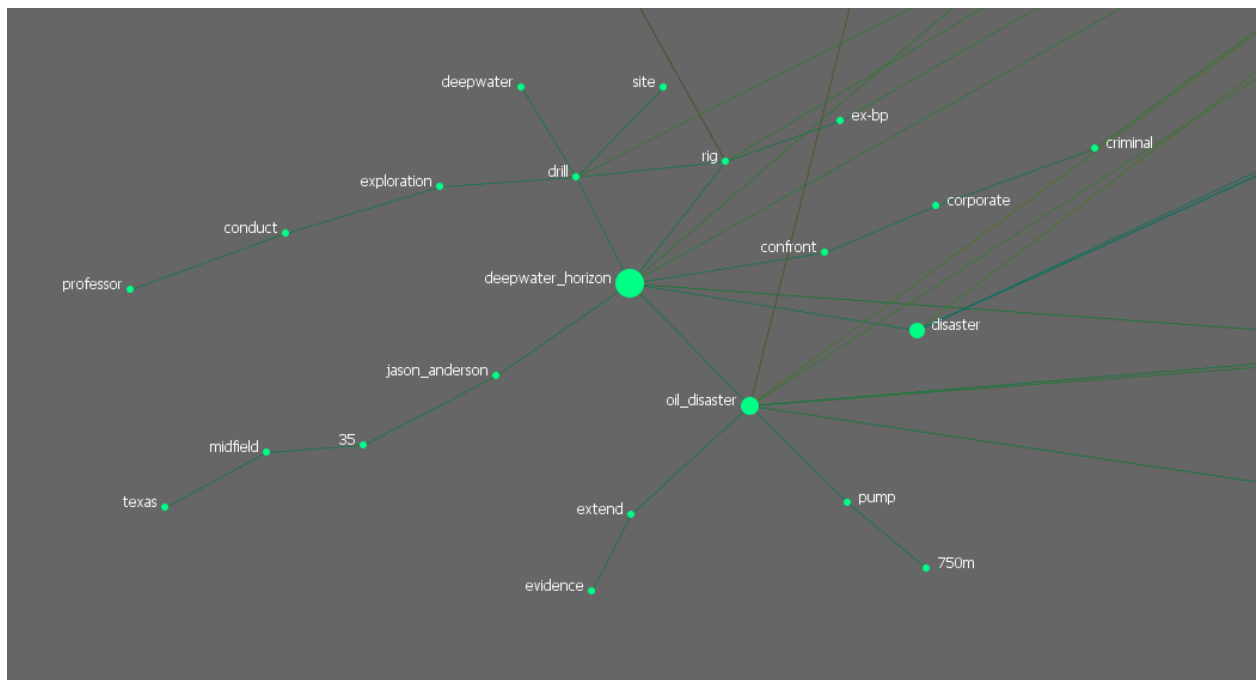
Figure B6

Network Group 6: Facebook of Boycott BP
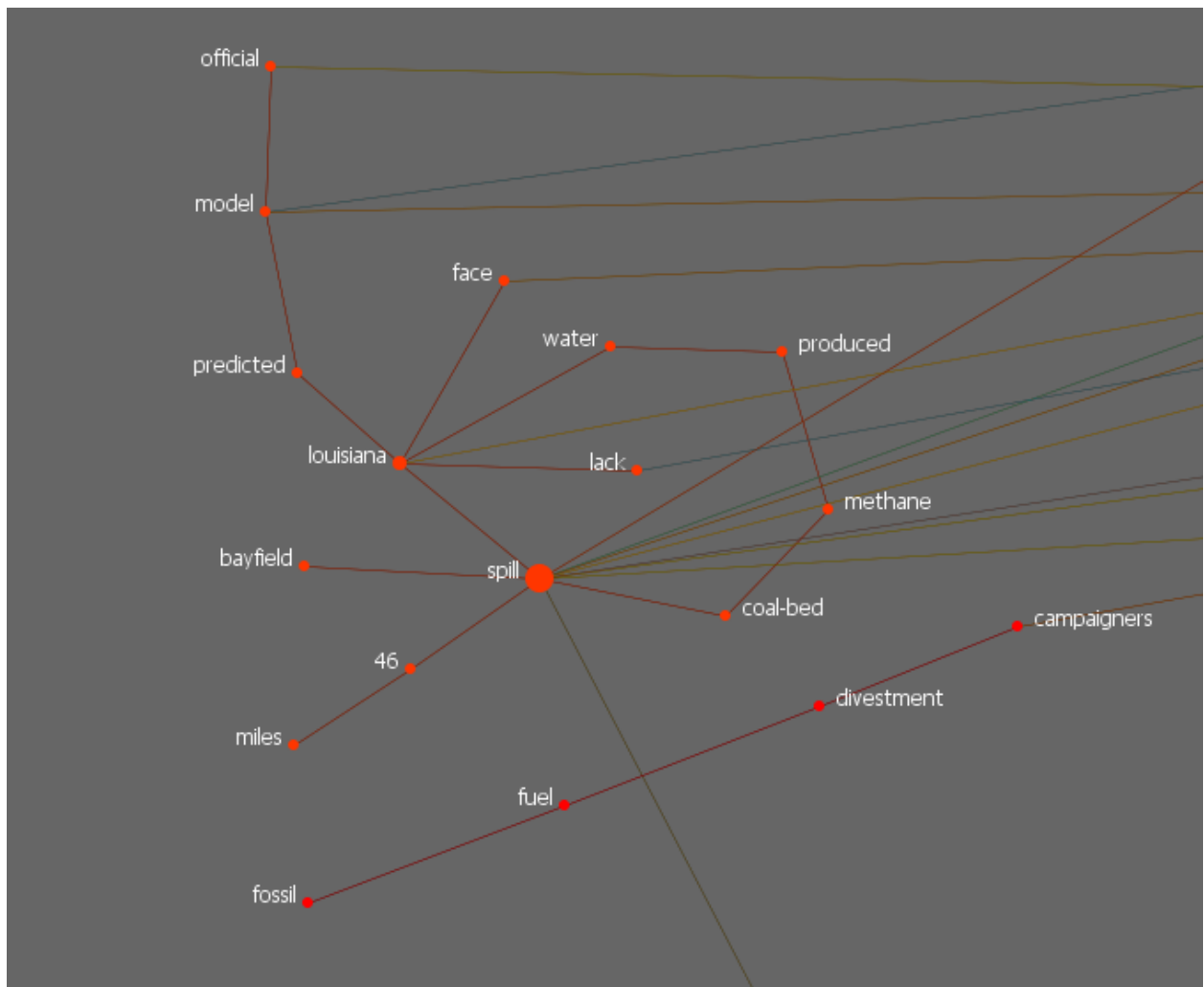
Figure B7

Network Group 7: Facebook of Boycott BP
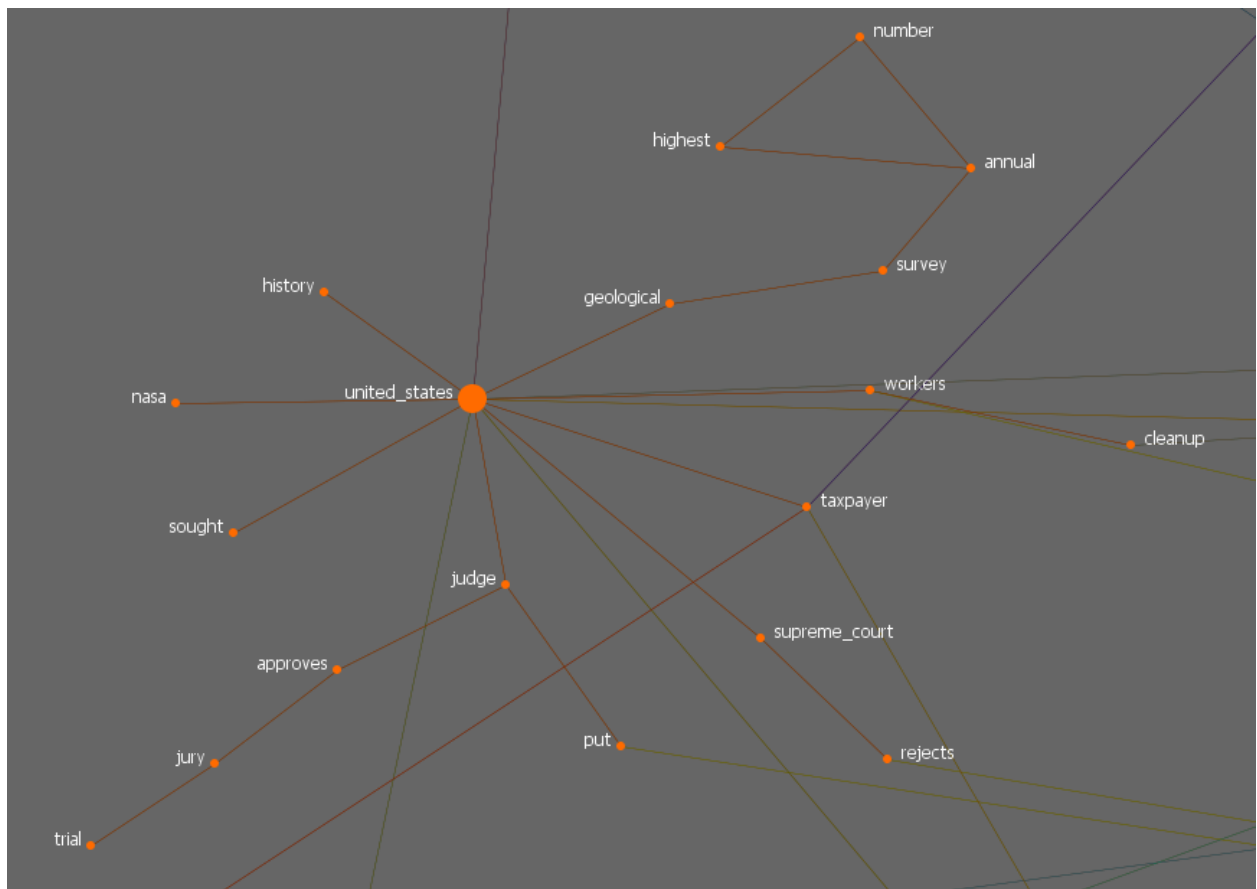
Figure B8

Network Group 8: Facebook of Boycott BP
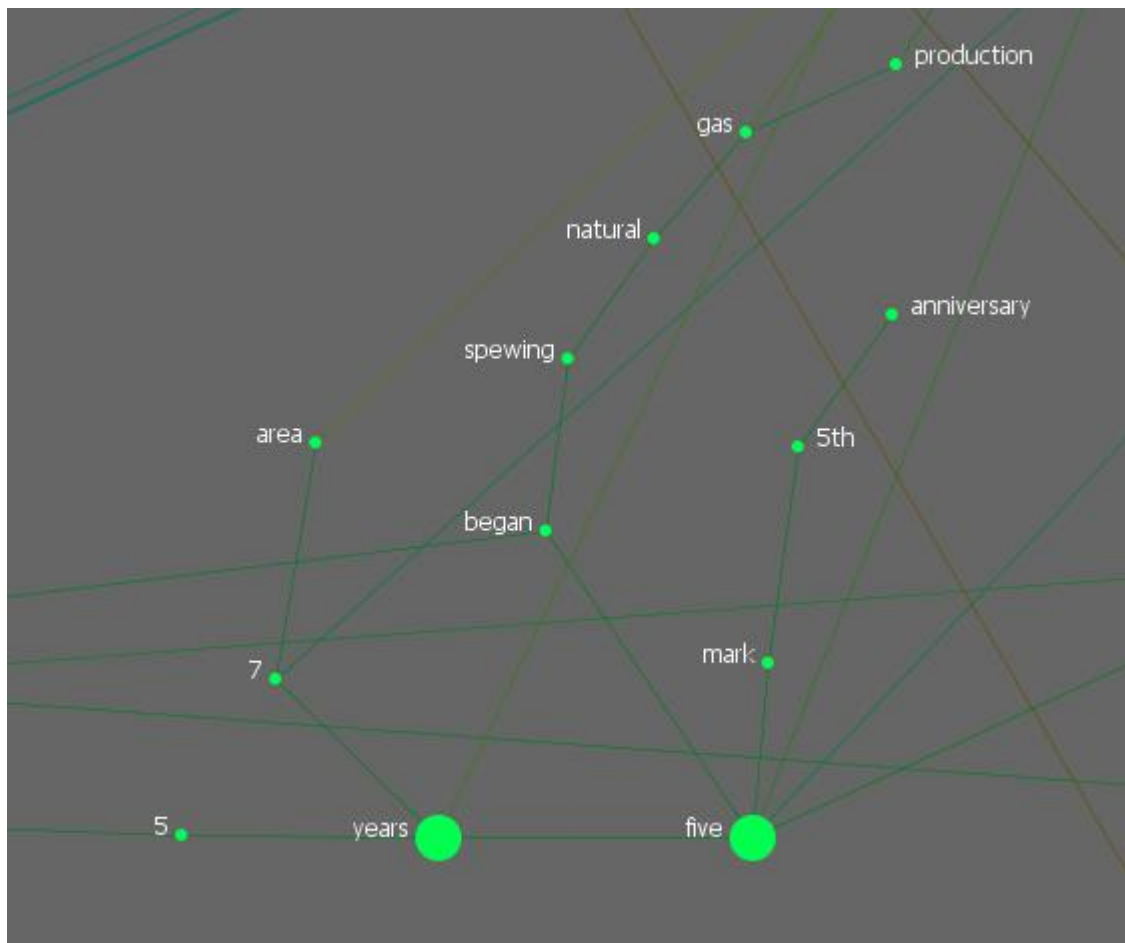
Figure B9

Network Group 9: Facebook of Boycott BP

Figure B10

Network Group 10: Facebook of Boycott BP
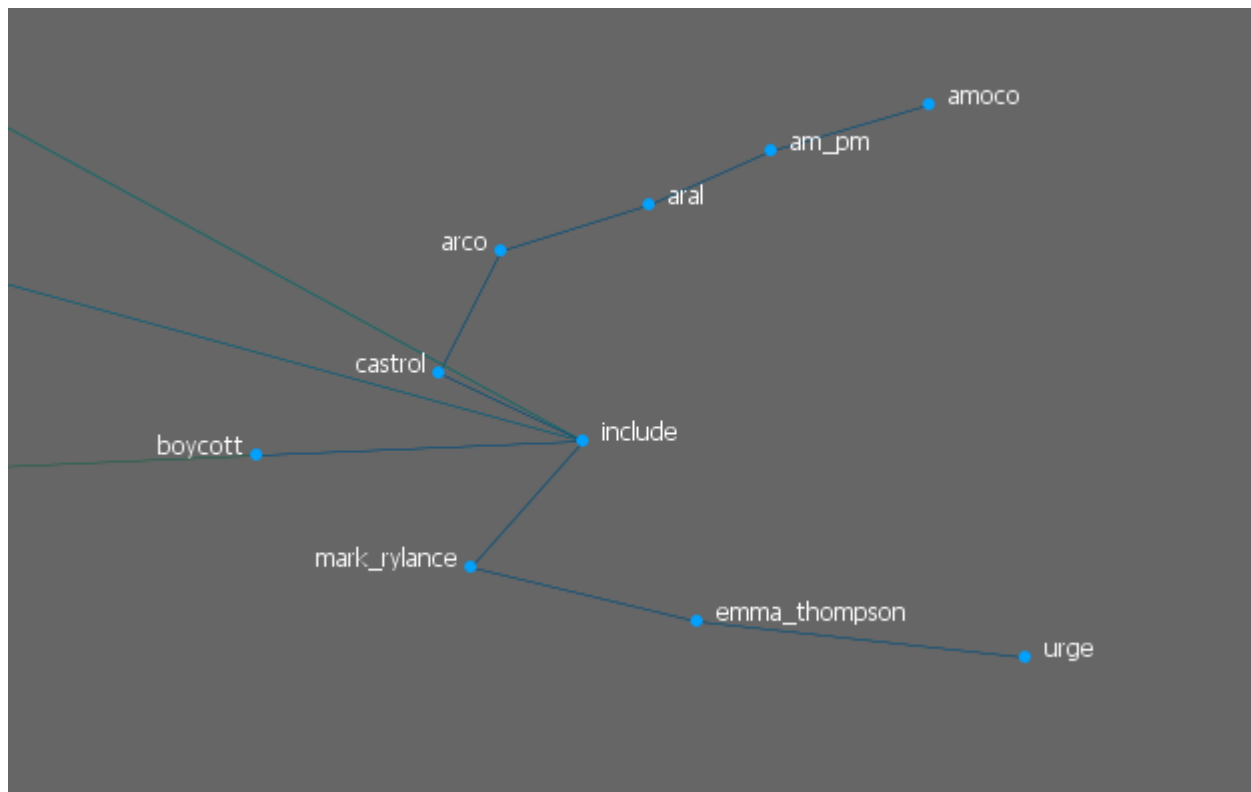
Figure B11

Network Group 11: Facebook of Boycott BP
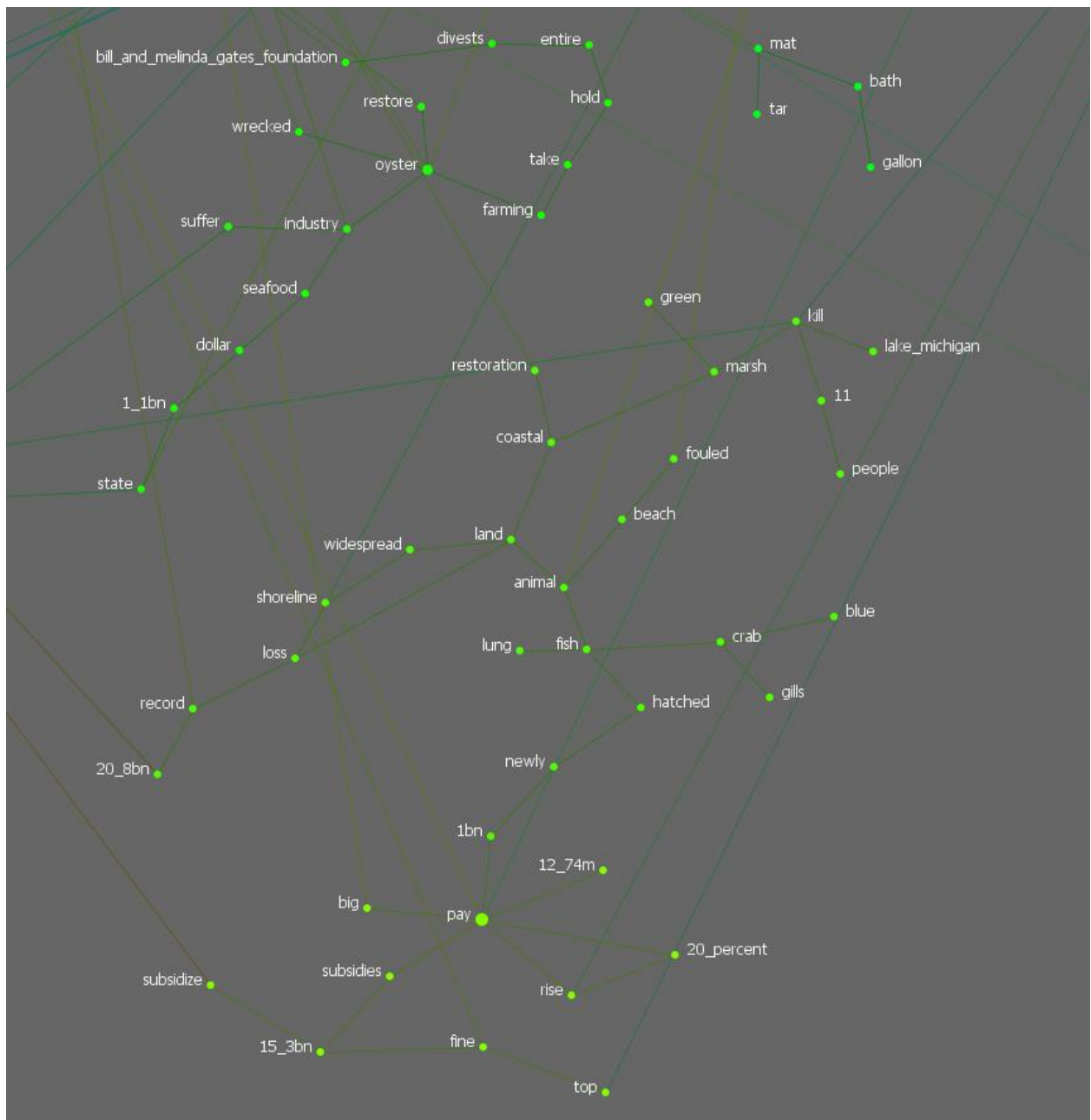
Figure B12

Network Group 12: Facebook of Boycott BP
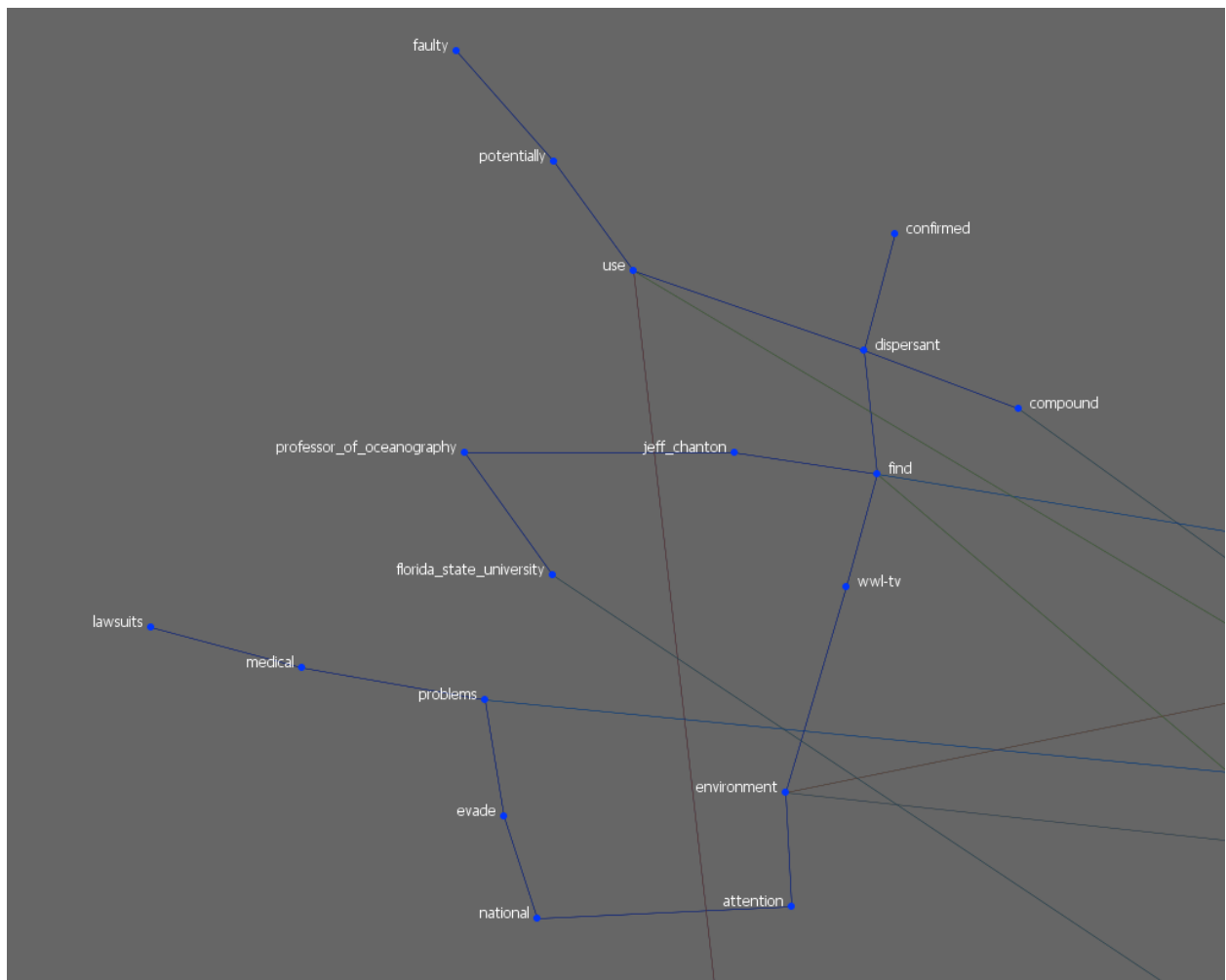
Figure B13

Network Group 13: Facebook of Boycott BP
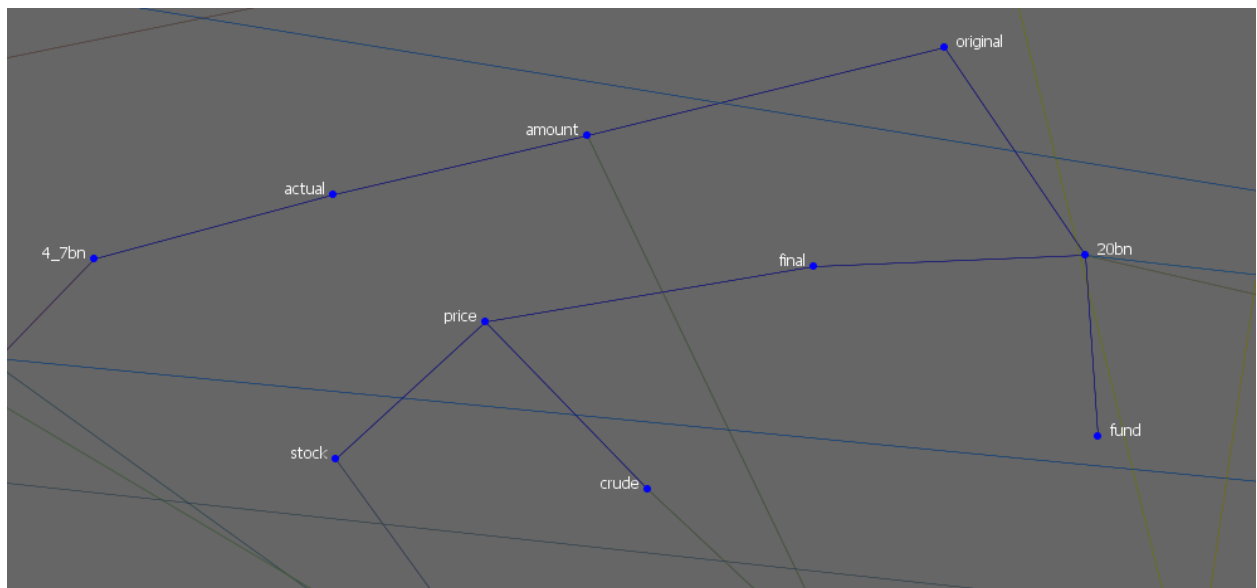
Figure B14

Network Group 14: Facebook of Boycott BP
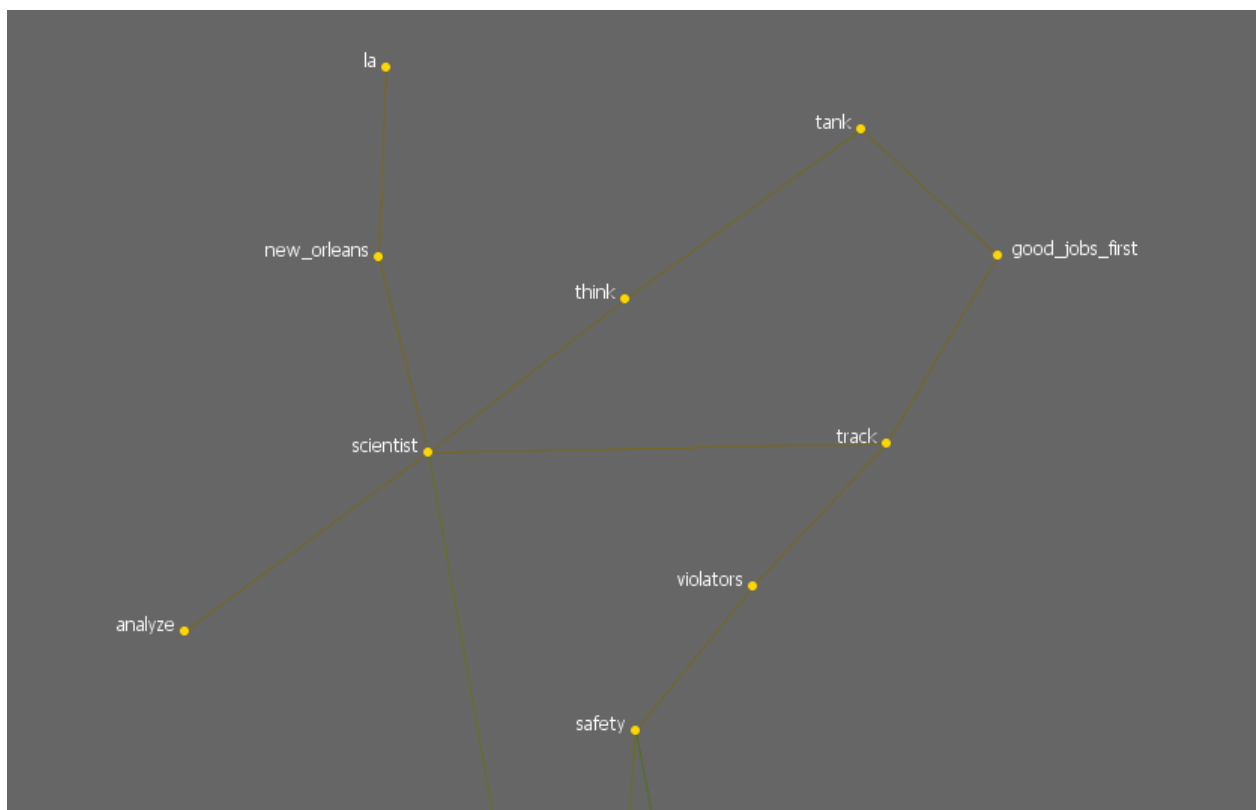
Figure B15

Network Group 15: Facebook of Boycott BP
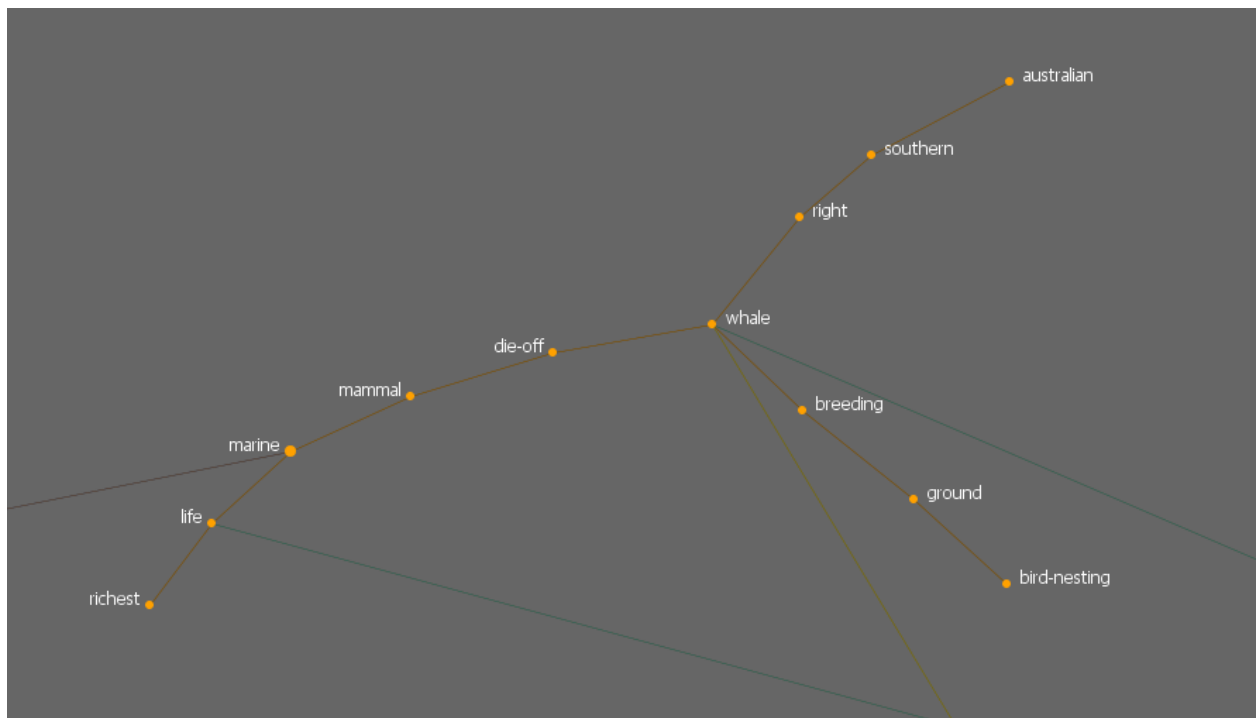
Figure B16

Network Group 16: Facebook of Boycott BP
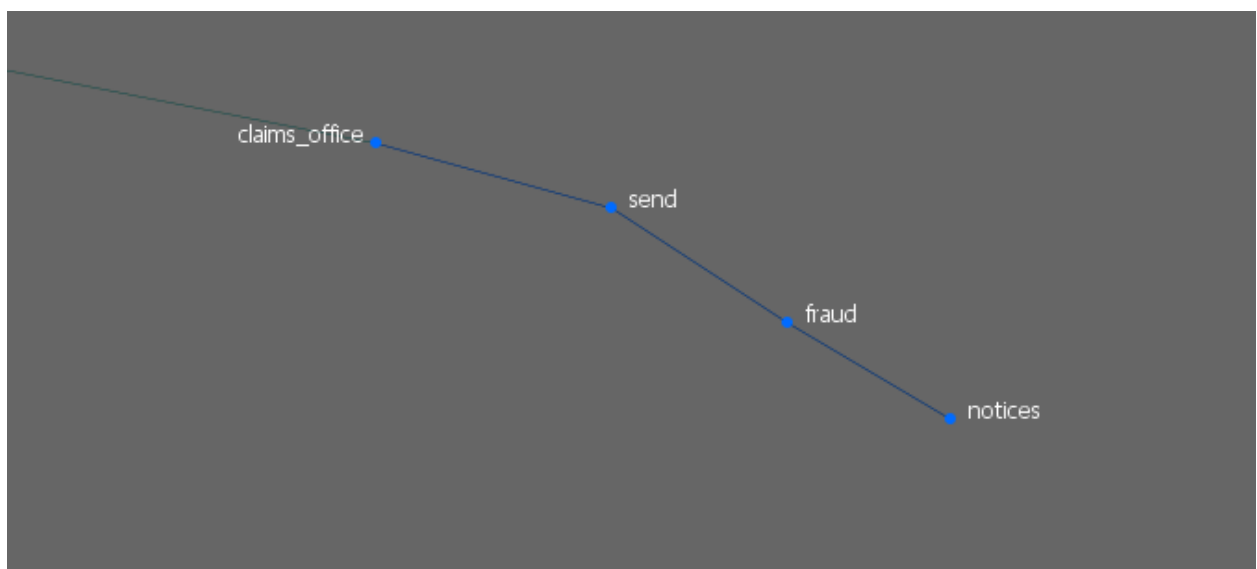
Table B1

Node Frequency: Facebook of Boycott BP

Rank	Node	Frequency
1	bp	140
2	2010_deepwater_horizon_oil_spill	75
3	oil	60
4	years	35
5	gulf	31
6	deepwater_horizon	24
7	gulf_of_mexico	24
8	more	24
9	pay	23
10	dolphin	21
11	spill	21
12	louisiana	20
13	damage	16
14	united_states	16
15	oil_spill	15
16	coast	14
17	disaster	14
18	find	14
19	five	14
20	2010	13
21	well	13
22	business	12
23	drill	12
24	great_australian_bight	12
25	settlement	12
26	cause	11
27	impact	11
28	report	11
29	scientist	10
30	use	10
31	animal	9
32	gallon	9
33	gas	9
34	lake_michigan	9
35	oyster	9

Table B1 (cont'd)

Node Frequency: Facebook of Boycott BP

Rank	Node	Frequency
36	state	9
37	birds	8
38	boycott	8
39	deaths	8
40	dump	8
41	life	8
42	marine	8
43	marsh	8
44	oil_disaster	8
45	boycott_bp	7
46	clean	7
47	dispersant	7
48	evidence	7
49	new_orleans	7
50	massive	7

Table B2

Total-degree Centrality: Facebook of Boycott BP

Rank	Node	Value	Unscaled
1	bp	0.020	148
2	2010_deepwater_horizon_oil_spill	0.010	74
3	oil	0.009	64
4	gulf	0.006	48
5	more	0.005	38
6	deepwater_horizon	0.005	36
7	five	0.005	36
8	years	0.005	36
9	dolphin	0.005	34
10	oil_spill	0.005	34
11	united_states	0.004	32
12	damage	0.004	28
13	spill	0.003	26
14	oil_disaster	0.003	24
15	settlement	0.003	24
16	disaster	0.003	22
17	well	0.003	22
18	cause	0.003	20
19	coast	0.003	20
20	giant	0.002	18
21	gulf_of_mexico	0.002	18
22	pay	0.002	18
23	boycott_bp	0.002	16
24	environmental	0.002	16
25	facebook	0.002	16
26	louisiana	0.002	14
27	marine	0.002	14
28	oyster	0.002	14
29	blowout	0.002	12
30	ceo	0.002	12
31	deaths	0.002	12
32	drill	0.002	12
33	dump	0.002	12
34	find	0.002	12
35	impact	0.002	12

Table B2 (cont'd)

Total-degree Centrality: Facebook of Boycott BP

Rank	Node	Value	Unscaled
36	life	0.002	12
37	massive	0.002	12
38	scientist	0.002	12
39	times	0.002	12
40	20bn	0.001	10
41	5	0.001	10
42	animal	0.001	10
43	discharged	0.001	10
44	floor	0.001	10
45	include	0.001	10
46	industry	0.001	10
47	kill	0.001	10
48	land	0.001	10
49	page	0.001	10
50	pipeline	0.001	10
51	reveal	0.001	10
52	rig	0.001	10
53	taxpayer	0.001	10
54	whale	0.001	10
55	2010	0.001	8
56	4-20-10	0.001	8
57	birds	0.001	8
58	bp_whiting_refinery	0.001	8
59	coal-bed	0.001	8
60	collected	0.001	8
61	compensation	0.001	8
62	continue	0.001	8
63	devastating	0.001	8
64	dispersant	0.001	8
65	environment	0.001	8
66	error	0.001	8
67	executive	0.001	8
68	fish	0.001	8
69	great_australian_bight	0.001	8
70	industrial	0.001	8

Table B3

Betweenness Centrality: Facebook of Boycott BP

Rank	Node	Value	Unscaled
1	bp	0.512	24,499.391
2	spill	0.130	6,213.055
3	2010_deepwater_horizon_oil_spill	0.120	5,755.076
4	oil	0.119	5,699.320
5	report	0.118	5,647.278
6	dolphin	0.116	5,578.720
7	more	0.100	4,804.914
8	oil_disaster	0.089	4,248.243
9	united_states	0.088	4,198.927
10	oil_spill	0.085	4,092.885
11	gulf_of_mexico	0.077	3,710.554
12	gulf	0.070	3,345.797
13	pay	0.066	3,181.780
14	include	0.061	2,923.239
15	whale	0.053	2,544.005
16	rig	0.049	2,323.165
17	scientist	0.046	2,220.727
18	damage	0.044	2,123.719
19	settlement	0.044	2,088.038
20	4-20-10	0.044	2,086.761
21	drill	0.039	1,887.098
22	deepwater_horizon	0.037	1,765.175
23	continue	0.036	1,737.171
24	environmental	0.035	1,692.071
25	kill	0.035	1,678.627
26	1bn	0.033	1,557.002
27	boycott_bp	0.032	1,530
28	find	0.031	1,506.508
29	reveal	0.031	1,478.318
30	great_australian_bight	0.030	1,441.826
31	release	0.029	1,412.461
32	five	0.028	1,362.307
33	environment	0.027	1,295.152
34	fish	0.027	1,289.467
35	use	0.027	1,276.568

Table B3 (cont'd)

Betweenness Centrality: Facebook of Boycott BP

Rank	Node	Value	Unscaled
36	newly	0.027	1,274.502
37	castrol	0.026	1,224
38	geological	0.026	1,224
39	oyster	0.025	1,207.632
40	cause	0.024	1,137.143
41	2010	0.023	1,081.167
42	hatched	0.021	1,024.352
43	estimate	0.021	1,007.173
44	well	0.021	995.045
45	business	0.021	993.736
46	years	0.021	986.736
47	boycott	0.020	973.500
48	judge	0.020	943.033
49	mat	0.019	923
50	health	0.019	922.001
51	arco	0.019	921
52	campaigners	0.019	921
53	claims_office	0.019	921
54	jason_anderson	0.019	921
55	survey	0.019	921
56	dump	0.019	920.500
57	impact	0.019	888.071
58	louisiana	0.017	835.834
59	blowout	0.017	809.059
60	bill_and_melinda_gates_foundation	0.016	786.359
61	20bn	0.016	776.164
62	devastating	0.016	773.899
63	shoreline	0.016	744.914
64	7	0.015	732.745
65	missing	0.015	715.196
66	industry	0.015	713.841
67	deaths	0.015	701.262
68	workers	0.015	697.419
69	problems	0.015	696.730
70	misuse	0.015	694.772

Table B4

Closeness Centrality: Facebook of Boycott BP

Rank	Node	Value	Unscaled
1	bp	0.321	5.171e-004
2	spill	0.284	4.587e-004
3	report	0.273	4.405e-004
4	2010	0.267	4.299e-004
5	oil_disaster	0.266	4.296e-004
6	great_australian_bight	0.266	4.292e-004
7	rig	0.265	4.277e-004
8	find	0.262	4.230e-004
9	oil_spill	0.260	4.191e-004
10	2010_deepwater_horizon_oil_spill	0.259	4.184e-004
11	settlement	0.259	4.174e-004
12	gulf_of_mexico	0.257	4.146e-004
13	blowout	0.256	4.136e-004
14	reveal	0.256	4.136e-004
15	catastrophic	0.256	4.129e-004
16	gulf	0.256	4.129e-004
17	damage	0.255	4.115e-004
18	pay	0.255	4.108e-004
19	release	0.255	4.108e-004
20	model	0.254	4.102e-004
21	missing	0.254	4.098e-004
22	oil	0.254	4.092e-004
23	misuse	0.252	4.062e-004
24	restore	0.252	4.062e-004
25	estimate	0.251	4.052e-004
26	boycott	0.251	4.049e-004
27	business	0.249	4.010e-004
28	put	0.248	4.003e-004
29	rejects	0.247	3.984e-004
30	united_states	0.247	3.984e-004
31	fine	0.247	3.981e-004
32	more	0.246	3.971e-004
33	4-20-10	0.246	3.968e-004
34	scientist	0.246	3.968e-004
35	official	0.245	3.959e-004

Table B4 (cont'd)

Closeness Centrality: Facebook of Boycott BP

Rank	Node	Value	Unscaled
36	amount	0.245	3.953e-004
37	face	0.245	3.946e-004
38	stock	0.244	3.943e-004
39	years	0.244	3.943e-004
40	bill_and_melinda_gates_foundation	0.244	3.940e-004
41	campaigners	0.244	3.937e-004
42	claims_office	0.244	3.937e-004
43	criminal	0.244	3.931e-004
44	announce	0.243	3.925e-004
45	gone	0.243	3.925e-004
46	boss	0.243	3.918e-004
47	cherry-pick	0.243	3.918e-004
48	refutes	0.243	3.918e-004
49	vowed	0.243	3.918e-004
50	impact	0.243	3.912e-004
51	well	0.240	3.867e-004
52	oyster	0.238	3.831e-004
53	cost	0.237	3.828e-004
54	include	0.237	3.826e-004
55	cause	0.235	3.797e-004
56	drill	0.231	3.731e-004
57	kill	0.231	3.723e-004
58	devastating	0.229	3.698e-004
59	dolphin	0.228	3.685e-004
60	louisiana	0.228	3.679e-004
61	disaster	0.227	3.666e-004
62	taxpayer	0.226	3.647e-004
63	dispersant	0.226	3.644e-004
64	big	0.224	3.621e-004
65	local	0.224	3.618e-004
66	environmental	0.224	3.610e-004
67	use	0.224	3.608e-004
68	appeal	0.224	3.605e-004
69	deepwater_horizon	0.223	3.595e-004
70	workers	0.223	3.592e-004

Table B5

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Boycott BP

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
1	bp	bp	bp
2	2010_deepwater_horizon_oil_spill	spill	spill
3	oil	2010_deepwater_horizon_oil_spill	report
4	gulf	oil	2010
5	more	report	oil_disaster
6	deepwater_horizon	dolphin	great_australian_bight
7	five	more	rig
8	years	oil_disaster	find
9	dolphin	united_states	oil_spill
10	oil_spill	oil_spill	2010_deepwater_horizon_oil_spill
11	united_states	gulf_of_mexico	settlement
12	damage	gulf	gulf_of_mexico
13	spill	pay	blowout
14	oil_disaster	include	reveal
15	settlement	whale	catastrophic
16	disaster	rig	gulf
17	well	scientist	damage
18	cause	damage	pay
19	coast	settlement	release
20	giant	4-20-10	model
21	gulf_of_mexico	drill	missing

Table B5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Boycott BP

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
22	pay	deepwater_horizon	oil
23	boycott_bp	continue	misuse
24	environmental	environmental	restore
25	facebook	kill	estimate
26	louisiana	1bn	boycott
27	marine	boycott_bp	business
28	oyster	find	put
29	blowout	reveal	rejects
30	ceo	great_australian_bight	united_states
31	deaths	release	fine
32	drill	five	more
33	dump	environment	4-20-10
34	find	fish	scientist
35	impact	use	official
36	life	newly	amount
37	massive	castrol	face
38	scientist	geological	stock
39	times	oyster	years
40	20bn	cause	bill_and_melinda_gates_foundation
41	5	2010	campaigners
42	animal	hatched	claims_office
43	discharged	estimate	criminal
44	floor	well	announce
45	include	business	gone
46	industry	years	boss
47	kill	boycott	cherry-pick
48	land	judge	refutes
49	page	mat	vowed
50	pipeline	health	impact

Table B5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Boycott BP

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
51	reveal	arco	well
52	rig	campaigners	oyster
53	taxpayer	claims_office	cost
54	whale	jason_anderson	include
55	2010	survey	cause
56	4-20-10	dump	drill
57	birds	impact	kill
58	bp_whiting_refinery	louisiana	devastating
59	coal-bed	blowout	dolphin
60	collected	bill_and_melinda_gates_foundation	louisiana
61	compensation	20bn	disaster
62	continue	devastating	taxpayer
63	devastating	shoreline	dispersant
64	dispersant	7	big
65	environment	missing	local
66	error	industry	environmental
67	executive	deaths	use
68	fish	workers	appeal
69	great_australian_bight	problems	deepwater_horizon
70	industrial	misuse	workers
71	jeff_chanton	fouled	lose
72	lasting	put	46
73	mercury	state	bayfield
74	methane	800000	20bn
75	model	began	compensation

Table B5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Boycott BP

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
76	produced	animal	trashed
77	professor_of_oceanography	coast	total
78	record	catastrophic	began
79	release	crab	judge
80	report	35	effect
81	rise	annual	supreme_court
82	staff	approves	leak
83	total	aral	continue
84	toxic	breeding	five
85	use	divestment	worst
86	waste	error	wwl-tv
87	15_3bn	exploration	cleanup
88	20_8bn	mark	lack
89	7	mark_rylance	top
90	adult	right	bottlenose
91	amount	send	money
92	annual	movement	restoration
93	began	mercury	extend
94	bob_dudley	attention	pump
95	bottlenose	fine	wrecked
96	business	amount	5
97	coastal	spreads	state
98	cost	dispersant	ex-bp
99	crab	birds	predicted
100	effect	marsh	industry

Appendix C

Figure C1

Network Group 1: Facebook of BP America

Figure C2

Network Group 2: Facebook of BP America
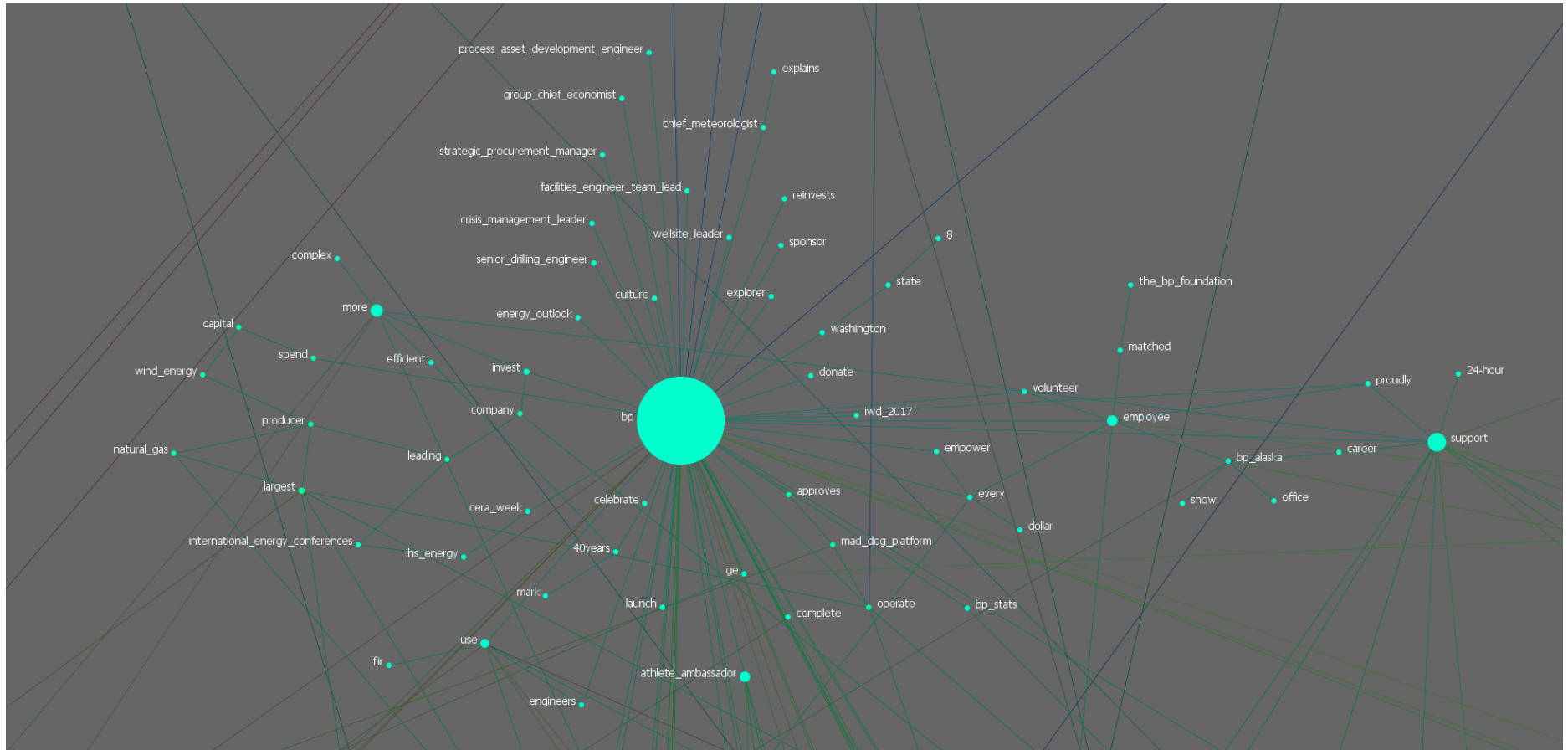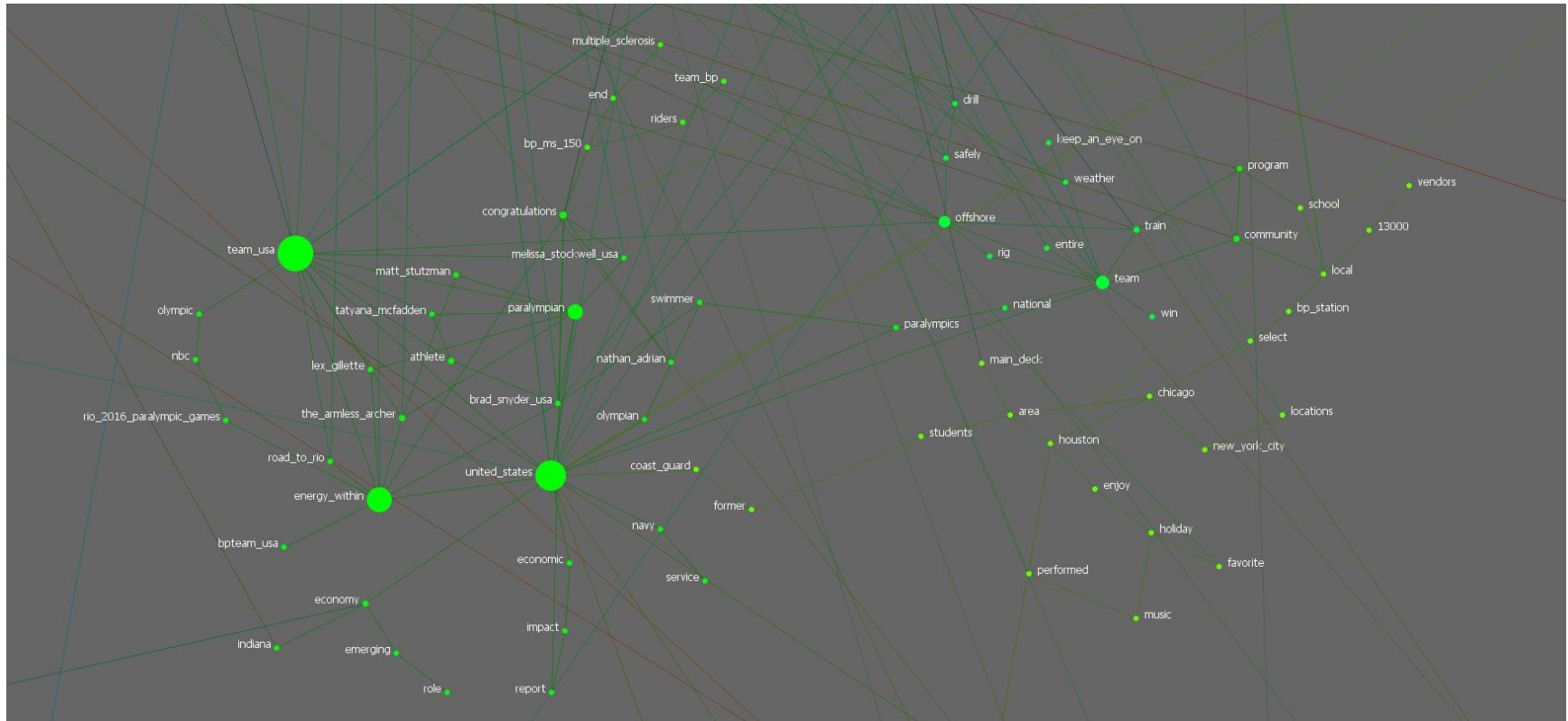
Figure C3

Network Group 3: Facebook of BP America
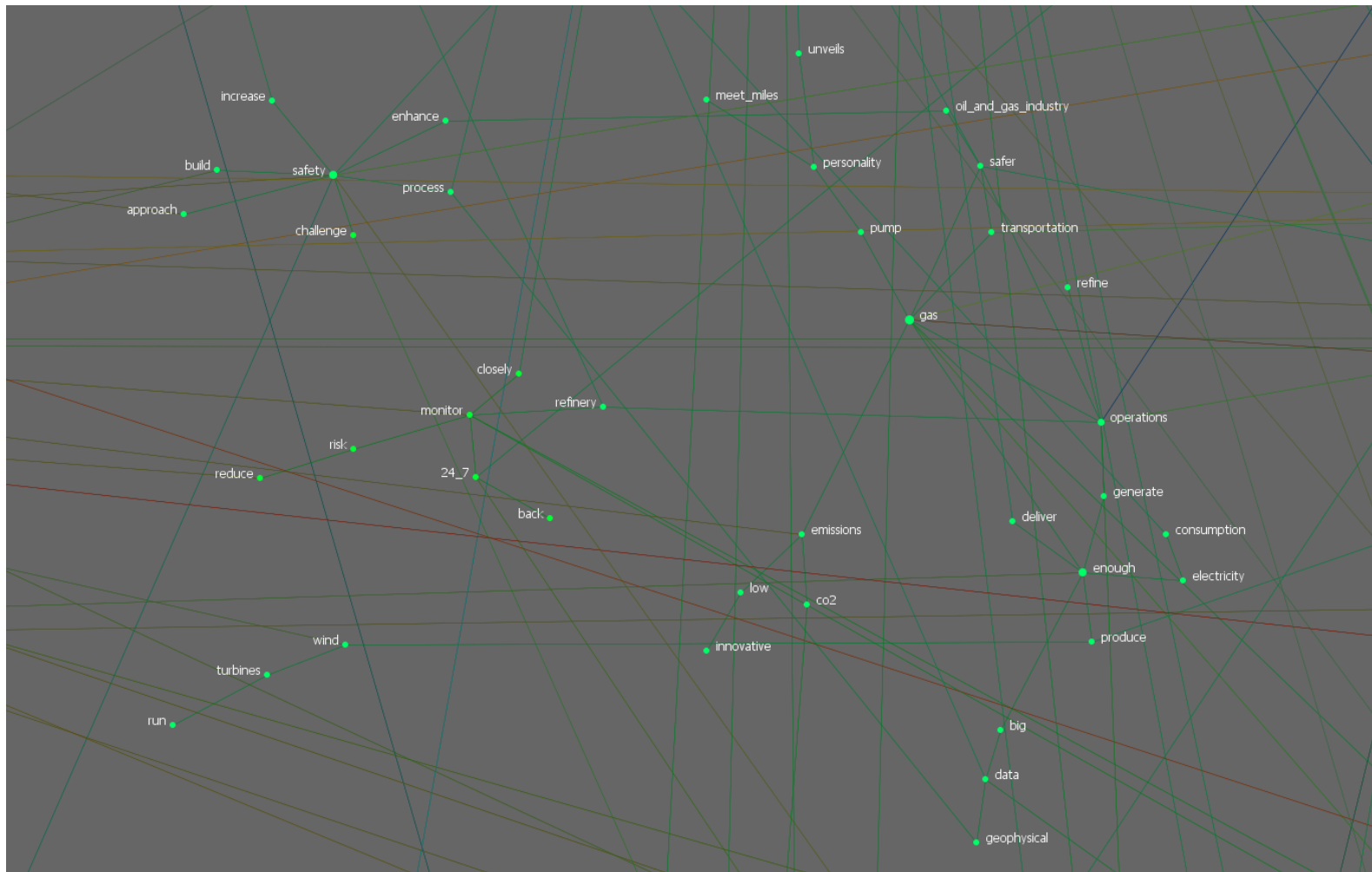
Figure C4

Network Group 4: Facebook of BP America
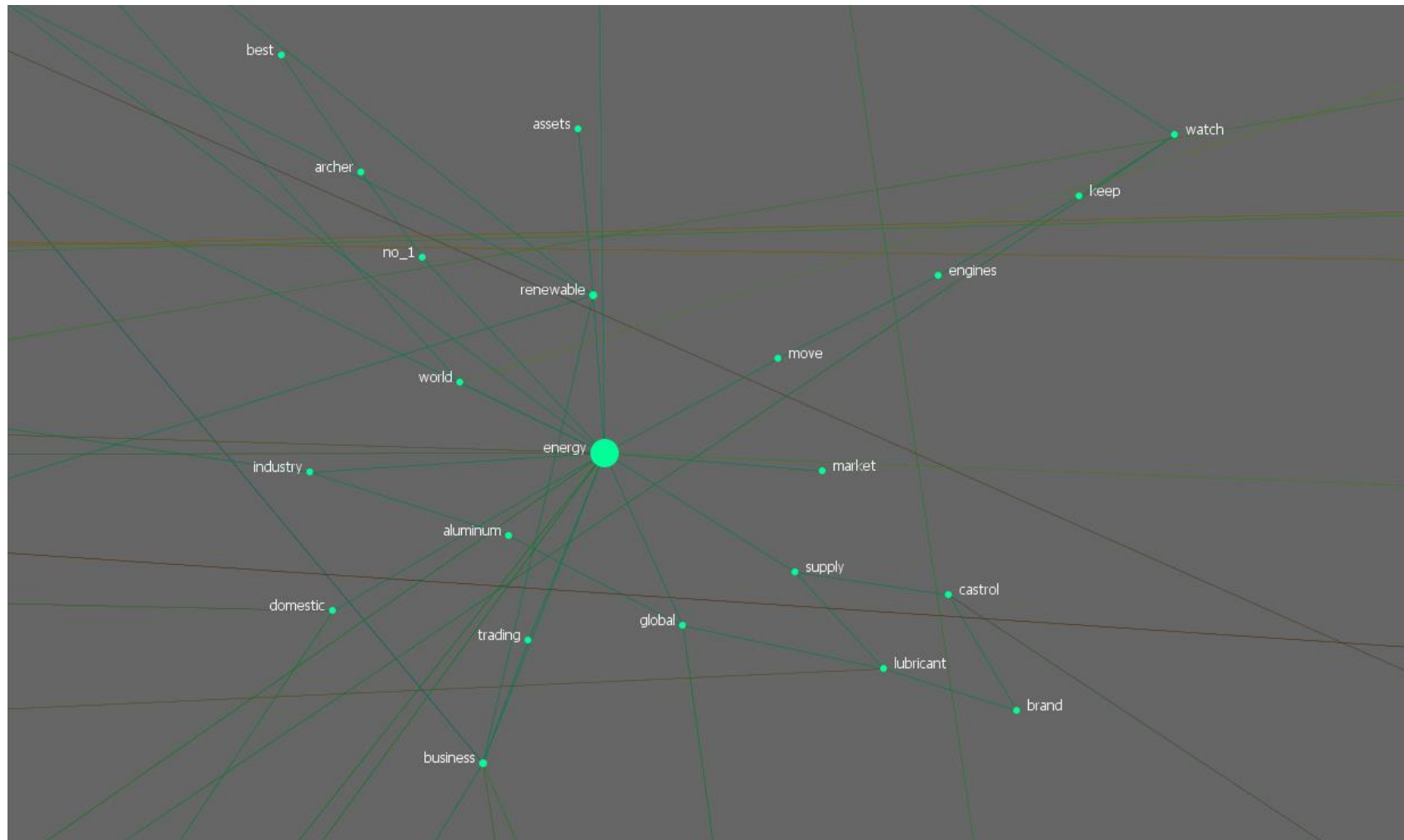
Figure C5

Network Group 5: Facebook of BP America
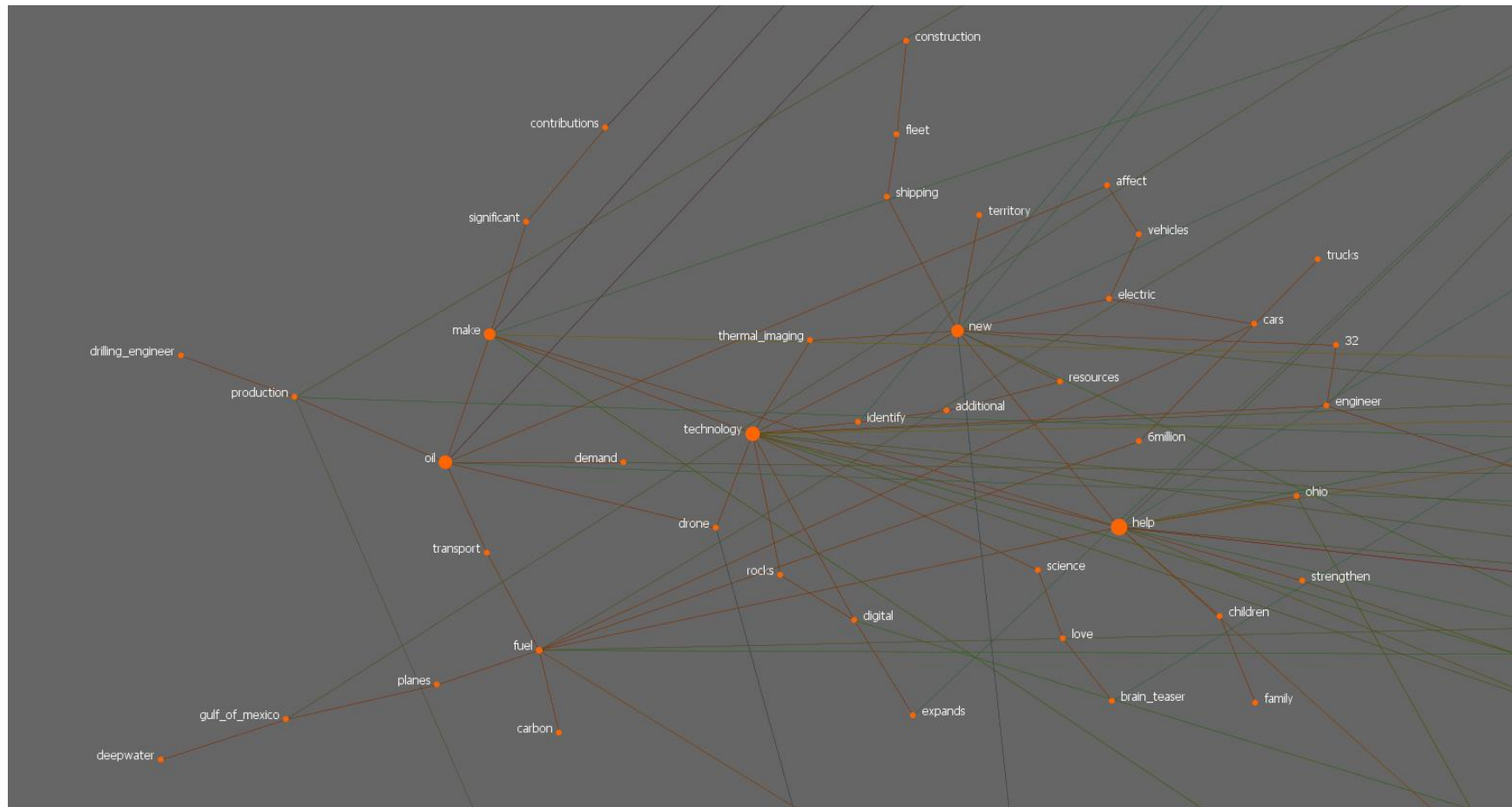
Figure C6

Network Group 6: Facebook of BP America
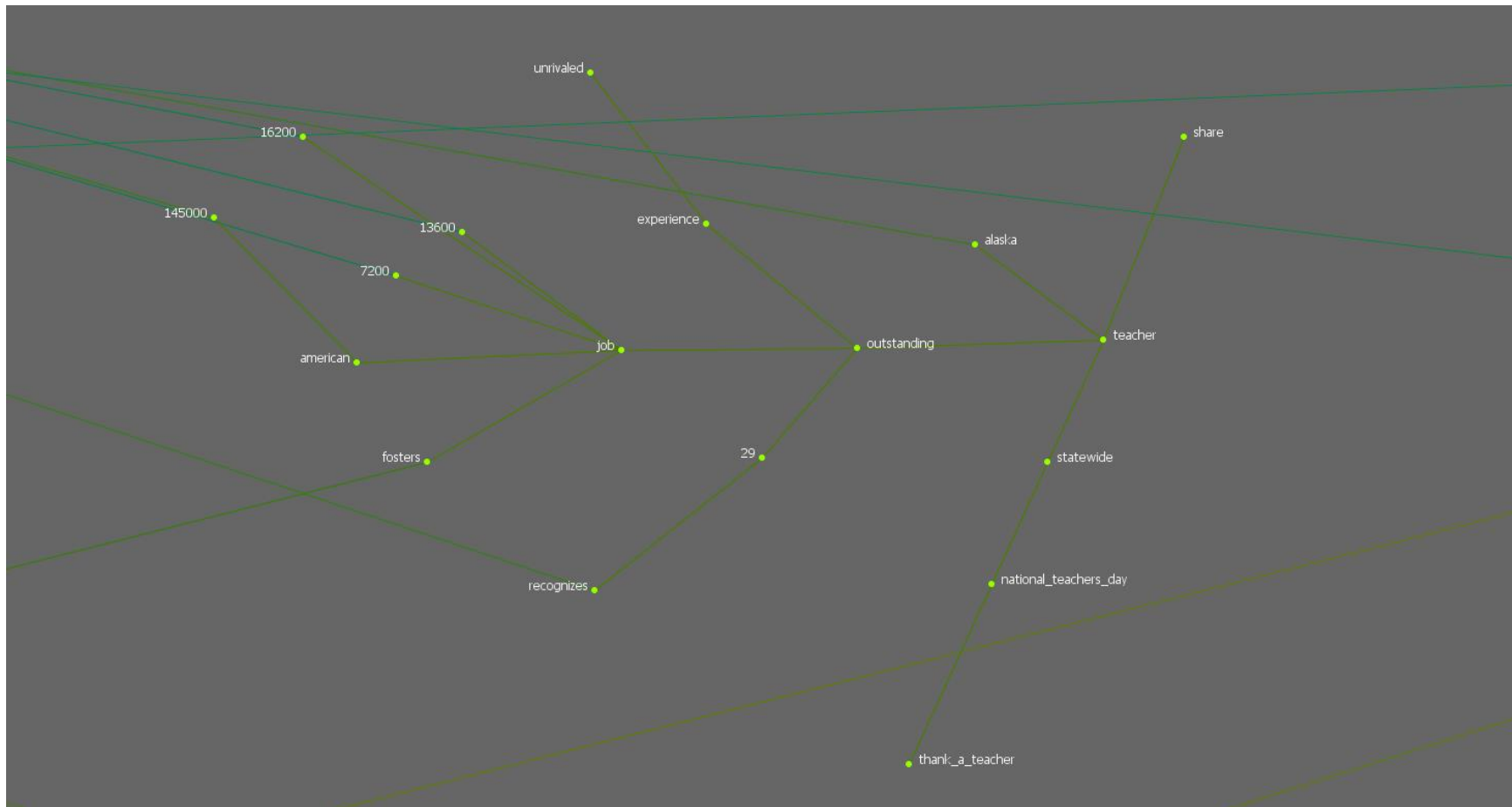
Figure C7

Network Group 7: Facebook of BP America
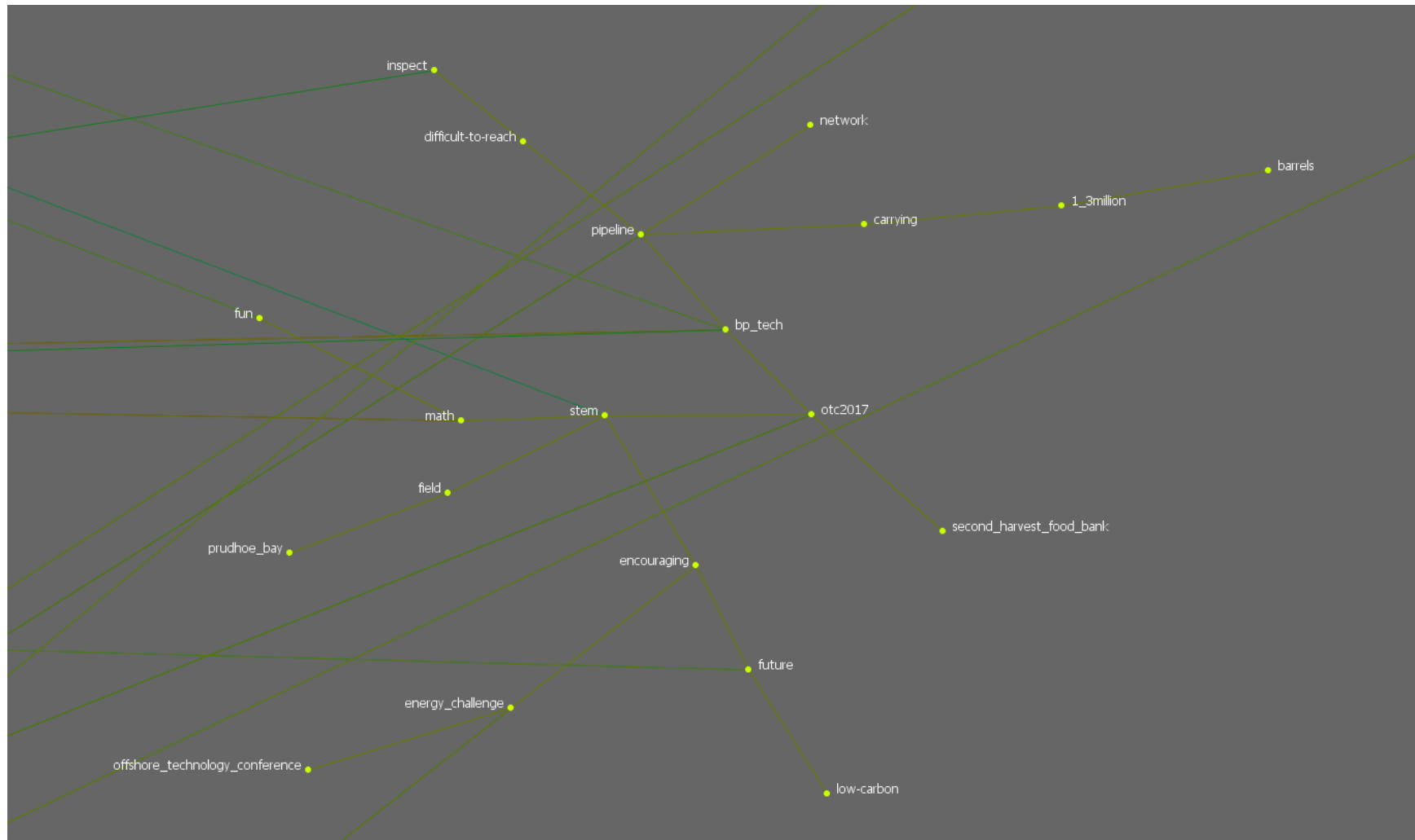
Figure C8

Network Group 8: Facebook of BP America
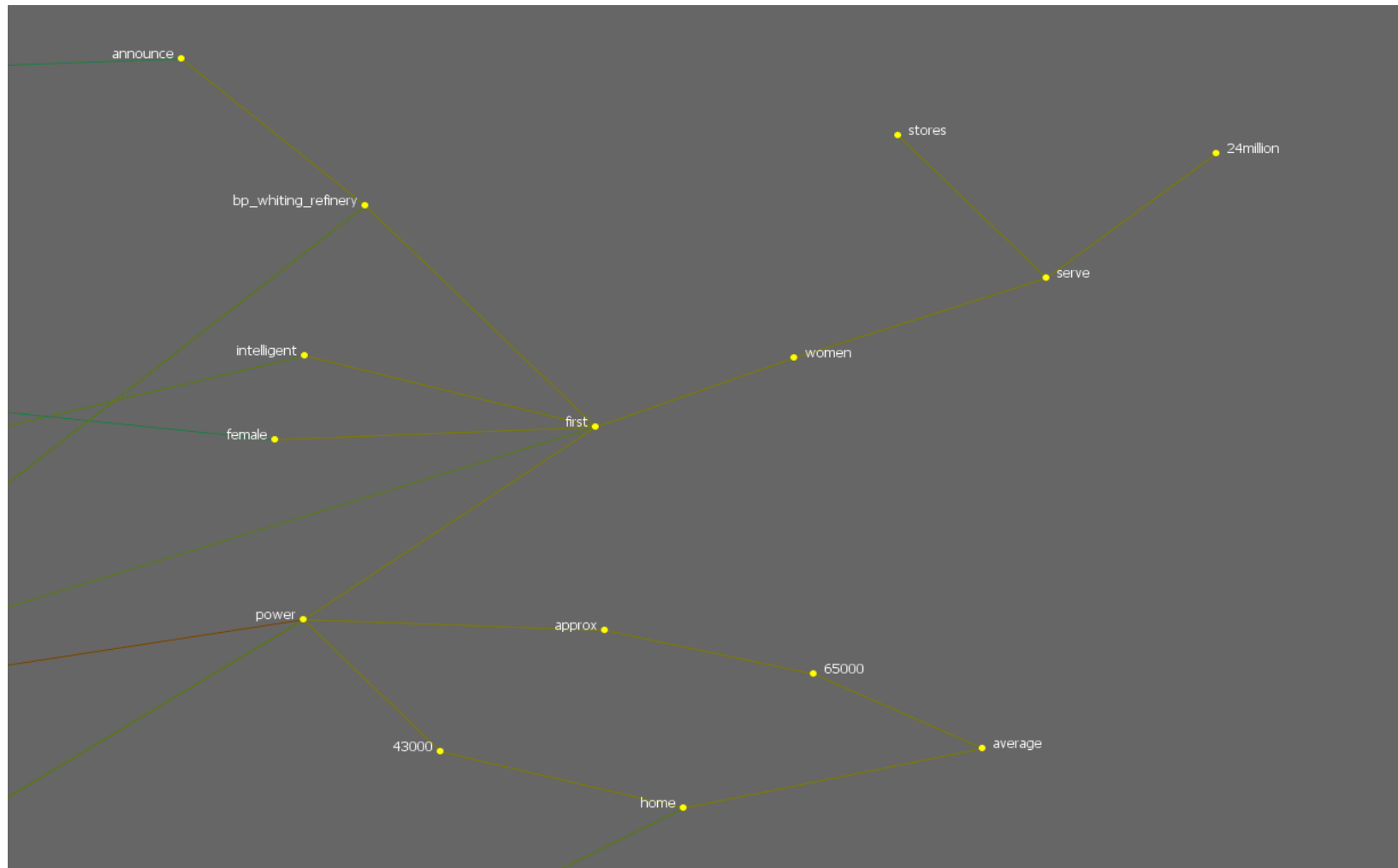
Figure C9

Network Group 9: Facebook of BP America
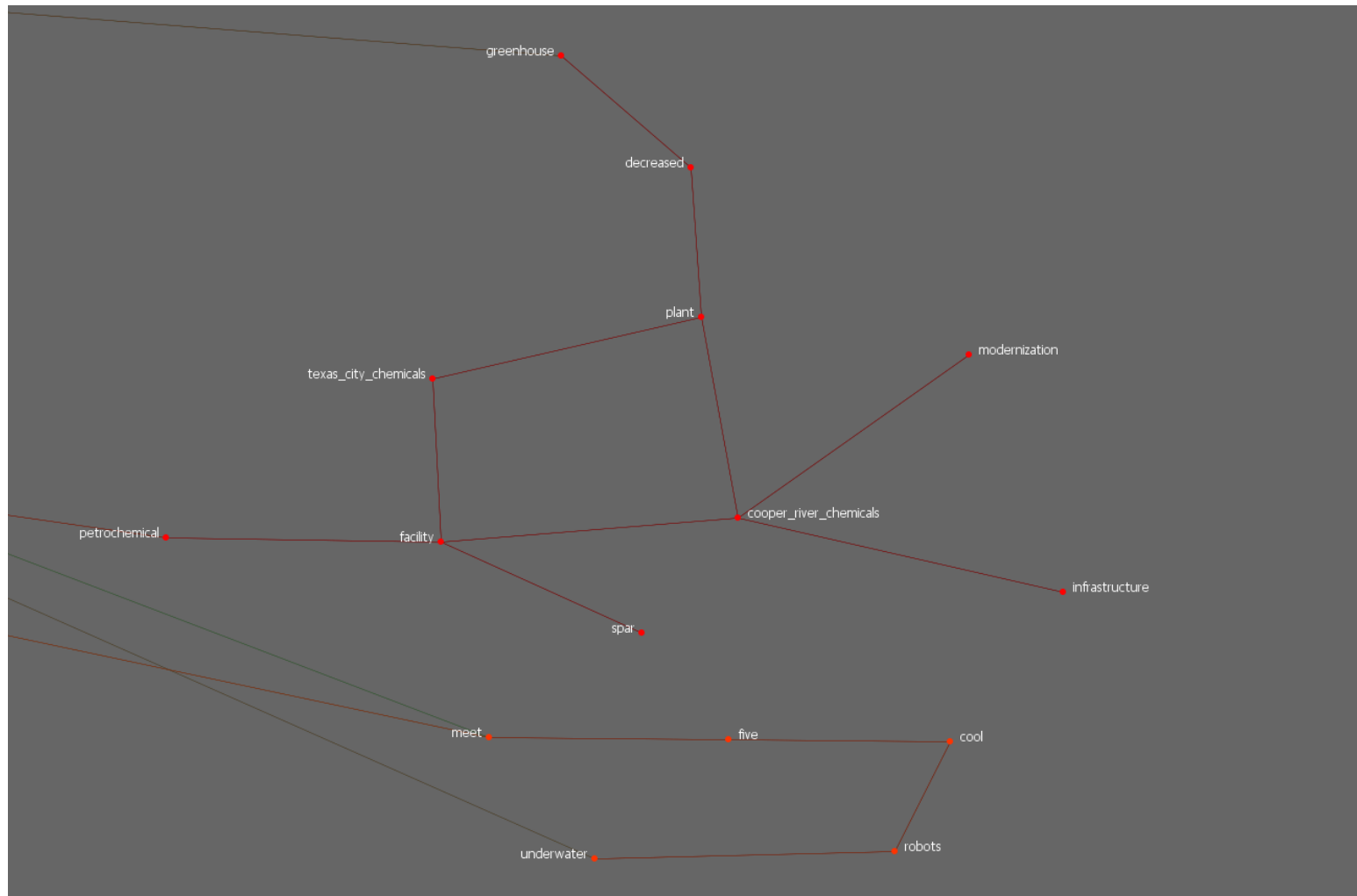
Figure C10

Network Group 10: Facebook of BP America
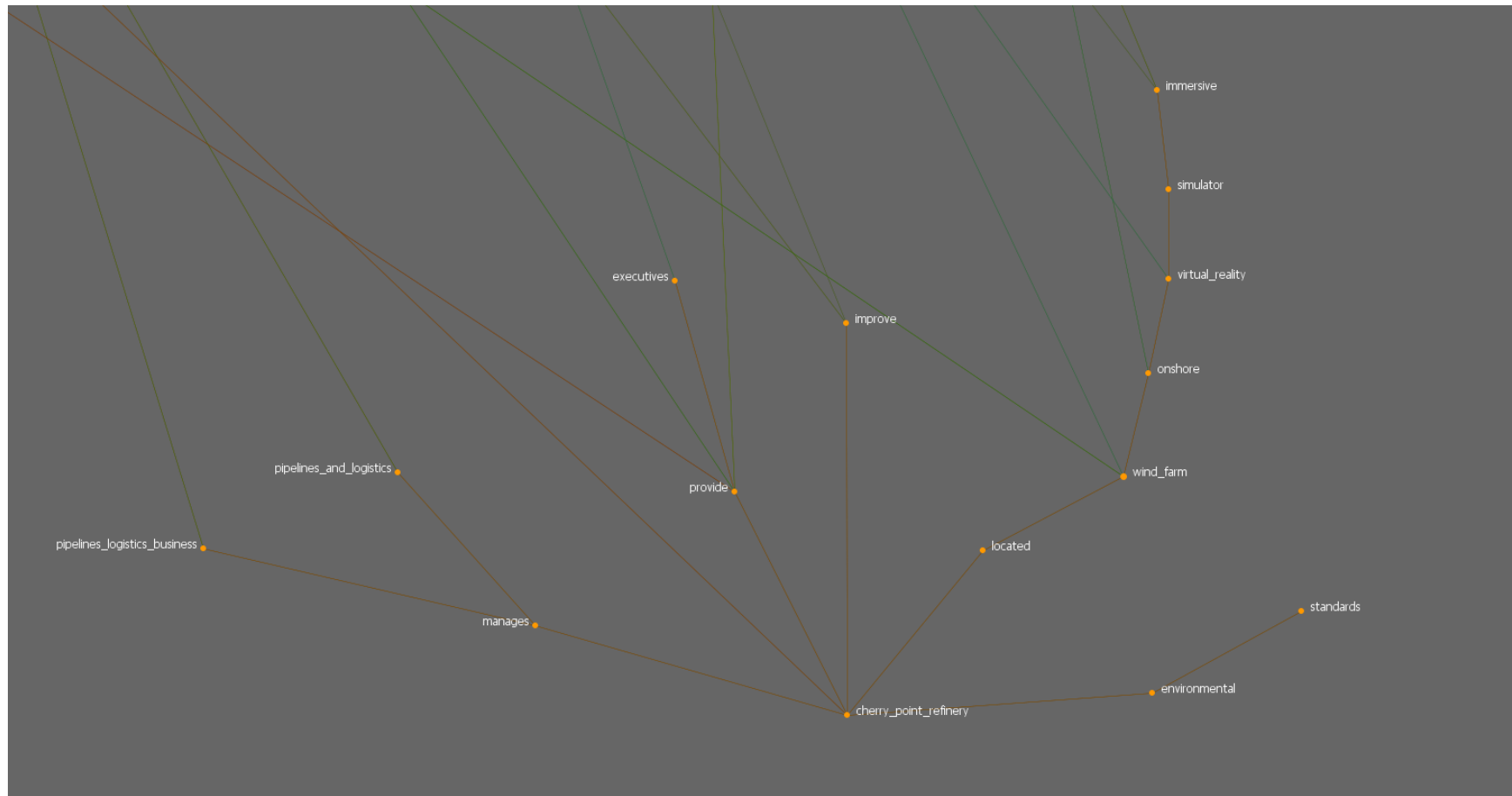
Figure C11

Network Group 11: Facebook of BP America

Figure C12

Network Group 12: Facebook of BP America
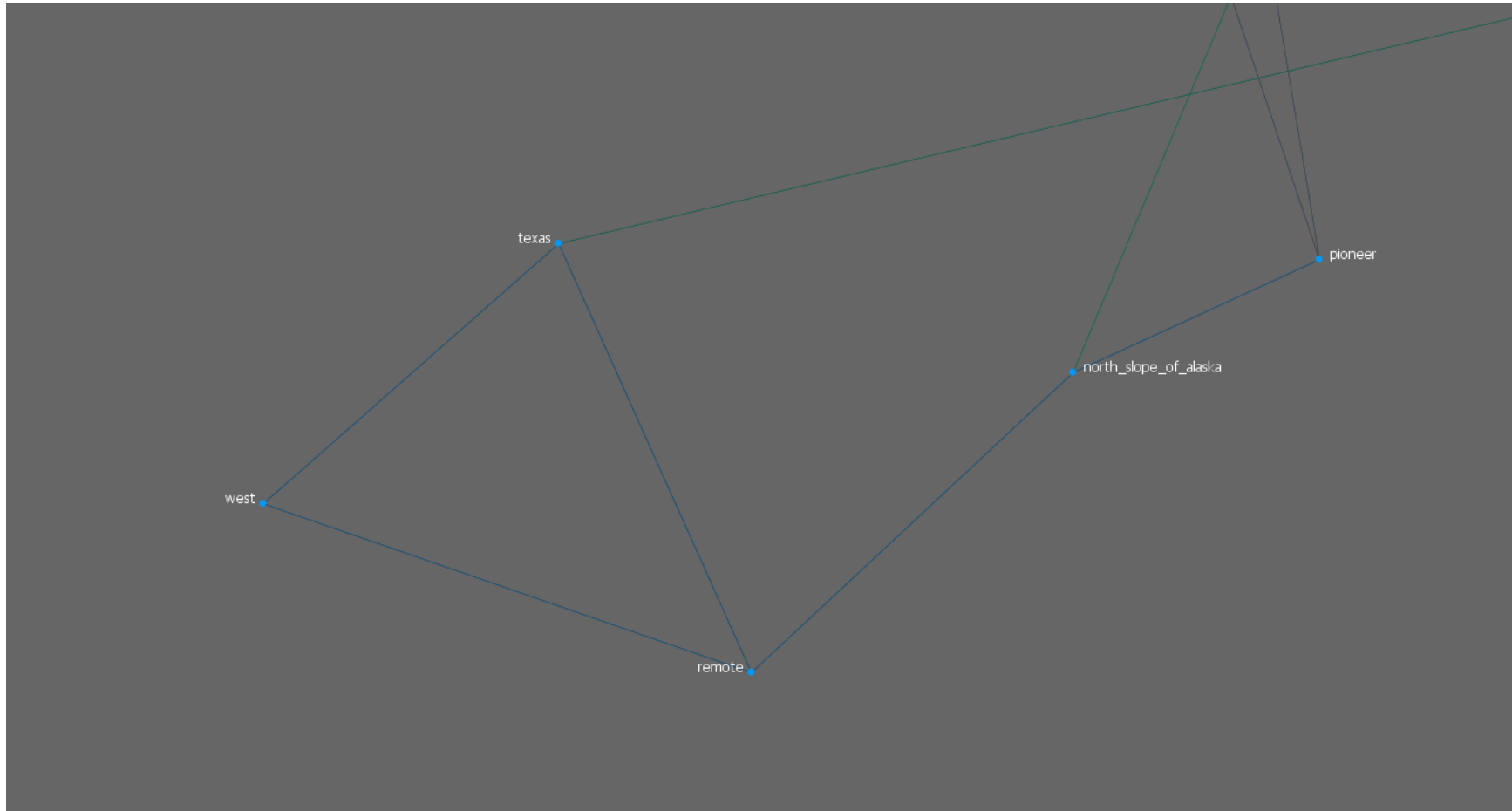
Figure C13

Network Group 13: Facebook of BP America
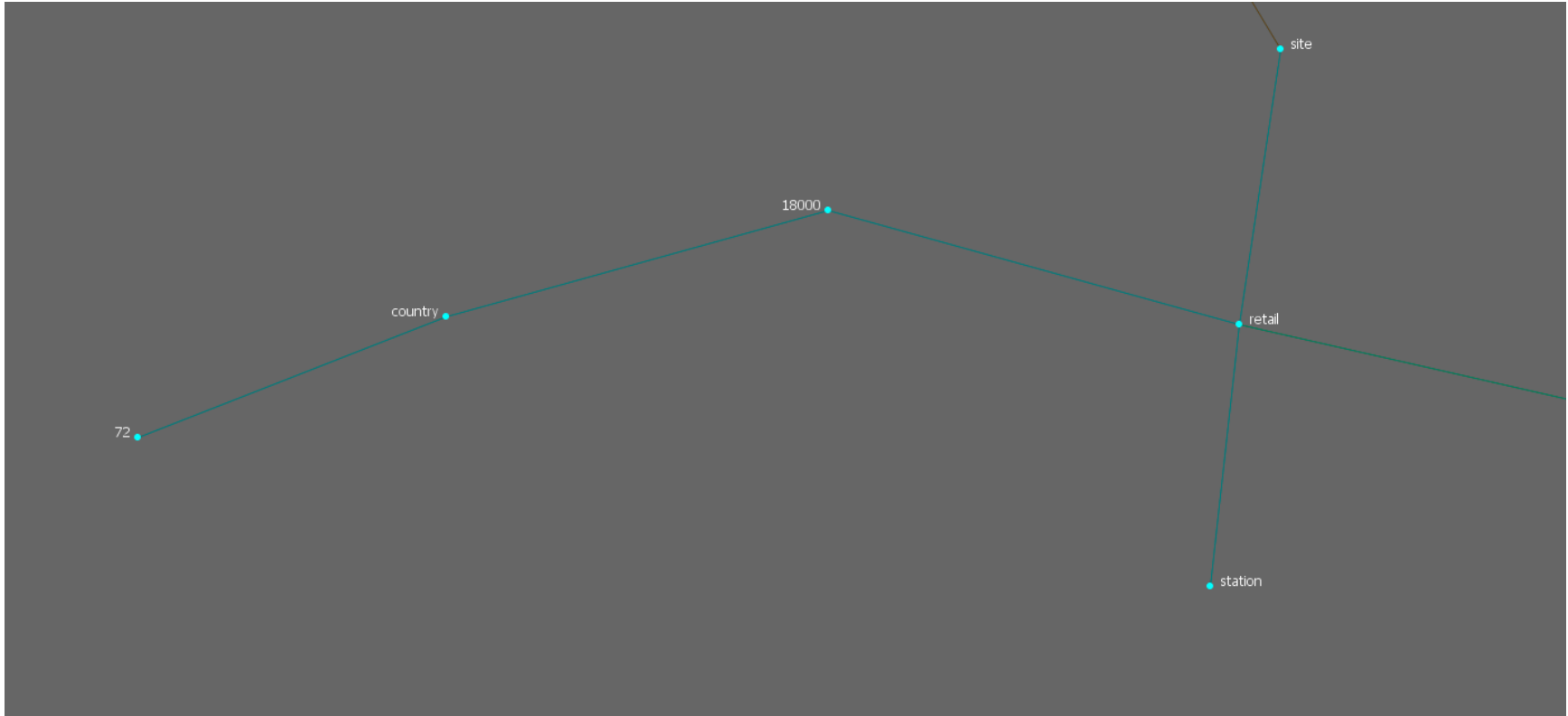
Figure C14

Network Group 14: Facebook of BP America
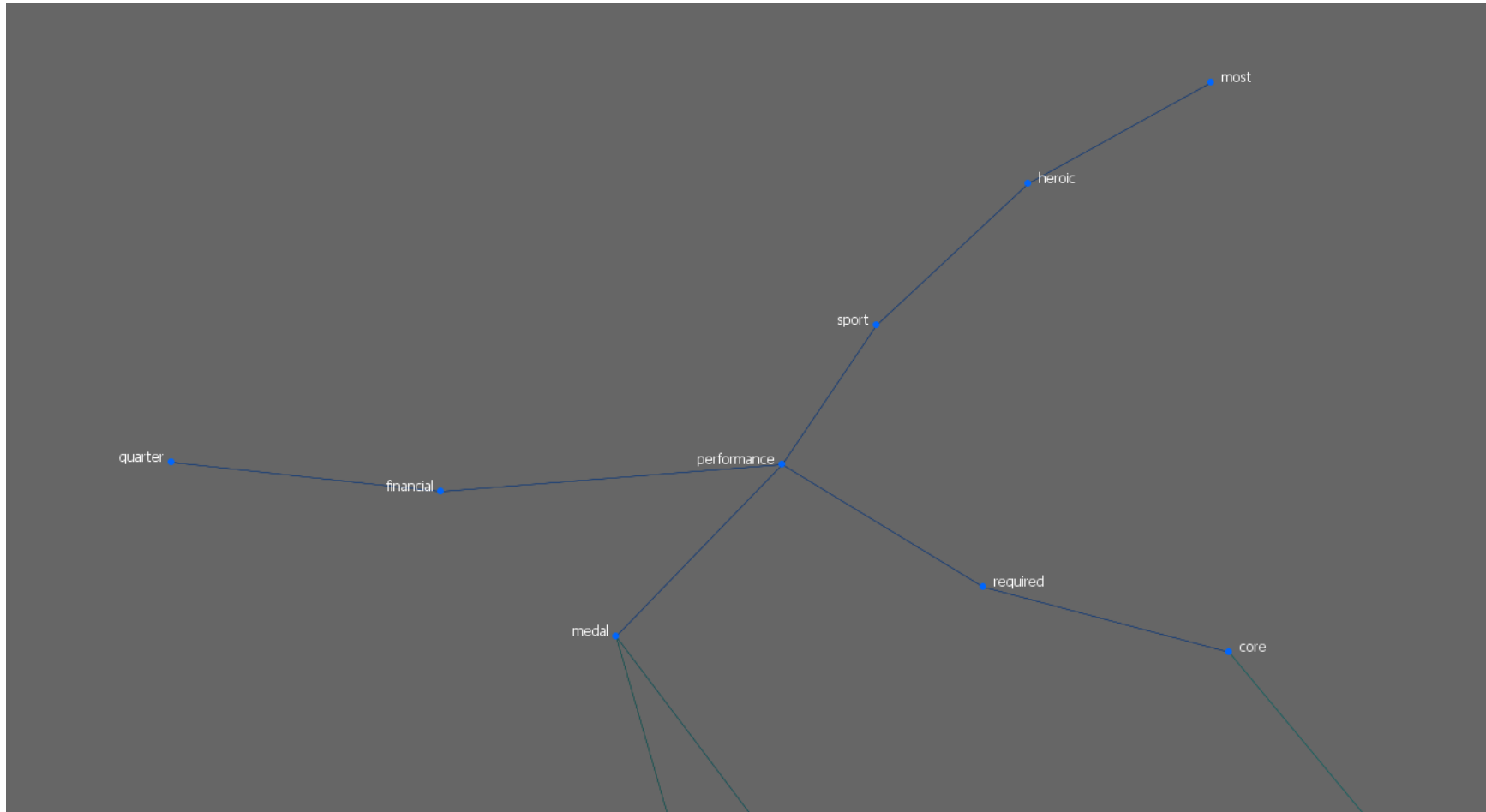
Figure C15

Network Group 15: Facebook of BP America
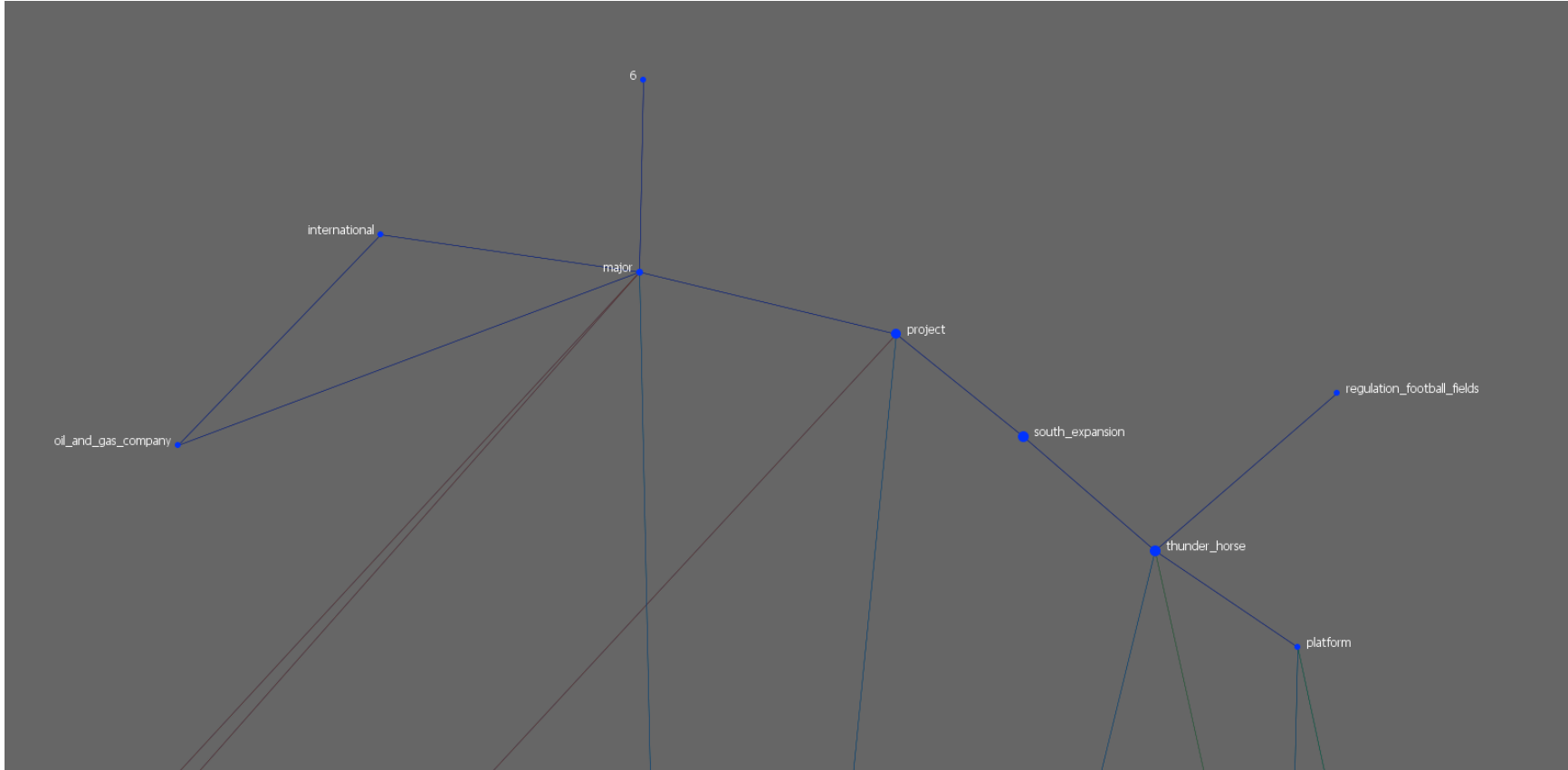
Figure C16

Network Group 16: Facebook of BP America
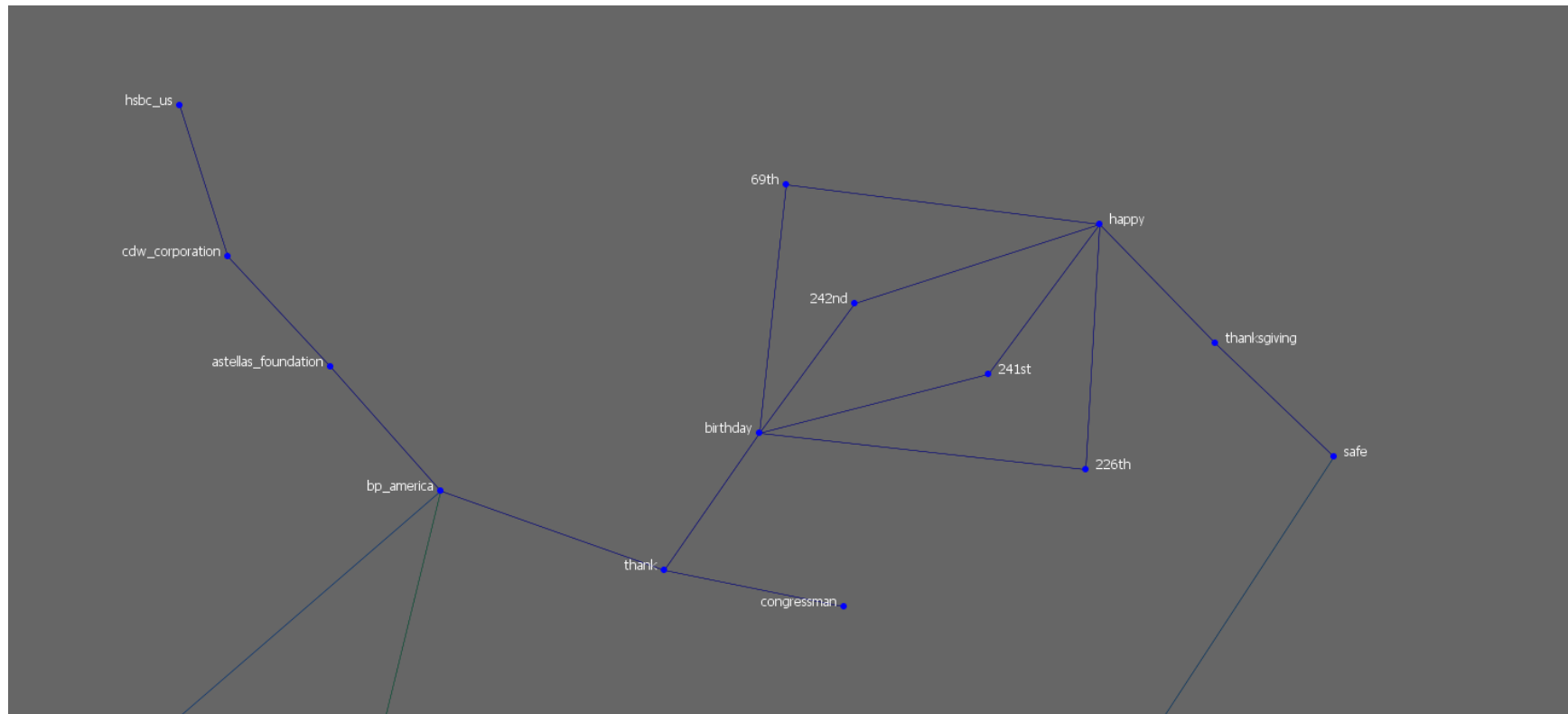
Figure C17

Network Group 17: Facebook of BP America
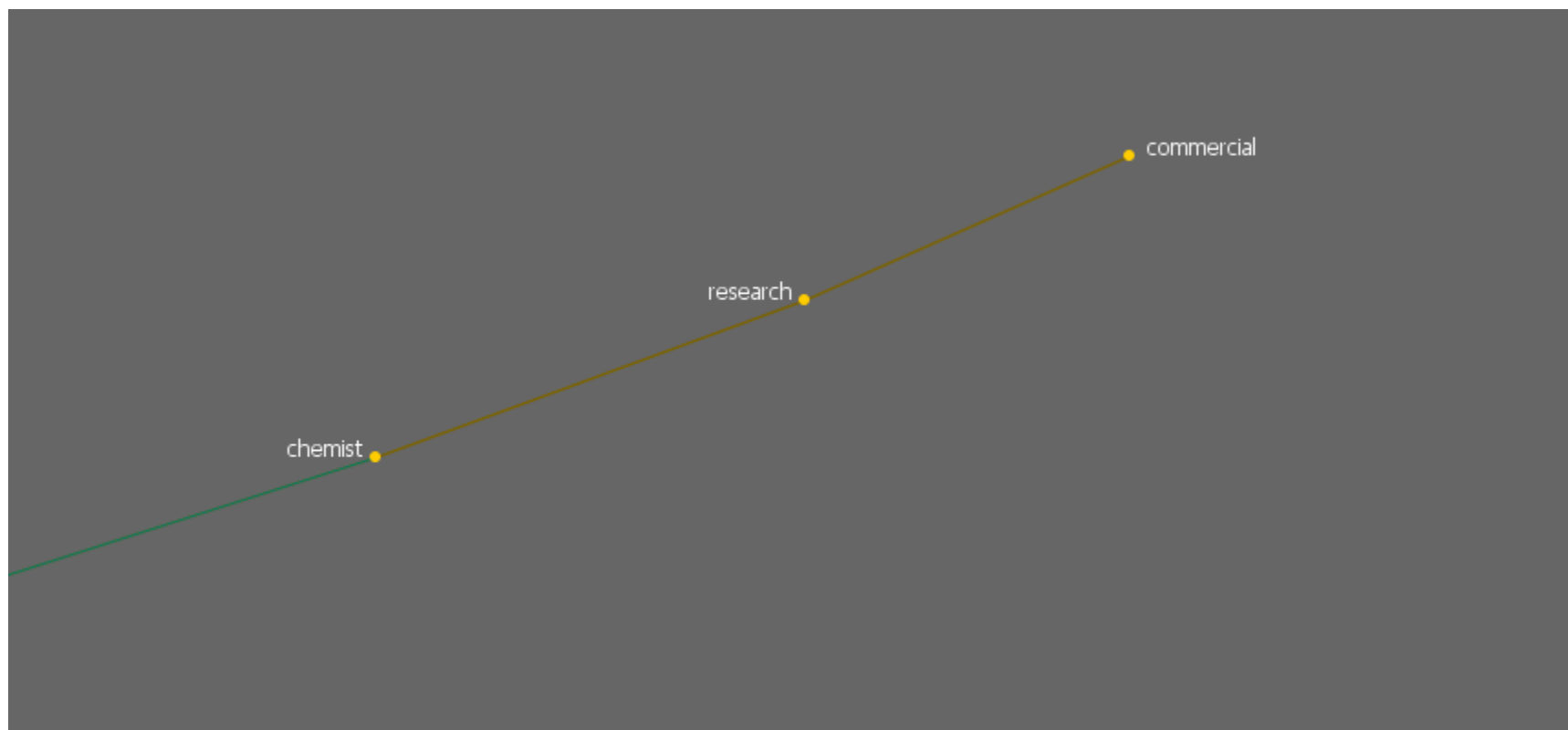
Table C1

Node Frequency: Facebook of BP America

Rank	Node	Frequency
1	bp	208
2	united_states	69
3	safety	65
4	team_usa	53
5	energy_within	41
6	energy	38
7	more	37
8	job	26
9	support	25
10	technology	25
11	help	24
12	make	22
13	new	21
14	employee	20
15	world	20
16	team	18
17	thank	18
18	alaska	17
19	houston	17
20	train	16
21	community	15
22	nathan_adrian	15
23	oil	15
24	bp_ms_150	14
25	happy	14
26	project	14
27	thunder_horse	14
28	use	14
29	largest	13
30	offshore	13
31	share	13
32	wind_farm	13
33	brad_snyder_usa	12
34	business	12
35	congratulations	12

Table C1 (cont'd)

Node Frequency: Facebook of BP America

Rank	Node	Frequency
36	economy	12
37	paralympian	12
38	stem	12
39	watch	12
40	future	11
41	gulf_of_mexico	11
42	operations	11
43	rio_2016_paralympic_games	11
44	bp_america	10
45	invest	10
46	north_slope_of_alaska	10
47	safer	10
48	production	10
49	operate	10
50	students	10

Table C2

Total-degree Centrality: Facebook of BP America

Rank	Node	Value	Unscaled
1	bp	0.018	452
2	team_usa	0.007	188
3	united_states	0.006	160
4	energy_within	0.005	128
5	energy	0.005	120
6	support	0.004	100
7	help	0.003	84
8	paralympian	0.003	84
9	technology	0.003	76
10	team	0.003	72
11	more	0.003	68
12	oil	0.003	68
13	new	0.003	64
14	offshore	0.003	64
15	athlete_ambassador	0.002	60
16	employee	0.002	60
17	make	0.002	60
18	south_expansion	0.002	56
19	thunder_horse	0.002	56
20	project	0.002	52
21	use	0.002	52
22	gas	0.002	48
23	congratulations	0.002	44
24	enough	0.002	44
25	safety	0.002	44
26	athlete	0.002	40
27	business	0.002	40
28	community	0.002	40
29	economy	0.002	40
30	fuel	0.002	40
31	invest	0.002	40
32	major	0.002	40
33	renewable	0.002	40
34	wind_farm	0.002	40
35	largest	0.001	36

Table C2 (cont'd)

Total-degree Centrality: Facebook of BP America

Rank	Node	Value	Unscaled
36	operations	0.001	36
37	the_armless_archer	0.001	36
38	train	0.001	36
39	brad_snyder_usa	0.001	32
40	monitor	0.001	32
41	operate	0.001	32
42	safely	0.001	32
43	safer	0.001	32
44	area	0.001	28
45	bp_alaska	0.001	28
46	digital	0.001	28
47	houston	0.001	28
48	job	0.001	28
49	onshore	0.001	28
50	production	0.001	28
51	matt_stutzman	0.001	26
52	birthday	9.539e-004	24
53	bp_tech	9.539e-004	24
54	cars	9.539e-004	24
55	cherry_point_refinery	9.539e-004	24
56	drill	9.539e-004	24
57	electric	9.539e-004	24
58	energy_challenge	9.539e-004	24
59	engineer	9.539e-004	24
60	engineers	9.539e-004	24
61	first	9.539e-004	24
62	local	9.539e-004	24
63	melissa_stockwell_usa	9.539e-004	24
64	nathan_adrian	9.539e-004	24
65	platform	9.539e-004	24
66	producer	9.539e-004	24
67	program	9.539e-004	24
68	retail	9.539e-004	24
69	road_to_rio	9.539e-004	24
70	24_7	7.949e-004	20

Table C3

Betweenness Centrality: Facebook of BP America

Rank	Node	Value	Unscaled
1	bp	0.420	57,309.273
2	united_states	0.303	41,428.832
3	energy	0.149	20,290.684
4	help	0.142	19,428.354
5	support	0.134	18,282.729
6	technology	0.099	13,484.466
7	power	0.073	10,018.729
8	new	0.068	9,219.961
9	safety	0.065	8,840.315
10	team_usa	0.063	8,545.918
11	operations	0.062	8,410.435
12	fuel	0.060	8,134.538
13	use	0.050	6,826.193
14	bp_america	0.049	6,647.870
15	gas	0.044	6,031.933
16	local	0.034	4,606.905
17	make	0.033	4,468.275
18	medal	0.032	4,389.298
19	bp_tech	0.032	4,336.692
20	petrochemical	0.032	4,319.100
21	first	0.030	4,089.102
22	business	0.029	3,939.313
23	employee	0.029	3,935.749
24	performance	0.028	3,870.305
25	alaska	0.028	3,868.802
26	largest	0.028	3,863.206
27	stem	0.028	3,860.479
28	pipeline	0.027	3,707.032
29	facility	0.027	3,638.767
30	teacher	0.026	3,487.618
31	safe	0.024	3,310.439
32	major	0.024	3,300.433
33	cherry_point_refinery	0.023	3,179.167
34	provide	0.023	3,156.249
35	retail	0.023	3,093.175

Table C3 (cont'd)

Betweenness Centrality: Facebook of BP America

Rank	Node	Value	Unscaled
36	proudly	0.022	3,053.700
37	monitor	0.022	3,039.268
38	enough	0.022	3,010.279
39	energy_within	0.022	2,954.982
40	bp_alaska	0.021	2,905.124
41	emissions	0.021	2,833.795
42	launch	0.020	2,780.840
43	every	0.020	2,726.926
44	job	0.020	2,718.688
45	brad_snyder_usa	0.020	2,691.600
46	operate	0.020	2,669.775
47	thanksgiving	0.019	2,604.439
48	watch	0.019	2,533.360
49	production	0.018	2,495.717
50	congratulations	0.018	2,491.751
51	improve	0.018	2,484.224
52	thank	0.018	2,481.561
53	team	0.018	2,454.459
54	thunder_horse	0.018	2,413.747
55	engineer	0.017	2,383.103
56	north_slope_of_alaska	0.017	2,325.503
57	outstanding	0.017	2,306.568
58	renewable	0.016	2,241.264
59	women	0.016	2,202
60	celebrate	0.016	2,171.778
61	train	0.016	2,148.843
62	safeguard	0.015	2,112.293
63	select	0.015	2,045.943
64	meet	0.015	2,037.629
65	wind	0.015	2,023.585
66	process	0.014	1,968.869
67	career	0.014	1,946.192
68	happy	0.014	1,923.339
69	domestic	0.014	1,903.317
70	end	0.014	1,896.395

Table C4

Closeness Centrality: Facebook of BP America

Rank	Node	Value	Unscaled
1	bp	0.303	4.088e-004
2	united_states	0.301	4.072e-004
3	energy	0.269	3.628e-004
4	support	0.260	3.511e-004
5	power	0.257	3.472e-004
6	help	0.256	3.463e-004
7	technology	0.255	3.446e-004
8	make	0.252	3.411e-004
9	proudly	0.252	3.408e-004
10	bp_tech	0.252	3.404e-004
11	team_usa	0.252	3.399e-004
12	improve	0.249	3.362e-004
13	operations	0.247	3.340e-004
14	launch	0.246	3.327e-004
15	domestic	0.245	3.316e-004
16	every	0.245	3.316e-004
17	watch	0.244	3.300e-004
18	process	0.243	3.287e-004
19	drill	0.242	3.266e-004
20	deliver	0.242	3.264e-004
21	pipeline	0.241	3.259e-004
22	employee	0.241	3.253e-004
23	operate	0.240	3.249e-004
24	bp_america	0.239	3.232e-004
25	new	0.239	3.230e-004
26	executives	0.239	3.226e-004
27	refine	0.239	3.224e-004
28	select	0.238	3.215e-004
29	major	0.238	3.213e-004
30	closely	0.238	3.211e-004
31	energy_within	0.237	3.203e-004
32	safety	0.237	3.203e-004
33	stem	0.237	3.201e-004
34	empower	0.237	3.197e-004
35	gulf_of_mexico	0.237	3.197e-004

Table C4 (cont'd)

Closeness Centrality: Facebook of BP America

| Rank	Node	Value	Unscaled
36	ge	0.236	3.195e-004
37	volunteer	0.236	3.193e-004
38	entire	0.236	3.187e-004
39	use	0.236	3.185e-004
40	safeguard	0.234	3.159e-004
41	thunder_horse	0.234	3.159e-004
42	pipelines_and_logistics	0.234	3.157e-004
43	pipelines_logistics_business	0.234	3.157e-004
44	spend	0.233	3.155e-004
45	celebrate	0.233	3.153e-004
46	locations	0.233	3.153e-004
47	unveils	0.233	3.153e-004
48	performed	0.233	3.151e-004
49	retail	0.233	3.151e-004
50	approves	0.233	3.149e-004
51	fun	0.233	3.149e-004
52	olympian	0.233	3.149e-004
53	washington	0.233	3.149e-004
54	economic	0.233	3.147e-004
55	chief_meteorologist	0.233	3.145e-004
56	coast_guard	0.232	3.141e-004
57	crisis_management_leader	0.232	3.141e-004
58	culture	0.232	3.141e-004
59	donate	0.232	3.141e-004
60	explorer	0.232	3.141e-004
61	facilities_engineer_team_lead	0.232	3.141e-004
62	group_chief_economist	0.232	3.141e-004
63	iwd_2017	0.232	3.141e-004
64	process_asset_development_engineer	0.232	3.141e-004
65	reinvests	0.232	3.141e-004
66	senior_drilling_engineer	0.232	3.141e-004
67	sponsor	0.232	3.141e-004
68	strategic_procurement_manager	0.232	3.141e-004
69	wellsite_leader	0.232	3.141e-004
70	fuel	0.232	3.137e-004

Table C5

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of BP America

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
1	bp	bp	bp
2	team_usa	united_states	united_states
3	united_states	energy	energy
4	energy_within	help	support
5	energy	support	power
6	support	technology	help
7	help	power	technology
8	paralympian	new	make
9	technology	safety	proudly
10	team	team_usa	bp_tech
11	more	operations	team_usa
12	oil	fuel	improve
13	new	use	operations
14	offshore	bp_america	launch
15	athlete_ambassador	gas	domestic
16	employee	local	every
17	make	make	watch
18	south_expansion	medal	process
19	thunder_horse	bp_tech	drill
20	project	petrochemical	deliver
21	use	first	pipeline
22	gas	business	employee
23	congratulations	employee	operate
24	enough	performance	bp_america
25	safety	alaska	new
26	athlete	largest	executives
27	business	stem	refine
28	community	pipeline	select
29	economy	facility	major
30	fuel	teacher	closely
31	invest	safe	energy_within
32	major	major	safety
33	renewable	cherry_point_refinery	stem
34	wind_farm	provide	empower
35	largest	retail	gulf_of_mexico

Table C5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of BP America

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
36	operations	proudly	ge
37	the_armless_archer	monitor	volunteer
38	train	enough	entire
39	brad_snyder_usa	energy_within	use
40	monitor	bp_alaska	safeguard
41	operate	emissions	thunder_horse
42	safely	launch	pipelines_and_logistics
43	safer	every	pipelines_logistics_business
44	area	job	spend
45	bp_alaska	brad_snyder_usa	celebrate
46	digital	operate	locations
47	houston	thanksgiving	unveils
48	job	watch	performed
49	onshore	production	retail
50	production	congratulations	approves
51	matt_stutzman	improve	fun
52	birthday	thank	olympian
53	bp_tech	team	washington
54	cars	thunder_horse	economic
55	cherry_point_refinery	engineer	chief_meteorologist
56	drill	north_slope_of_alaska	coast_guard
57	electric	outstanding	crisis_management_leader
58	energy_challenge	renewable	culture
59	engineer	women	donate
60	engineers	celebrate	explorer
61	first	train	facilities_engineer_team_lead
62	local	safeguard	group_chief_economist
63	melissa_stockwell_usa	select	iwd_2017
64	nathan_adrian	meet	process_asset_development_engineer
65	platform	wind	reinvests
66	producer	process	senior_drilling_engineer
67	program	career	sponsor
68	retail	happy	strategic_procurement_manager
69	road_to_rio	domestic	wellsite_leader
70	24_7	end	fuel

Table C5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of BP America

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
71	bp_america	24_7	navy
72	company	ohio	monitor
73	efficient	bp_ms_150	provide
74	every	drill	enough
75	global	fosters	cherry_point_refinery
76	happy	cooper_river_chemicals	gas
77	holiday	oil	industry
78	lex_gillette	unveils	local
79	otc2017	supply	24_7
80	performance	houston	supply
81	pipeline	natural_gas	complete
82	power	future	brad_snyder_usa
83	provide	economy	production
84	shipping	remote	mad_dog_platform
85	stem	serve	transportation
86	texas	18000	train
87	virtual_reality	astellas_foundation	build
88	32	carrying	math
89	affect	chemist	engineer
90	cera_week	no_1	refinery
91	chicago	shipping	future
92	complete	sport	safer
93	cooper_river_chemicals	statewide	emissions
94	data	washington	first
95	demand	spend	medal
96	drone	greenhouse	planes
97	electricity	40years	trading
98	emissions	encouraging	largest
99	end	industry	team
100	expands	coast_guard	thermal_imaging

Appendix D

Figure D1.1

Network Group 1 (Part 1): Twitter of BP America
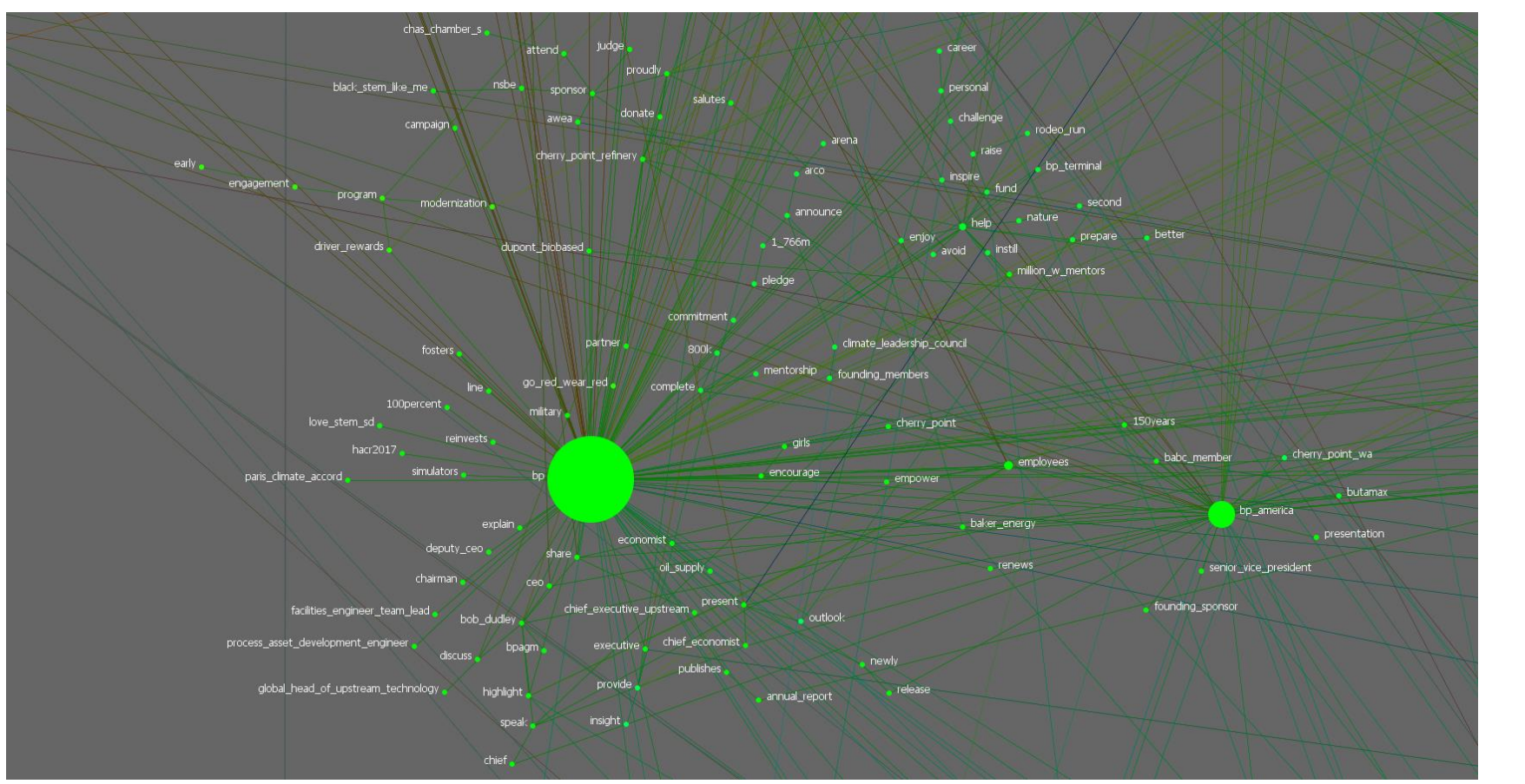
Figure D1.2

Network Group 1 (Part 2): Twitter of BP America
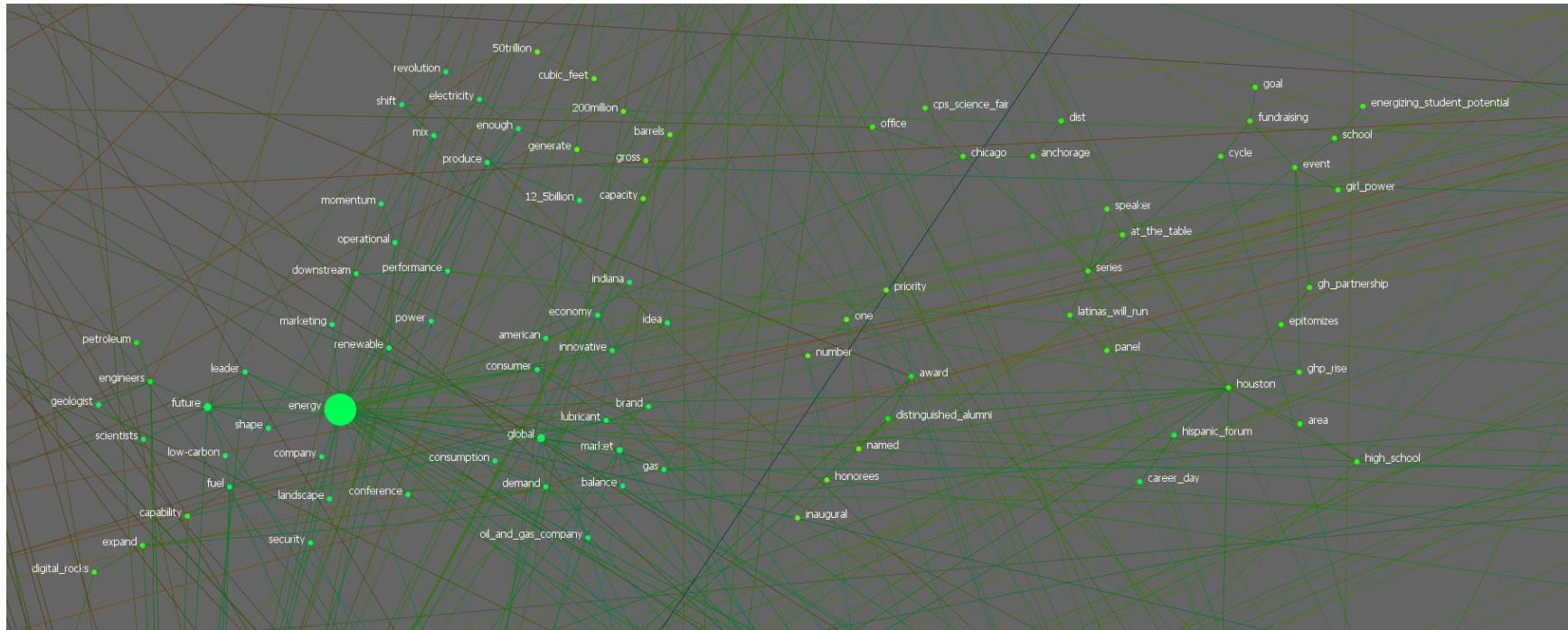
Figure D1.3

Network Group 1 (Part 3): Twitter of BP America
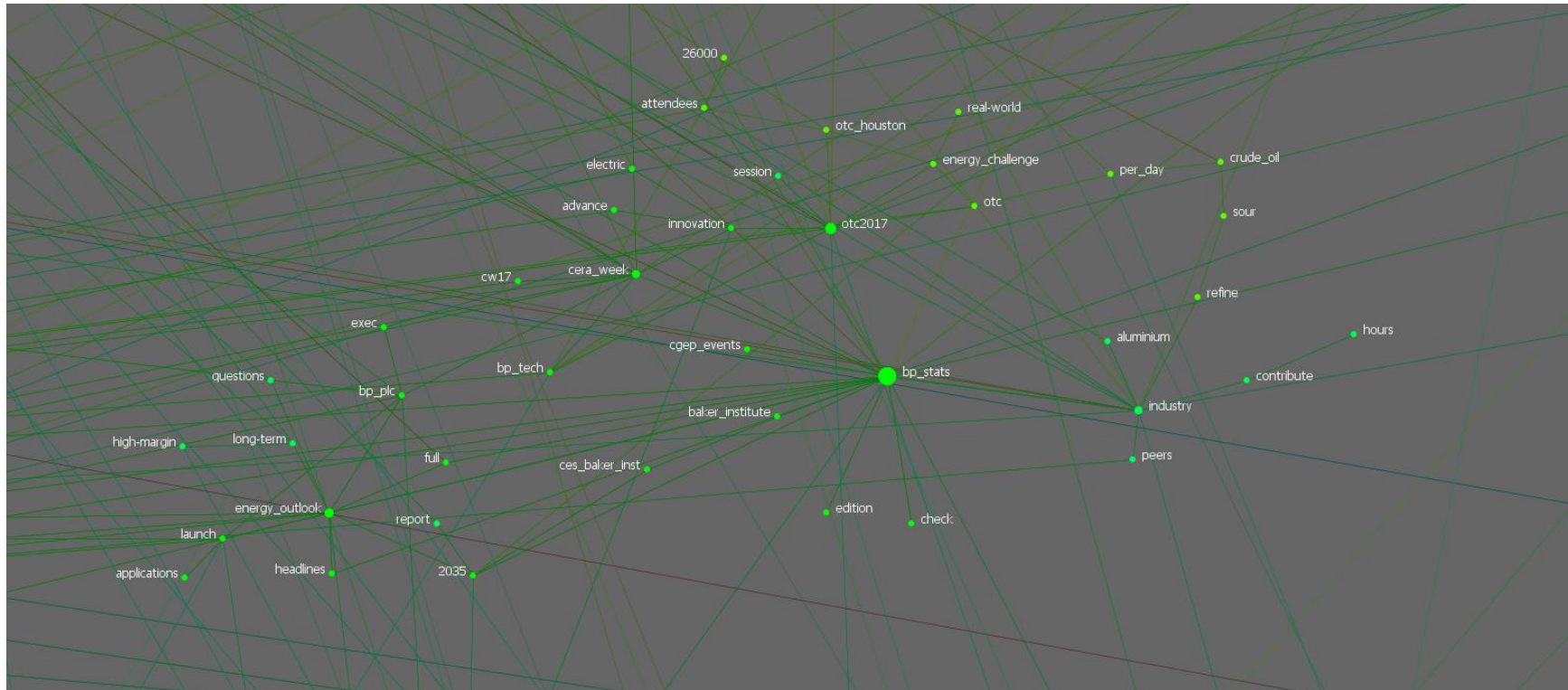
Figure D2

Network Group 2: Twitter of BP America
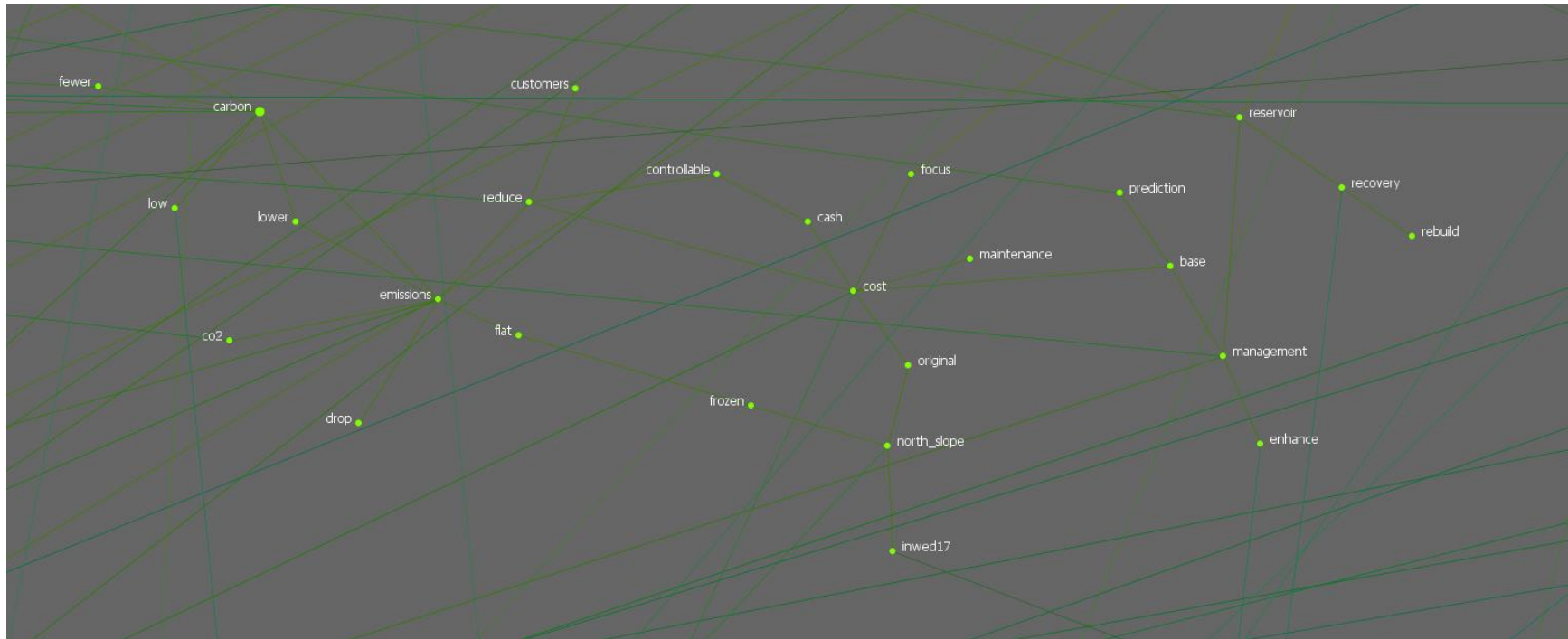
Figure D3

Network Group 3: Twitter of BP America
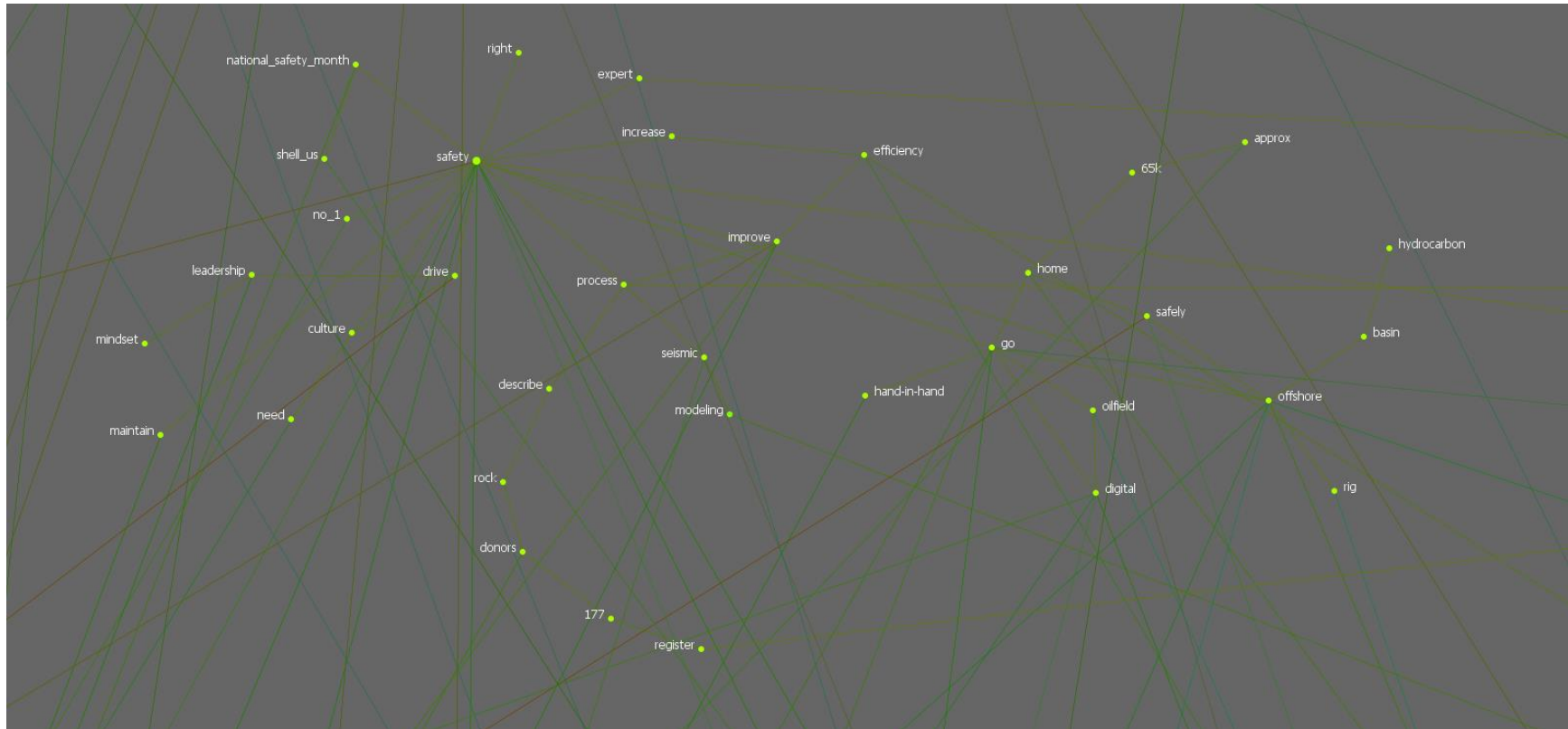
Figure D4

Network Group 4: Twitter of BP America
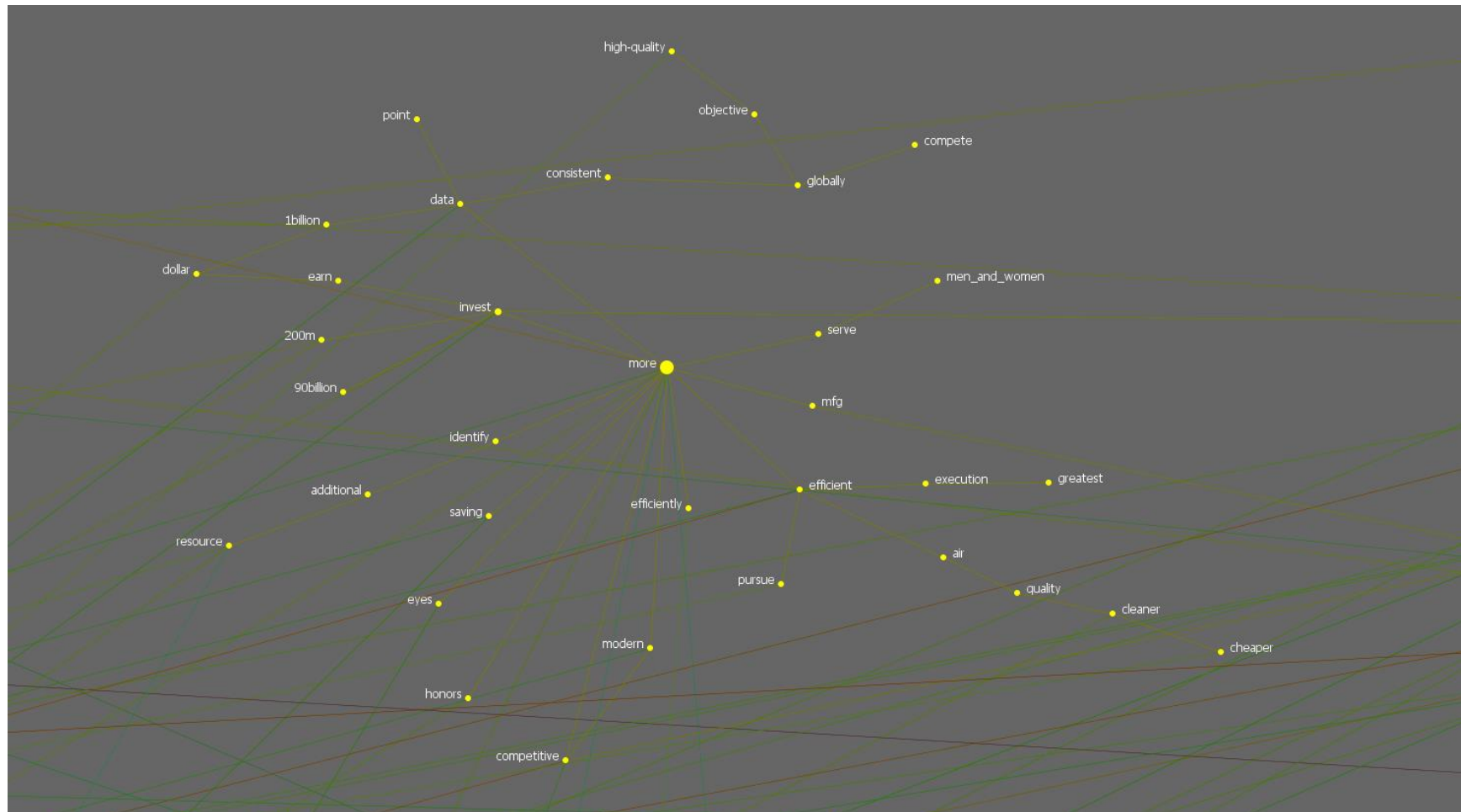
Figure D5

Network Group 5: Twitter of BP America
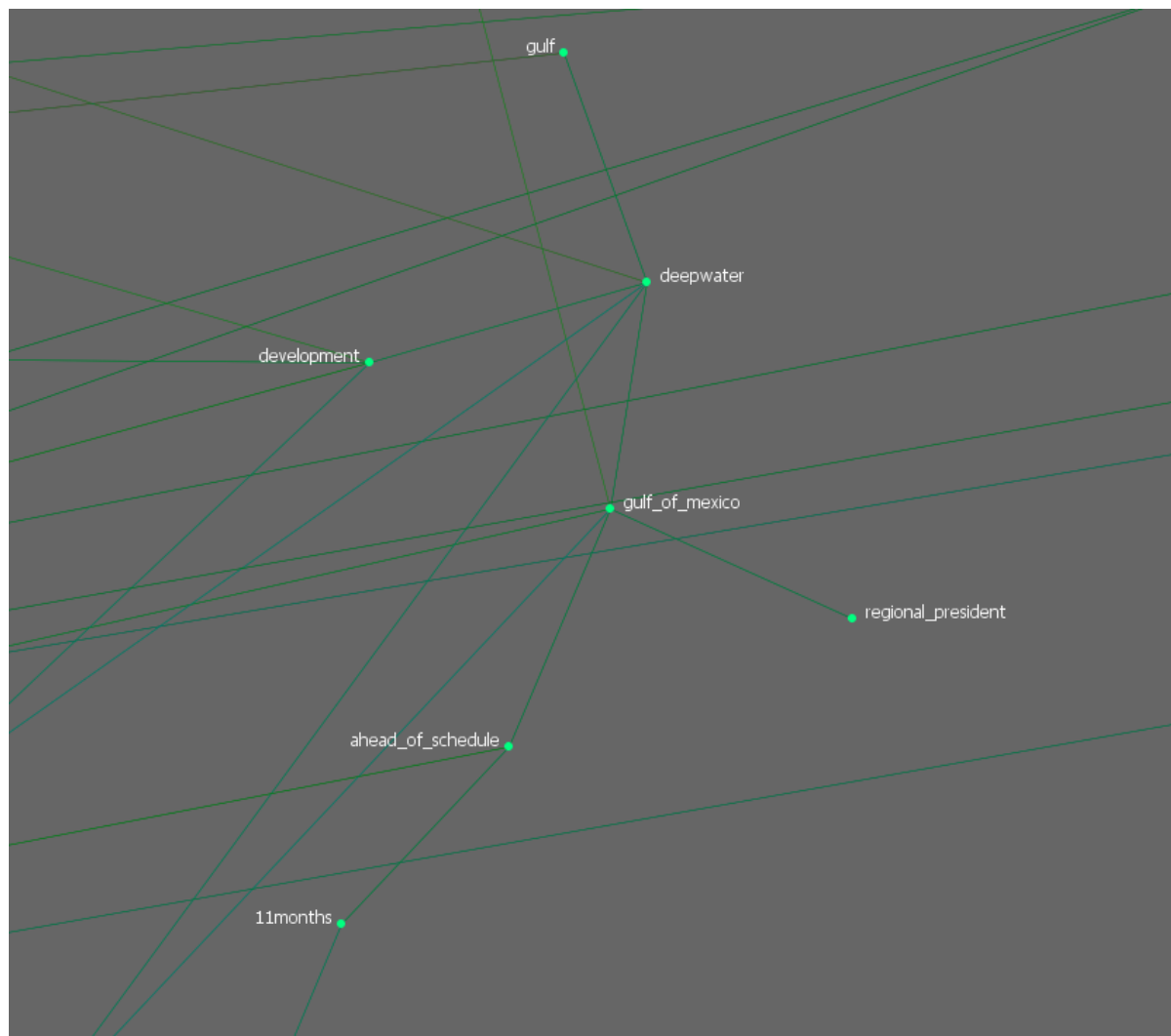
Figure D6

Network Group 6: Twitter of BP America
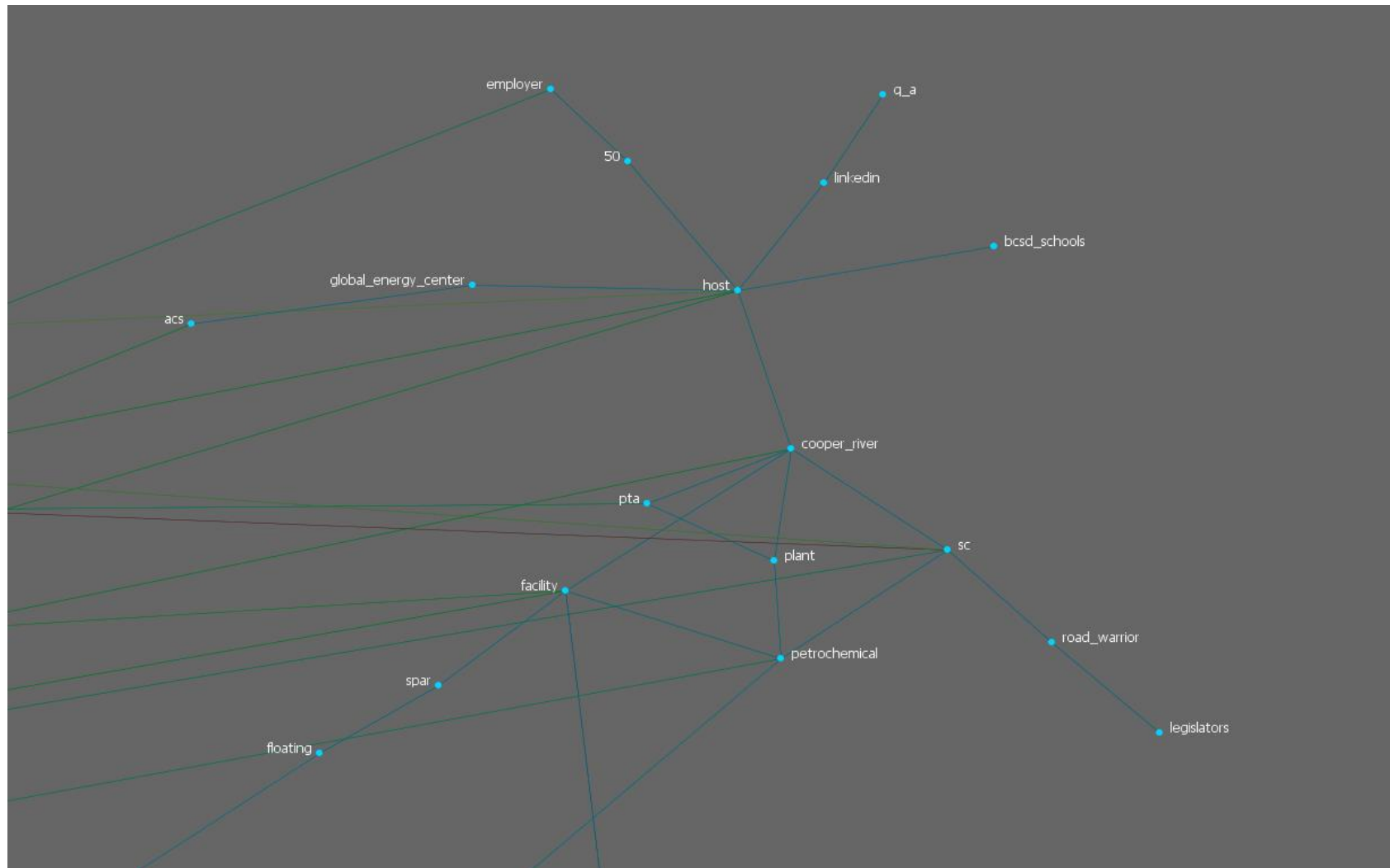
Figure D7

Network Group 7: Twitter of BP America

Figure D8

Network Group 8: Twitter of BP America
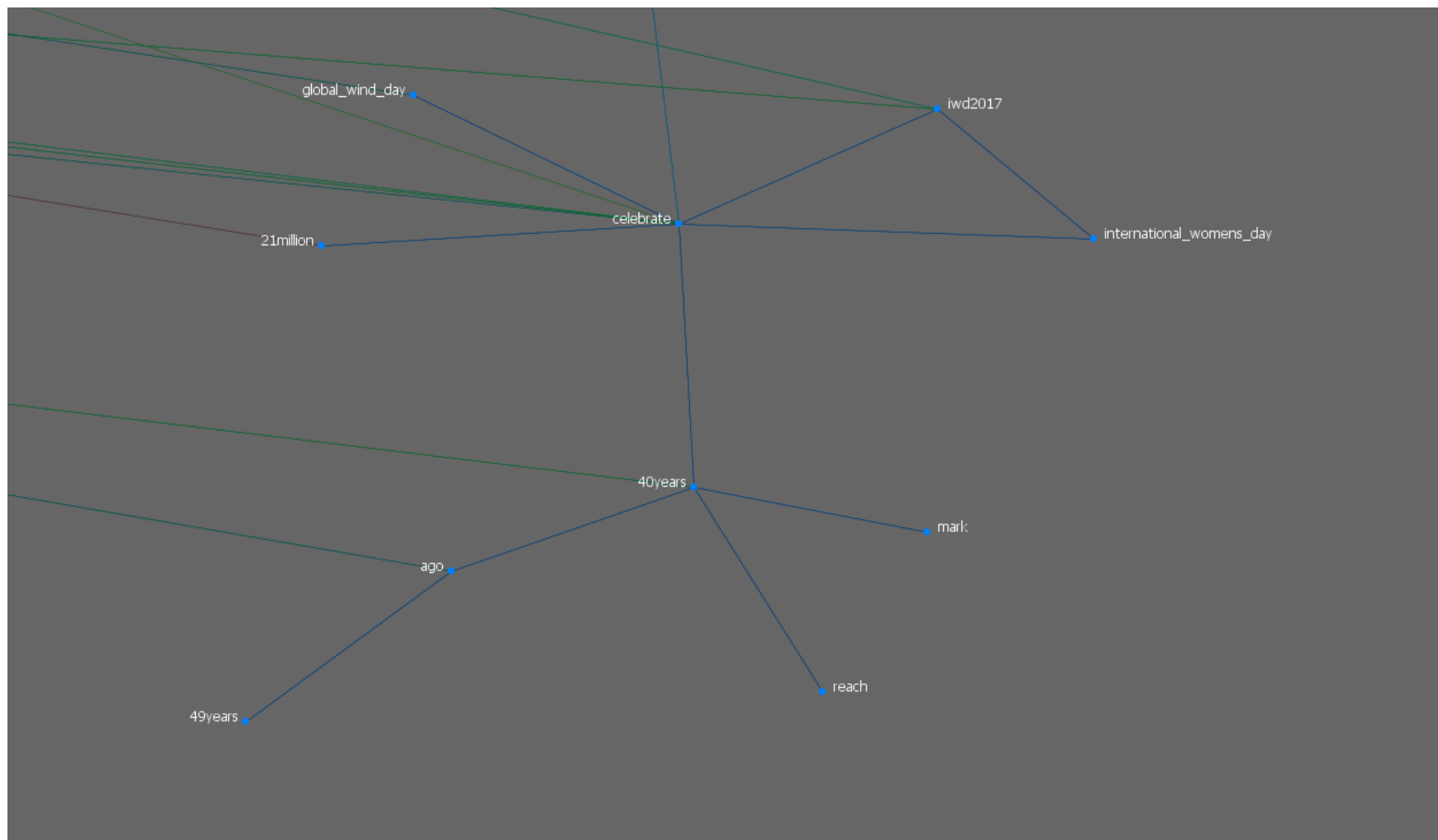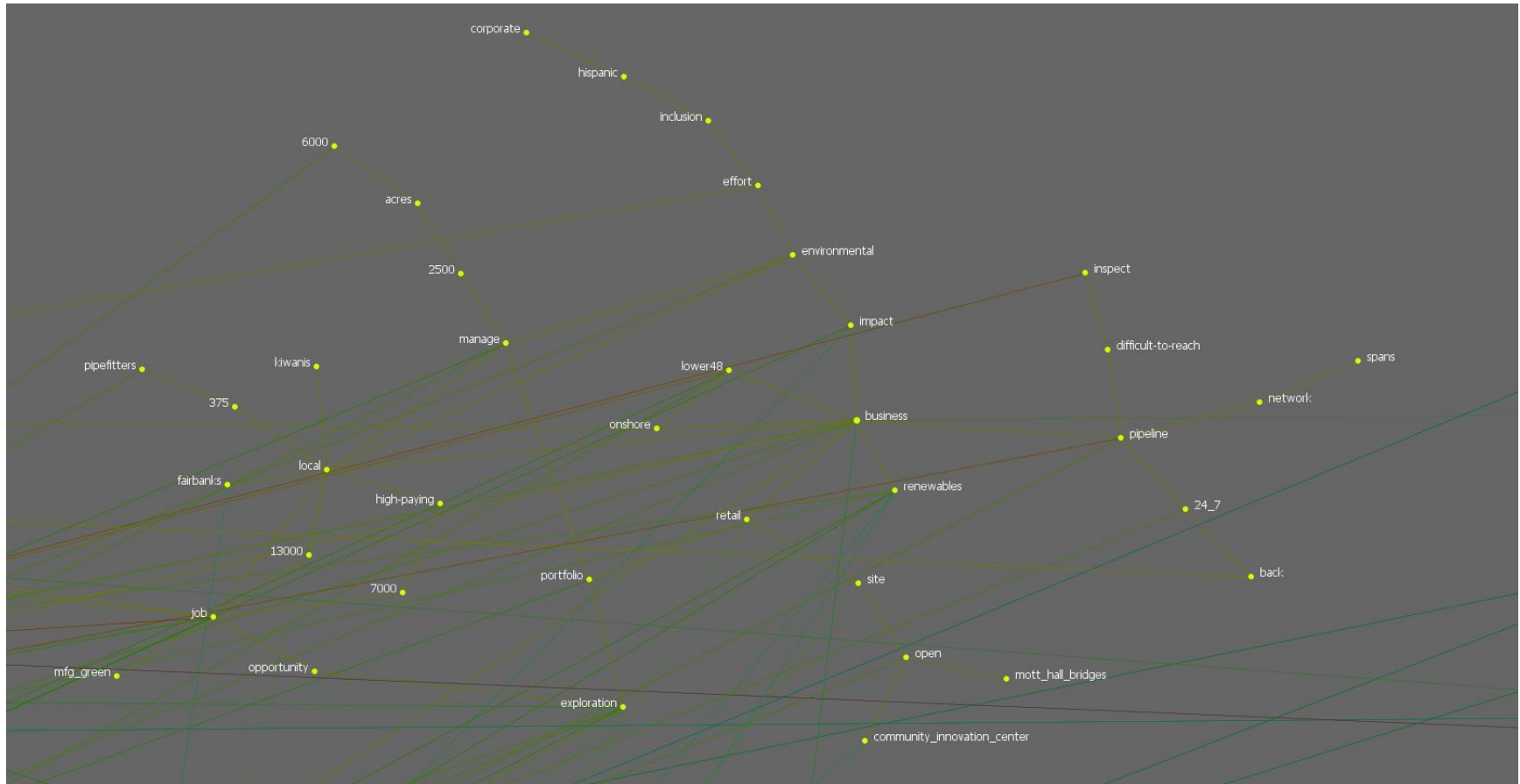
Figure D9

Network Group 9: Twitter of BP America
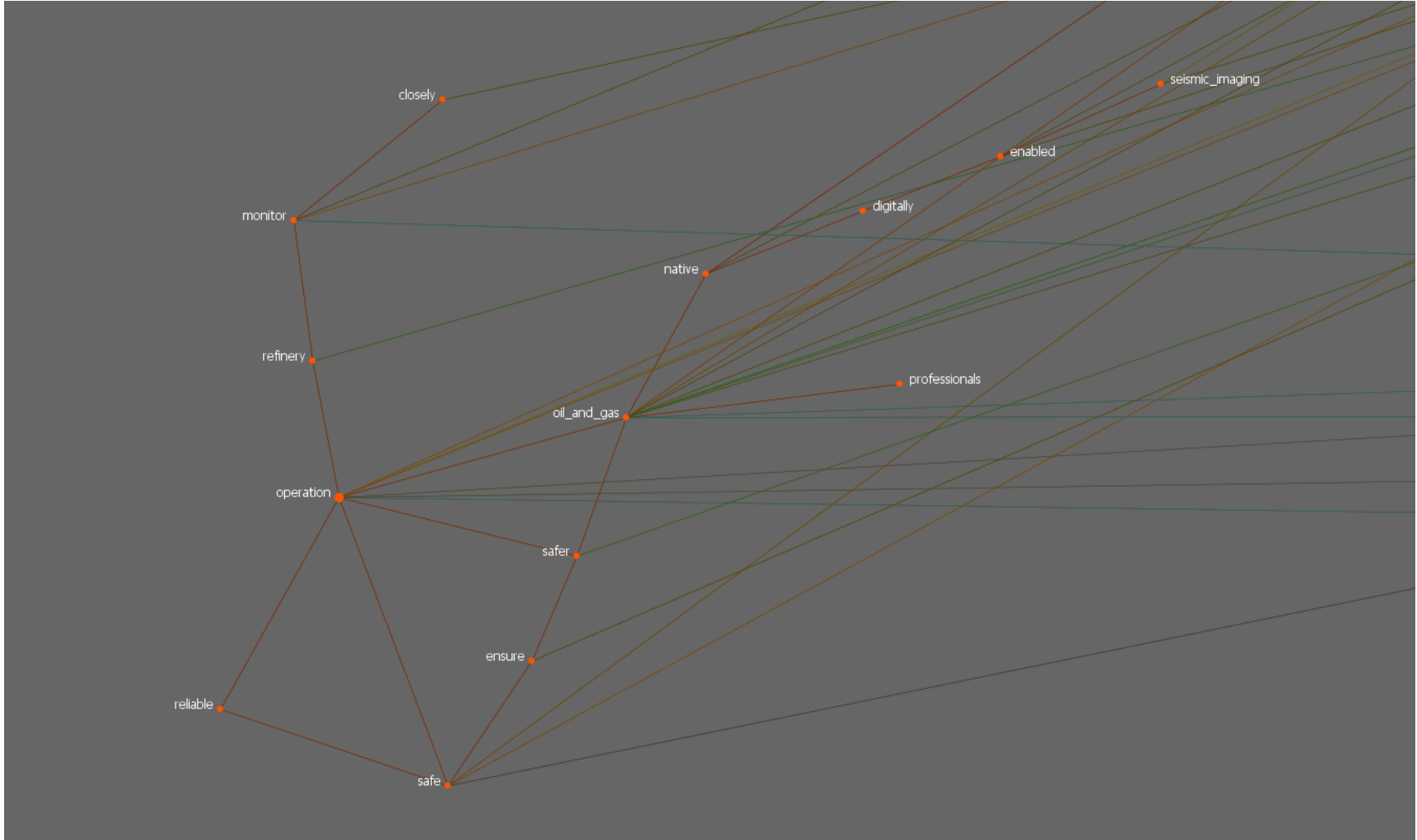
Figure D10

Network Group 10: Twitter of BP America
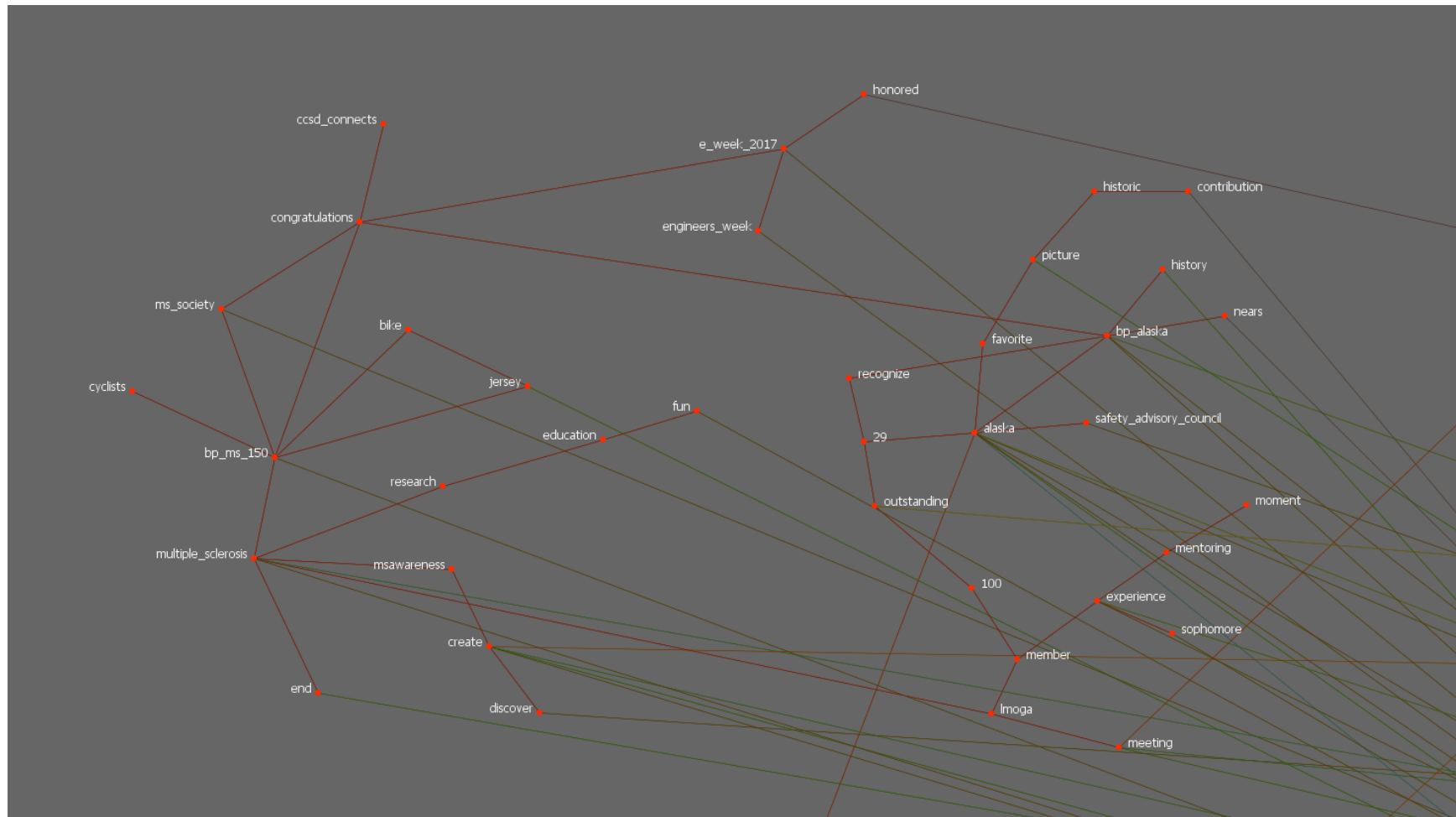
Figure D11

Network Group 11: Twitter of BP America
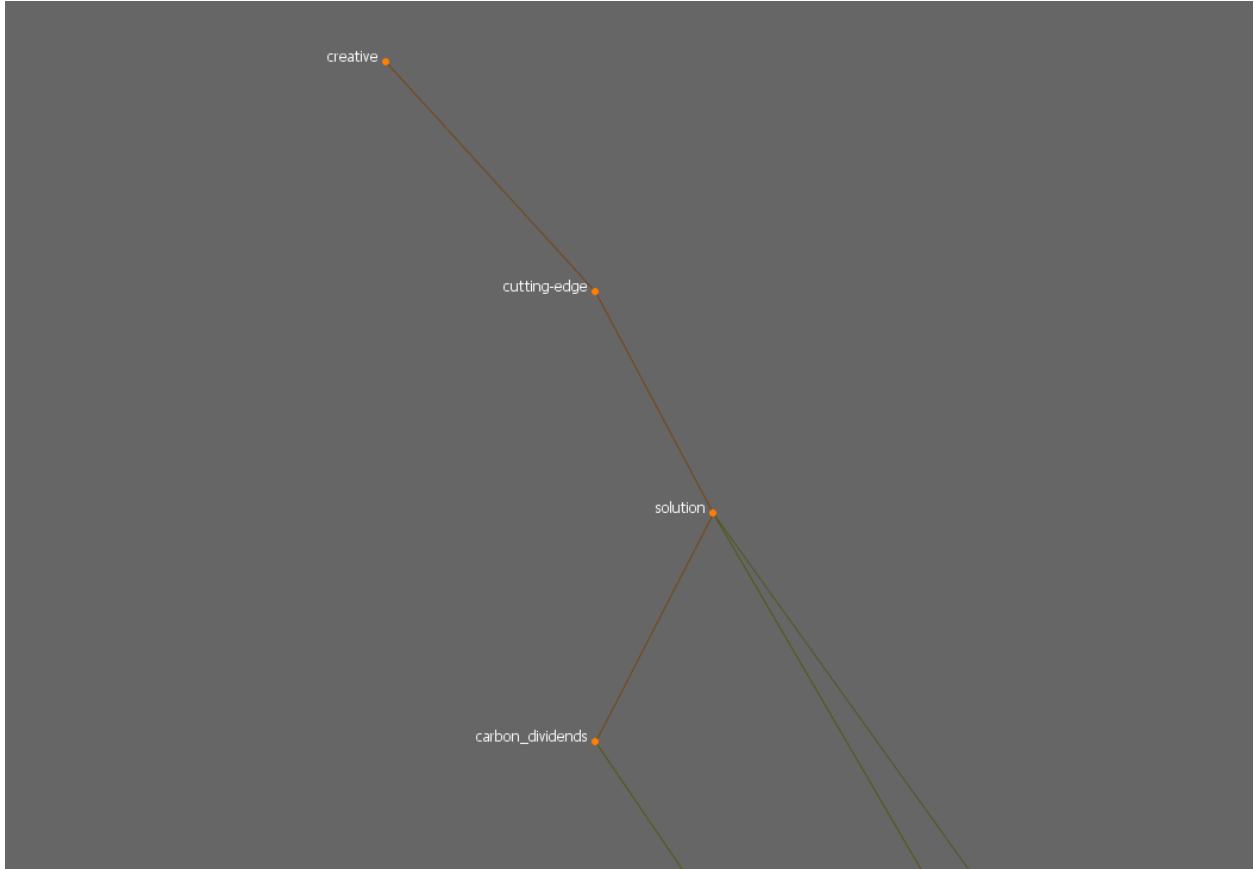
Figure D12

Network Group 12: Twitter of BP America
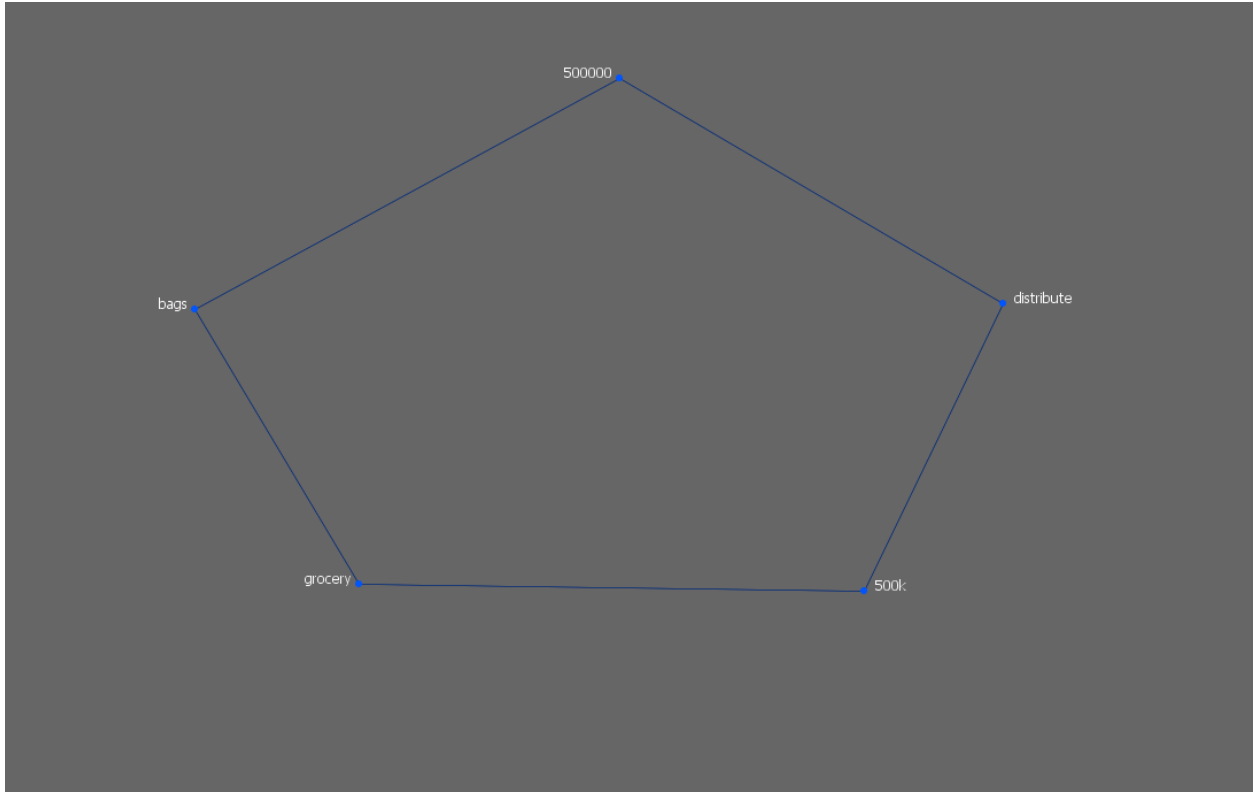
Figure D13

Network Group 13: Twitter of BP America
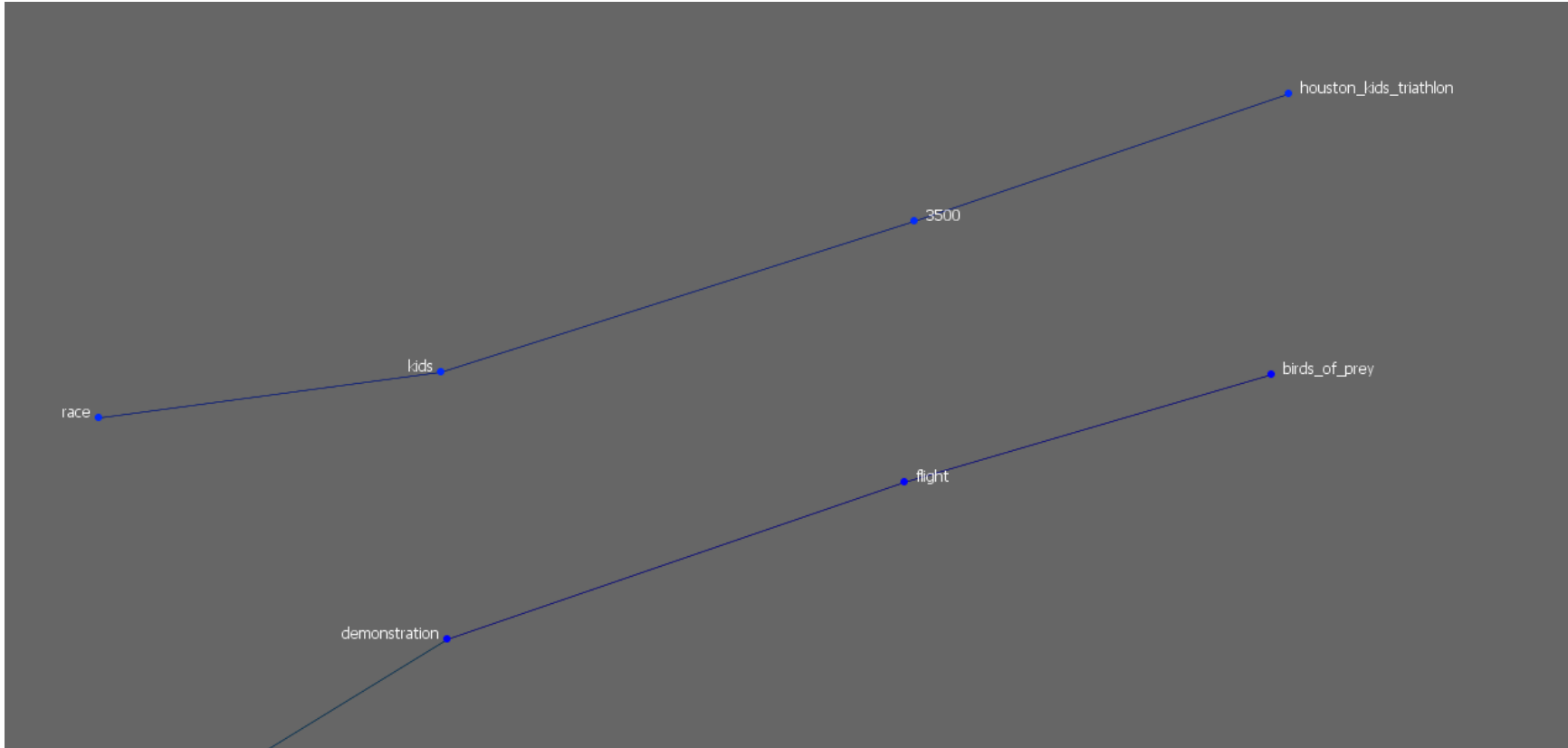
Figure D14

Network Group 14: Twitter of BP America

Figure D15

Network Group 15: Twitter of BP America

445
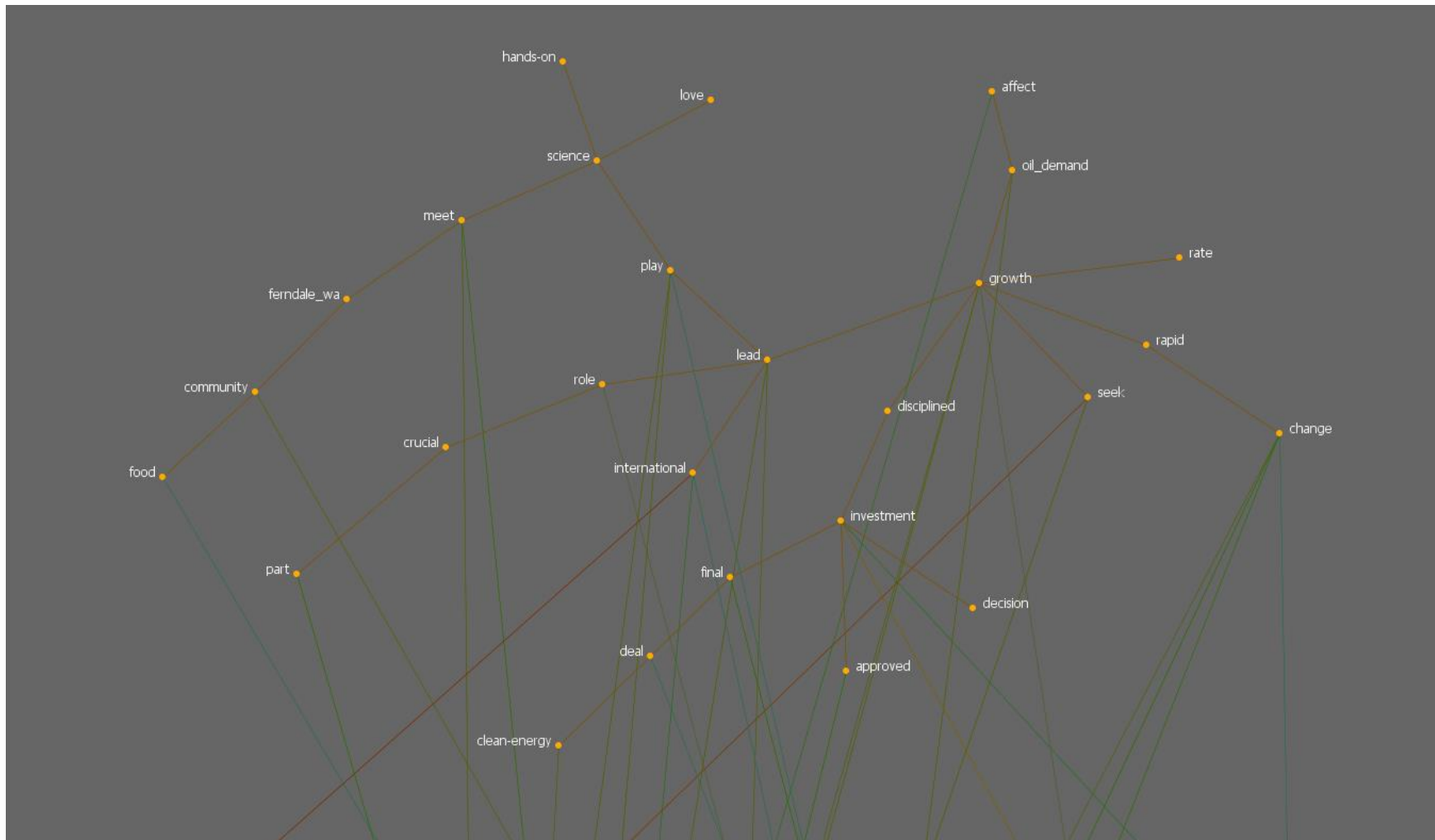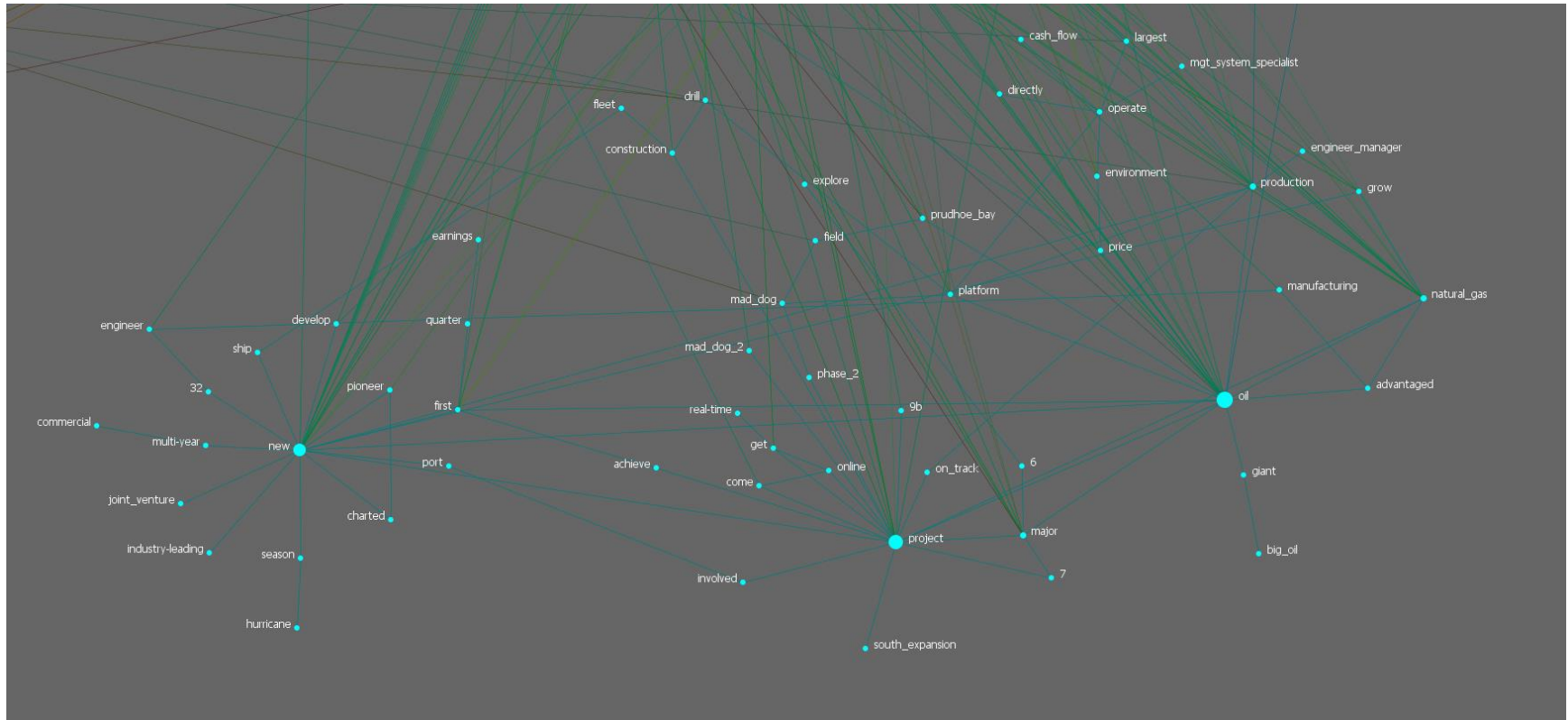
Figure D16

Network Group 16: Twitter of BP America
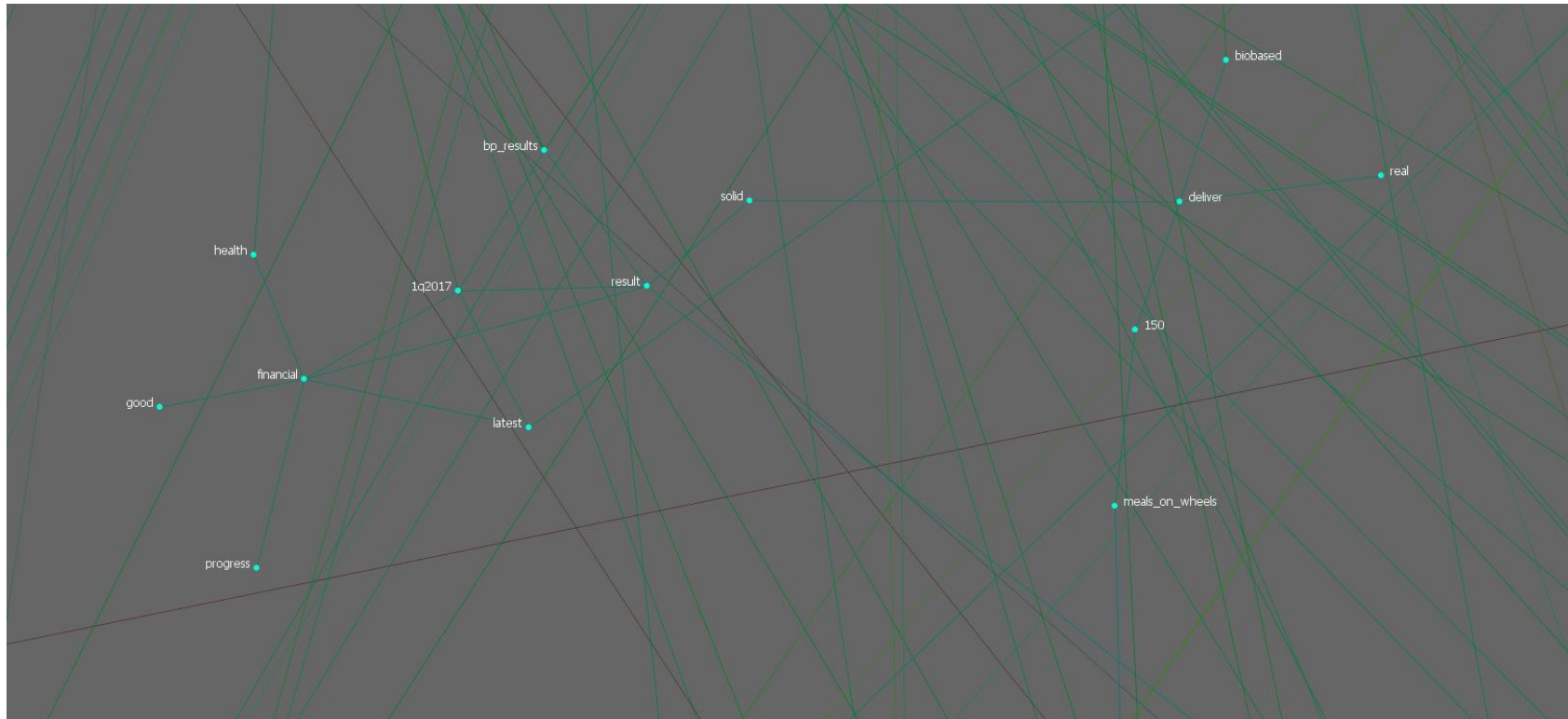
Figure D17

Network Group 17: Twitter of BP America
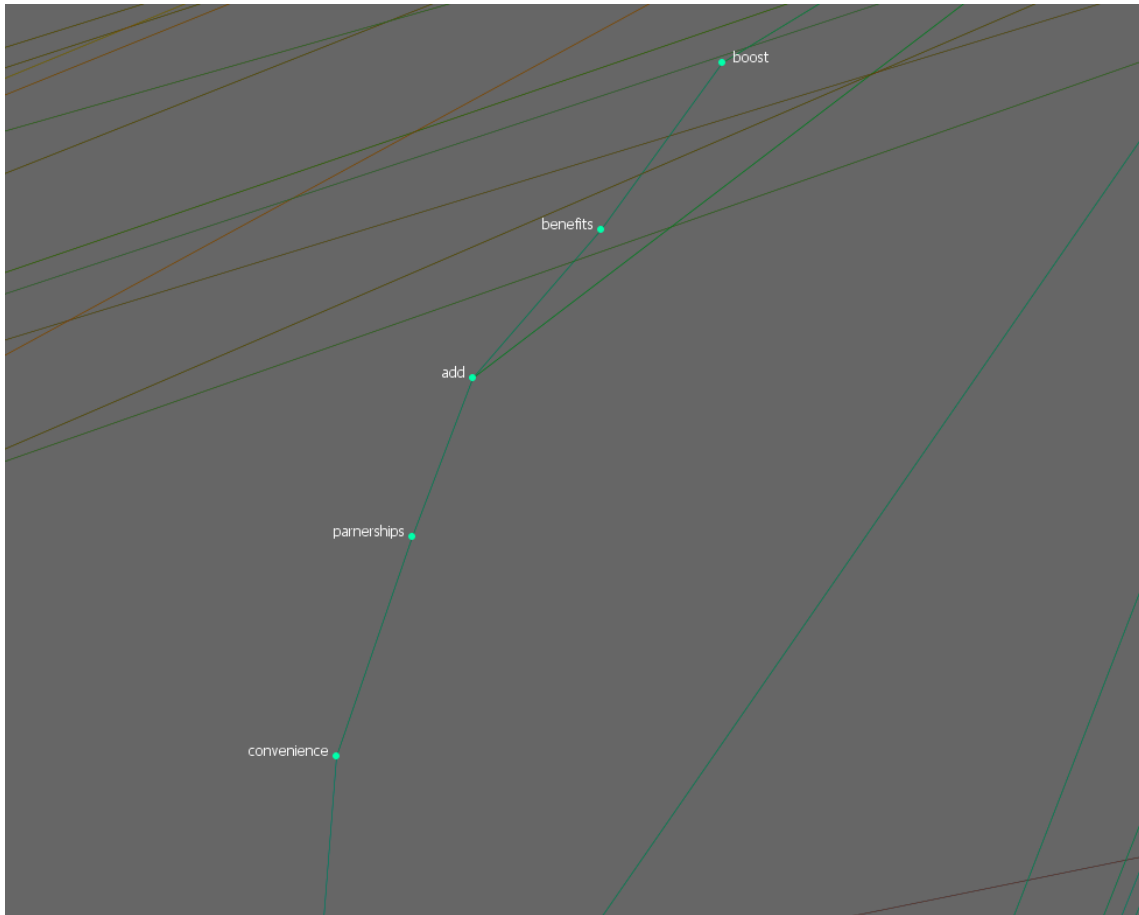
Table D1

Node Frequency: Twitter of BP America

Rank	Node	Frequency
1	bp	480
2	bp_america	155
3	energy	108
4	support	66
5	bp_stats	65
6	united_states	65
7	otc2017	58
8	more	55
9	oil	51
10	safety	48
11	project	47
12	future	46
13	new	46
14	cera_week	45
15	help	45
16	speak	42
17	stem	41
18	employees	37
19	technology	37
20	energy_outlook	34
21	houston	34
22	business	33
23	sponsor	31
24	share	31
25	natural_gas	30
26	bp_plc	28
27	operation	28
28	congratulations	26
29	gulf_of_mexico	25
30	students	25
31	bp_ms_150	24
32	growth	24
33	industry	24
34	invest	24
35	production	24

Table D1 (cont'd)

Node Frequency: Twitter of BP America

Rank	Node	Frequency
36	alaska	23
37	global	23
38	thunder_horse	23
39	whatcom	23
40	cherry_point_refinery	22
41	major	22
42	oil_and_gas	21
43	team	21
44	carbon	20
45	change	20
46	platform	20
47	offshore	19
48	women	19
49	otc_houston	18
50	celebrate	18

Table D2

Total-degree Centrality: Twitter of BP America

Rank	Node	Value	Unscaled
1	bp	0.027	1,040
2	energy	0.011	404
3	bp_america	0.008	308
4	oil	0.005	200
5	bp_stats	0.005	188
6	project	0.005	184
7	new	0.004	154
8	otc2017	0.003	128
9	more	0.003	124
10	employees	0.003	116
11	energy_outlook	0.003	112
12	future	0.003	112
13	carbon	0.003	104
14	global	0.003	104
15	operation	0.003	104
16	help	0.003	100
17	industry	0.003	100
18	safety	0.003	100
19	cera_week	0.002	92
20	invest	0.002	84
21	market	0.002	84
22	natural_gas	0.002	84
23	production	0.002	84
24	bob_dudley	0.002	76
25	business	0.002	76
26	major	0.002	76
27	safer	0.002	76
28	cherry_point_refinery	0.002	72
29	oil_and_gas	0.002	72
30	emissions	0.002	68
31	ceo	0.002	64
32	houston	0.002	64
33	alaska	0.002	60
34	1q2017	0.001	56
35	bp_plc	0.001	56

Table D2 (cont'd)

Total-degree Centrality: Twitter of BP America

Rank	Node	Value	Unscaled
36	gulf_of_mexico	0.001	56
37	offshore	0.001	56
38	proudly	0.001	56
39	celebrate	0.001	52
40	deepwater	0.001	52
41	engineers	0.001	52
42	financial	0.001	52
43	go	0.001	52
44	lower	0.001	52
45	result	0.001	52
46	sponsor	0.001	52
47	bp_alaska	0.001	48
48	cooper_river	0.001	48
49	job	0.001	48
50	operate	0.001	48
51	platform	0.001	48
52	price	0.001	48
53	bp_results	0.001	44
54	first	0.001	44
55	growth	0.001	44
56	launch	0.001	44
57	local	0.001	44
58	otc_houston	0.001	44
59	present	0.001	44
60	safe	0.001	44
61	cost	0.001	40
62	drill	0.001	40
63	energy_challenge	0.001	40
64	expand	0.001	40
65	fuel	0.001	40
66	host	0.001	40
67	bp_ms_150	9.370e-004	36
68	demand	9.370e-004	36
69	development	9.370e-004	36
70	efficient	9.370e-004	36

Table D3

Betweenness Centrality: Twitter of BP America

Rank	Node	Value	Unscaled
1	bp	0.457	145,567.906
2	bp_america	0.125	39,710.797
3	energy	0.109	34,684.352
4	houston	0.076	24,185.422
5	new	0.065	20,766.072
6	safety	0.065	20,645.383
7	oil	0.053	16,734.730
8	bp_stats	0.050	15,791.064
9	help	0.048	15,408.121
10	project	0.048	15,346.914
11	natural_gas	0.044	13,880.074
12	oil_and_gas	0.037	11,734.001
13	exploration	0.034	10,750.604
14	business	0.032	10,264.405
15	otc2017	0.032	10,166.341
16	industry	0.031	9,978.743
17	more	0.031	9,785.178
18	proudly	0.030	9,528.693
19	production	0.029	9,096.825
20	launch	0.026	8,383.968
21	job	0.026	8,320.046
22	manage	0.025	7,810.570
23	bp_alaska	0.024	7,515.511
24	market	0.023	7,488.365
25	data	0.023	7,239.467
26	cherry_point_refinery	0.022	7,140.821
27	major	0.022	7,114.963
28	cera_week	0.022	6,958.674
29	ghp_rise	0.022	6,958.080
30	prudhoe_bay	0.021	6,796.631
31	bob_dudley	0.021	6,543.015
32	fuel	0.020	6,496.421
33	host	0.019	6,018.138
34	improve	0.018	5,864.967
35	produce	0.018	5,774.749

Table D3 (cont'd)

Betweenness Centrality: Twitter of BP America

Rank	Node	Value	Unscaled
36	announce	0.018	5,701.558
37	drill	0.018	5,668.626
38	present	0.018	5,629.956
39	create	0.018	5,629.613
40	offshore	0.017	5,334.224
41	operation	0.017	5,321.751
42	global	0.017	5,303.083
43	first	0.017	5,277.795
44	pipeline	0.016	5,192.981
45	cost	0.016	5,163.919
46	reservoir	0.016	5,071.817
47	employees	0.015	4,919.924
48	efficient	0.015	4,861.453
49	environmental	0.015	4,809.108
50	per_day	0.015	4,776.601
51	renewables	0.015	4,703.447
52	meet	0.015	4,676.137
53	local	0.015	4,649.035
54	security	0.014	4,473.075
55	management	0.014	4,398.221
56	alaska	0.014	4,390.412
57	future	0.014	4,346.397
58	complete	0.013	4,291.857
59	impact	0.013	4,256.822
60	sponsor	0.013	4,256.604
61	grow	0.013	4,237.775
62	ago	0.013	4,118.934
63	barrels	0.013	4,108.340
64	emissions	0.013	4,106.464
65	sc	0.013	4,081.173
66	otc	0.013	4,045.710
67	provide	0.013	4,017.521
68	lower48	0.013	3,994.657
69	bp_tech	0.012	3,926.553
70	economy	0.012	3,903.367

Table D4

Closeness Centrality: Twitter of BP America

Rank	Node	Value	Unscaled
1	bp	0.006	5.672e-006
2	safety	0.006	5.655e-006
3	bp_america	0.006	5.652e-006
4	oil_and_gas	0.006	5.652e-006
5	energy	0.006	5.651e-006
6	houston	0.006	5.651e-006
7	go	0.006	5.651e-006
8	job	0.006	5.649e-006
9	market	0.006	5.649e-006
10	create	0.006	5.648e-006
11	launch	0.006	5.648e-006
12	exploration	0.006	5.648e-006
13	produce	0.006	5.648e-006
14	resource	0.006	5.648e-006
15	grow	0.006	5.647e-006
16	bp_stats	0.006	5.647e-006
17	major	0.006	5.646e-006
18	baker_energy	0.006	5.645e-006
19	lower48	0.006	5.645e-006
20	oil	0.006	5.645e-006
21	economy	0.006	5.644e-006
22	partner	0.006	5.643e-006
23	impact	0.006	5.643e-006
24	natural_gas	0.006	5.643e-006
25	leader	0.006	5.643e-006
26	bob_dudley	0.006	5.643e-006
27	new	0.006	5.642e-006
28	otc	0.006	5.642e-006
29	offshore	0.006	5.642e-006
30	security	0.006	5.642e-006
31	national_safety_month	0.006	5.642e-006
32	seek	0.006	5.642e-006
33	data	0.006	5.642e-006
34	distinguished_alumni	0.006	5.642e-006
35	manage	0.006	5.642e-006

Table D4 (cont'd)

Closeness Centrality: Twitter of BP America

Rank	Node	Value	Unscaled
36	capability	0.006	5.641e-006
37	maintain	0.006	5.641e-006
38	discuss	0.006	5.641e-006
39	drill	0.006	5.641e-006
40	meet	0.006	5.641e-006
41	sc	0.006	5.641e-006
42	project	0.006	5.641e-006
43	industry	0.006	5.641e-006
44	business	0.006	5.640e-006
45	honors	0.006	5.640e-006
46	encourage	0.006	5.640e-006
47	enjoy	0.006	5.640e-006
48	facility	0.006	5.640e-006
49	multiple_sclerosis	0.006	5.640e-006
50	cherry_point	0.006	5.640e-006
51	empower	0.006	5.640e-006
52	present	0.006	5.640e-006
53	help	0.006	5.639e-006
54	improve	0.006	5.639e-006
55	bp_alaska	0.006	5.639e-006
56	hand-in-hand	0.006	5.639e-006
57	economist	0.006	5.639e-006
58	more	0.006	5.639e-006
59	awea	0.006	5.639e-006
60	cw17	0.006	5.639e-006
61	cera_week	0.006	5.638e-006
62	production	0.006	5.638e-006
63	bp_ms_150	0.006	5.638e-006
64	dupont_biobased	0.006	5.638e-006
65	closely	0.006	5.638e-006
66	develop	0.006	5.638e-006
67	approved	0.006	5.638e-006
68	directly	0.006	5.638e-006
69	otc2017	0.006	5.638e-006
70	ago	0.006	5.637e-006

Table D5

Top Scoring Nodes Side-By-Side for Centrality Measures: Twitter of BP America

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
1	bp	bp	bp
2	energy	bp_america	safety
3	bp_america	energy	bp_america
4	oil	houston	oil_and_gas
5	bp_stats	new	energy
6	project	safety	houston
7	new	oil	go
8	otc2017	bp_stats	job
9	more	help	market
10	employees	project	create
11	energy_outlook	natural_gas	launch
12	future	oil_and_gas	exploration
13	carbon	exploration	produce
14	global	business	resource
15	operation	otc2017	grow
16	help	industry	bp_stats
17	industry	more	major
18	safety	proudly	baker_energy
19	cera_week	production	lower48
20	invest	launch	oil
21	market	job	economy
22	natural_gas	manage	partner
23	production	bp_alaska	impact
24	bob_dudley	market	natural_gas
25	business	data	leader
26	major	cherry_point_refinery	bob_dudley
27	safer	major	new
28	cherry_point_refinery	cera_week	otc
29	oil_and_gas	ghp_rise	offshore
30	emissions	prudhoe_bay	security
31	ceo	bob_dudley	national_safety_month
32	houston	fuel	seek
33	alaska	host	data
34	1q2017	improve	distinguished_alumni
35	bp_plc	produce	manage

Table D5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Twitter of BP America

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
36	gulf_of_mexico	announce	capability
37	offshore	drill	maintain
38	proudly	present	discuss
39	celebrate	create	drill
40	deepwater	offshore	meet
41	engineers	operation	sc
42	financial	global	project
43	go	first	industry
44	lower	pipeline	business
45	result	cost	honors
46	sponsor	reservoir	encourage
47	bp_alaska	employees	enjoy
48	cooper_river	efficient	facility
49	job	environmental	multiple_sclerosis
50	operate	per_day	cherry_point
51	platform	renewables	empower
52	price	meet	present
53	bp_results	local	help
54	first	security	improve
55	growth	management	bp_alaska
56	launch	alaska	hand-in-hand
57	local	future	economist
58	otc_houston	complete	more
59	present	impact	awea
60	safe	sponsor	cw17
61	cost	grow	cera_week
62	drill	ago	production
63	energy_challenge	barrels	bp_ms_150
64	expand	emissions	dupont_biobased
65	fuel	sc	closely
66	host	otc	develop
67	bp_ms_150	provide	approved
68	demand	lower48	directly
69	development	bp_tech	otc2017
70	efficient	economy	ago

Table D5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Twitter of BP America

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
71	ensure	event	attendees
72	exploration	invest	leadership
73	highlight	go	seismic_imaging
74	linkedin	outlook	cleaner
75	multiple_sclerosis	driver_rewards	e_week_2017
76	renewable	celebrate	sophomore
77	share	effort	pipefitters
78	south_expansion	energy_outlook	add
79	bp_tech	innovative	engineers_week
80	chief_economist	capability	jersey
81	company	multiple_sclerosis	campaign
82	environment	nears	fun
83	largest	chicago	boost
84	mad_dog	awea	publishes
85	one	health	reinvests
86	prudhoe_bay	facility	fosters
87	reduce	growth	line
88	renewables	resource	carbon_dividends
89	2035	price	chairman
90	40years	renewable	company
91	baker_energy	enough	deputy_ceo
92	chicago	distinguished_alumni	explain
93	complete	attendees	facilities_engineer_team_lead
94	congratulations	operate	go_red_wear_red
95	digital	experience	hacr2017
96	economy	performance	love_stem_sd
97	enabled	program	military
98	environmental	gas	paris_climate_accord
99	facility	share	process_asset_development_engineer
100	lead	consistent	simulators

Appendix E

Figure E1

Network Group 1: Facebook of Occupy Monsanto
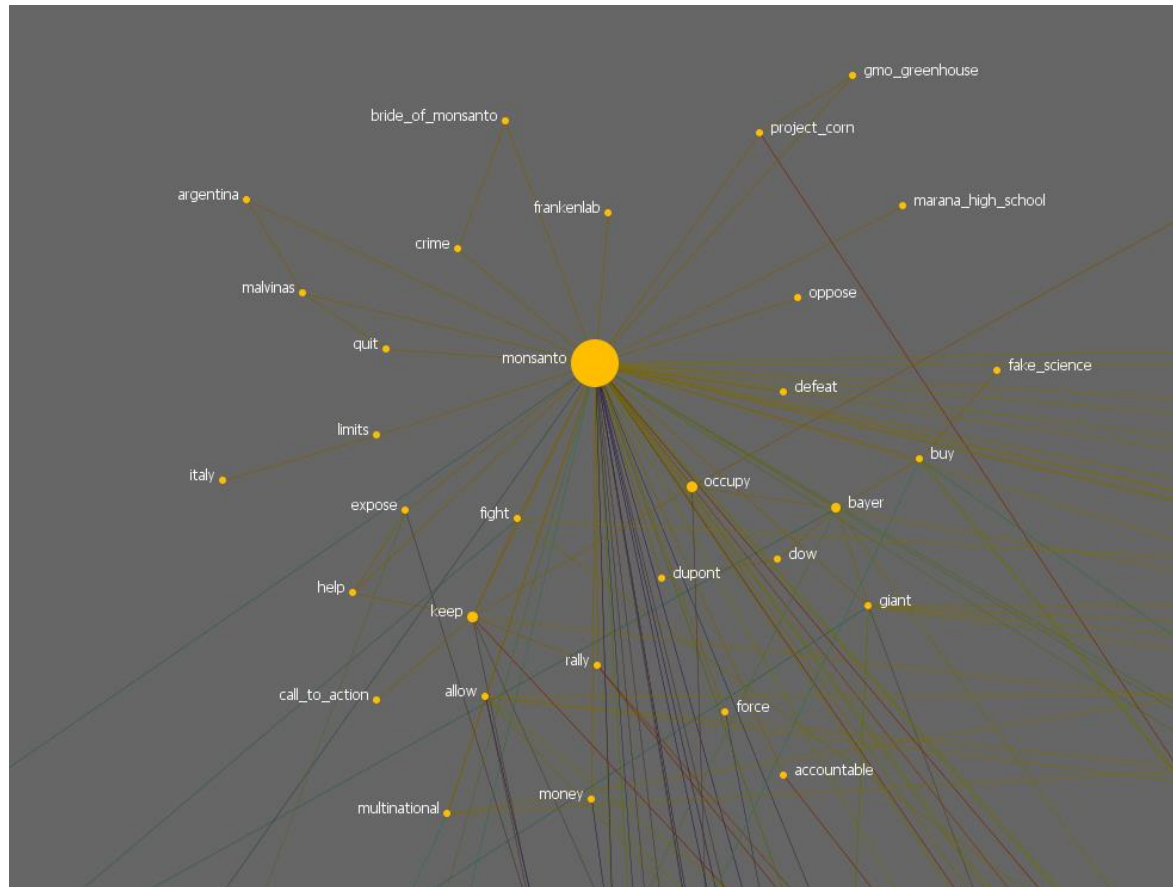
Figure E2

Network Group 2: Facebook of Occupy Monsanto
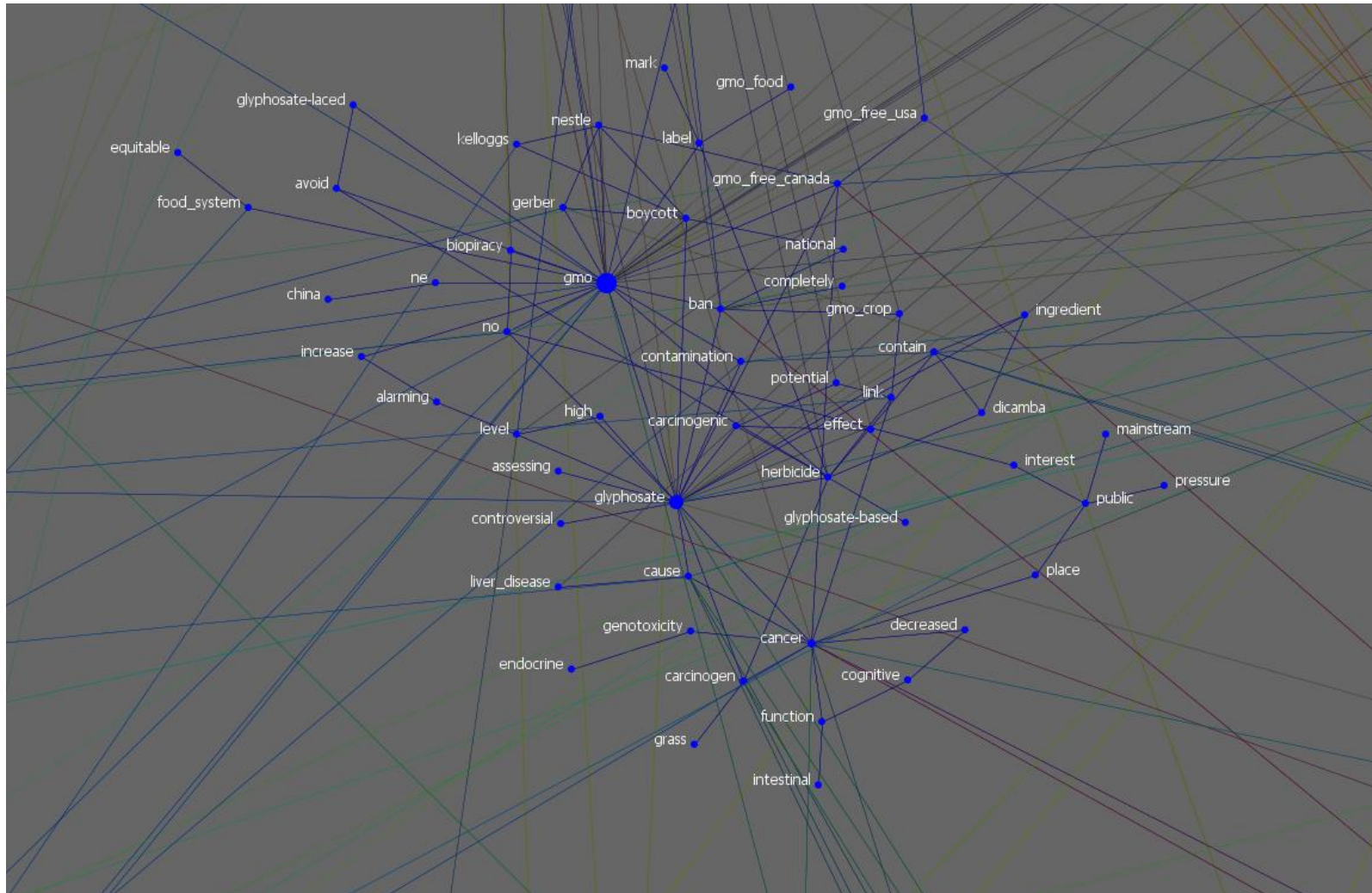
Figure E3

Network Group 3: Facebook of Occupy Monsanto
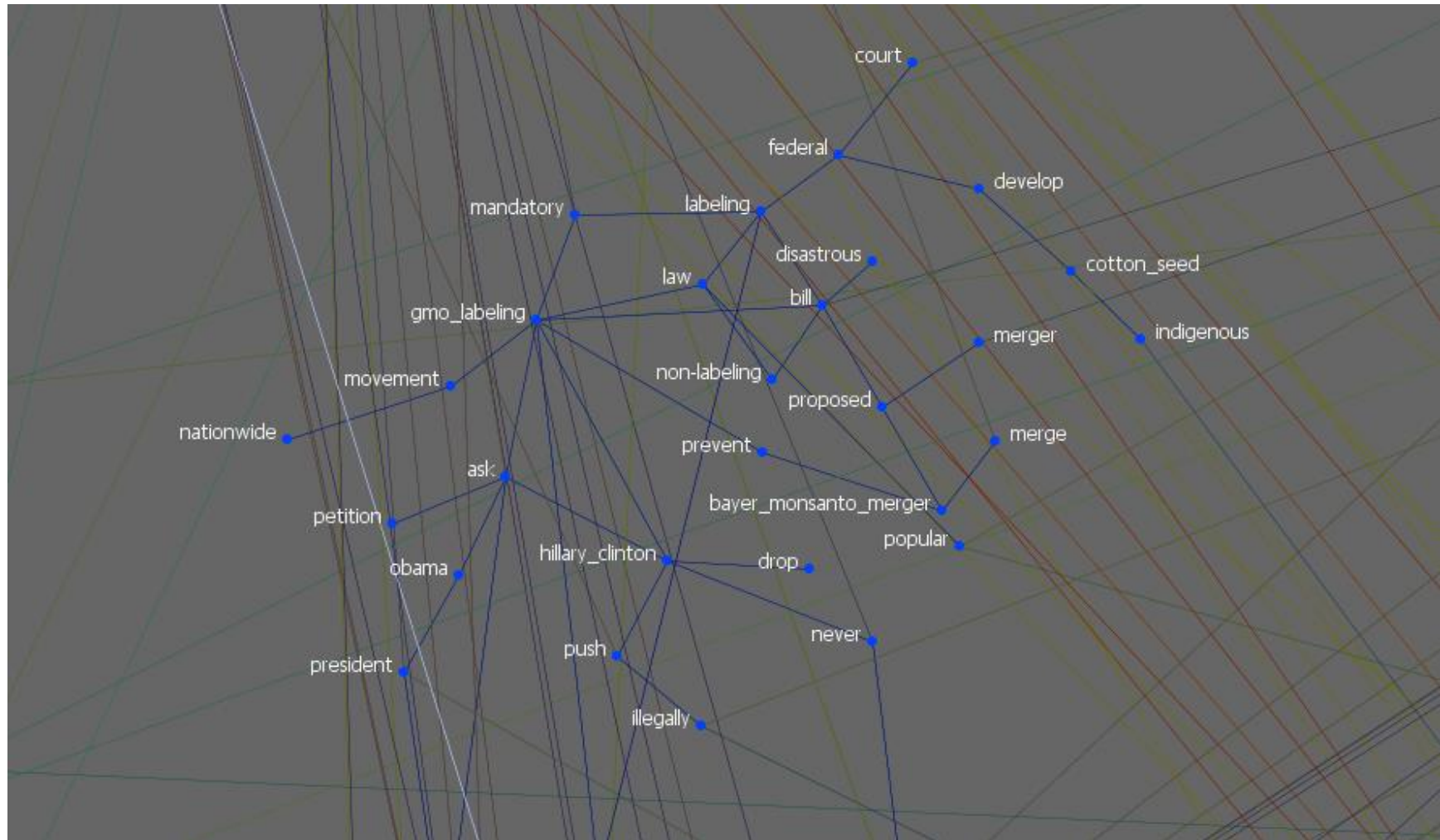
Figure E4

Network Group 4: Facebook of Occupy Monsanto
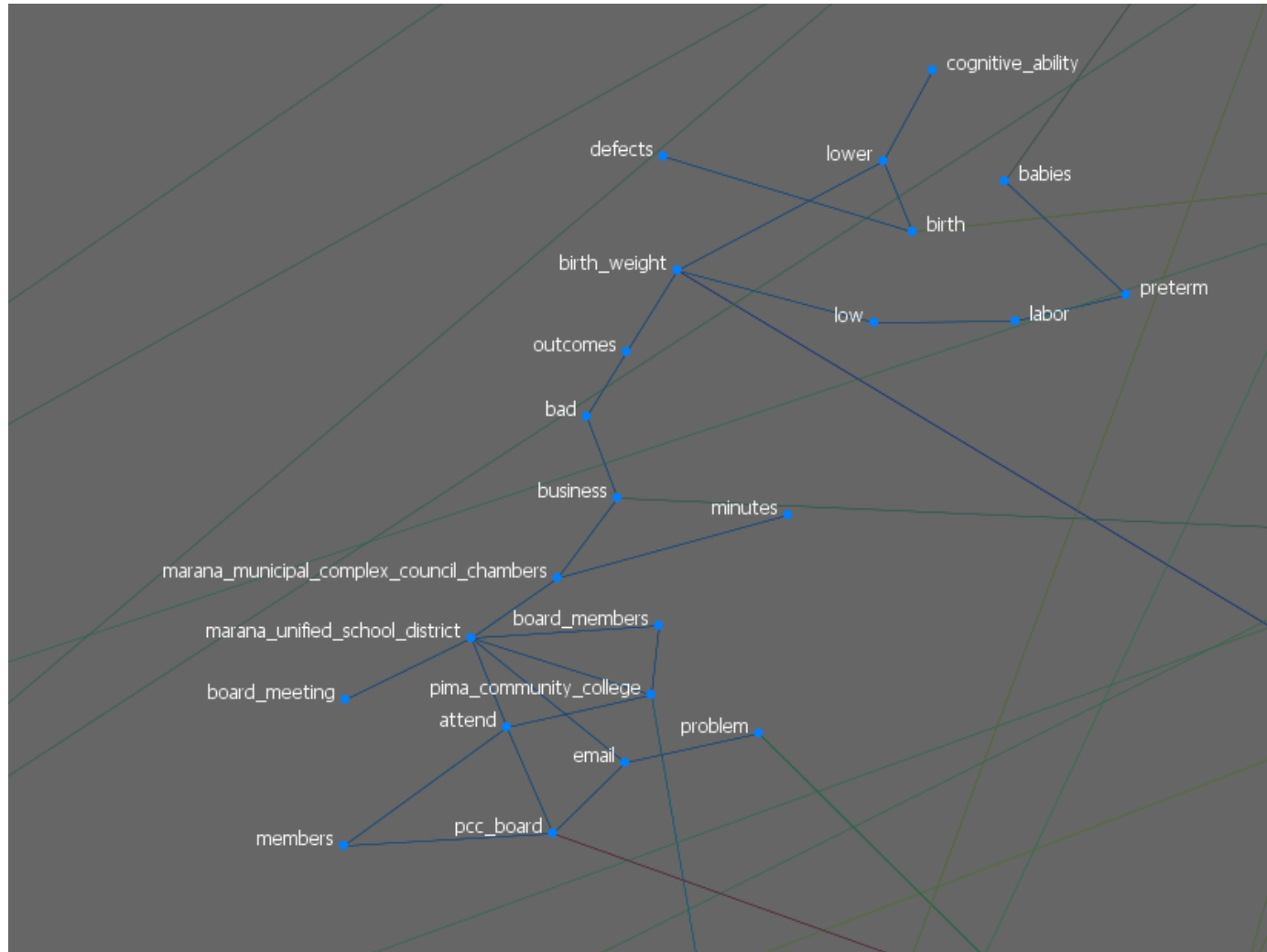
Figure E5

Network Group 5: Facebook of Occupy Monsanto
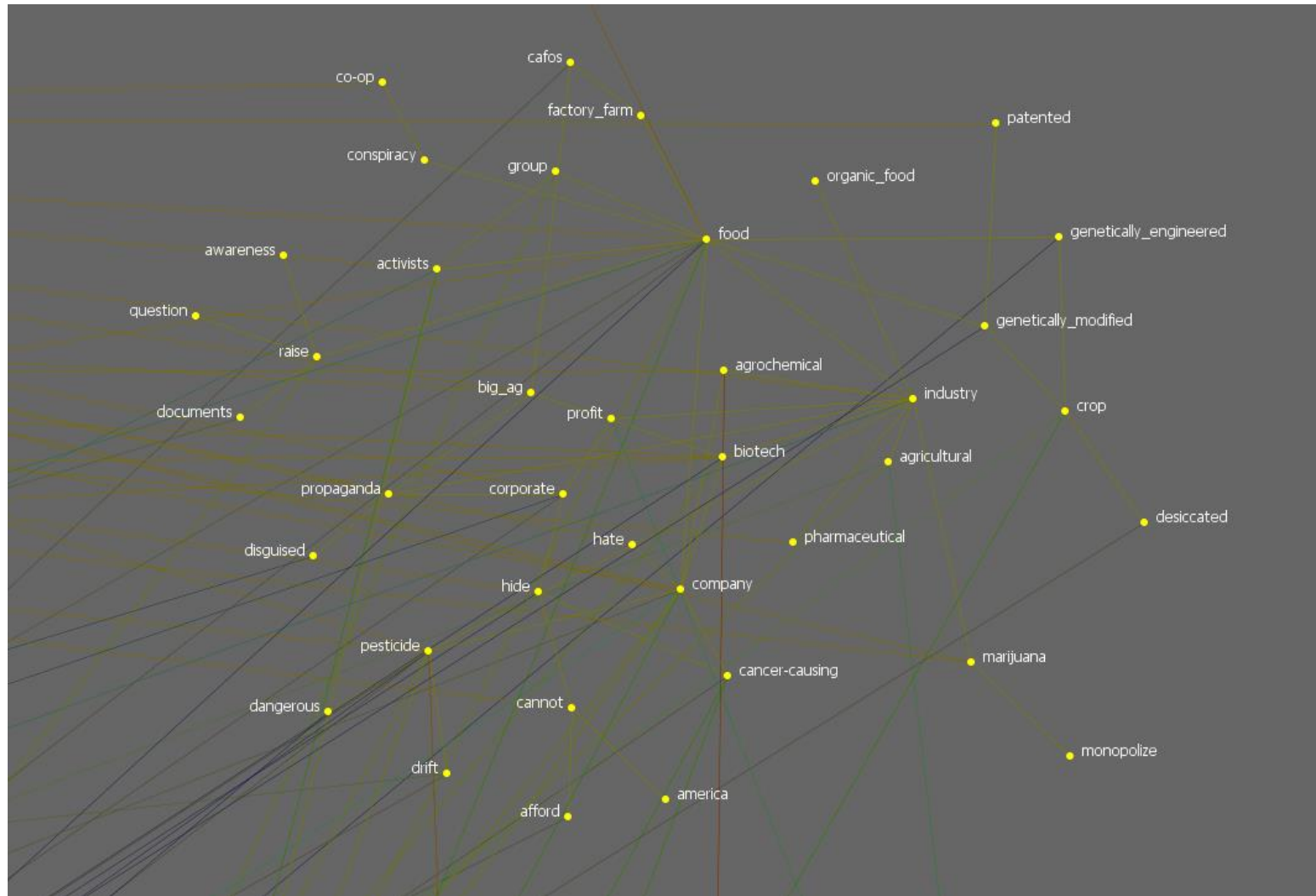
Figure E6

Network Group 6: Facebook of Occupy Monsanto
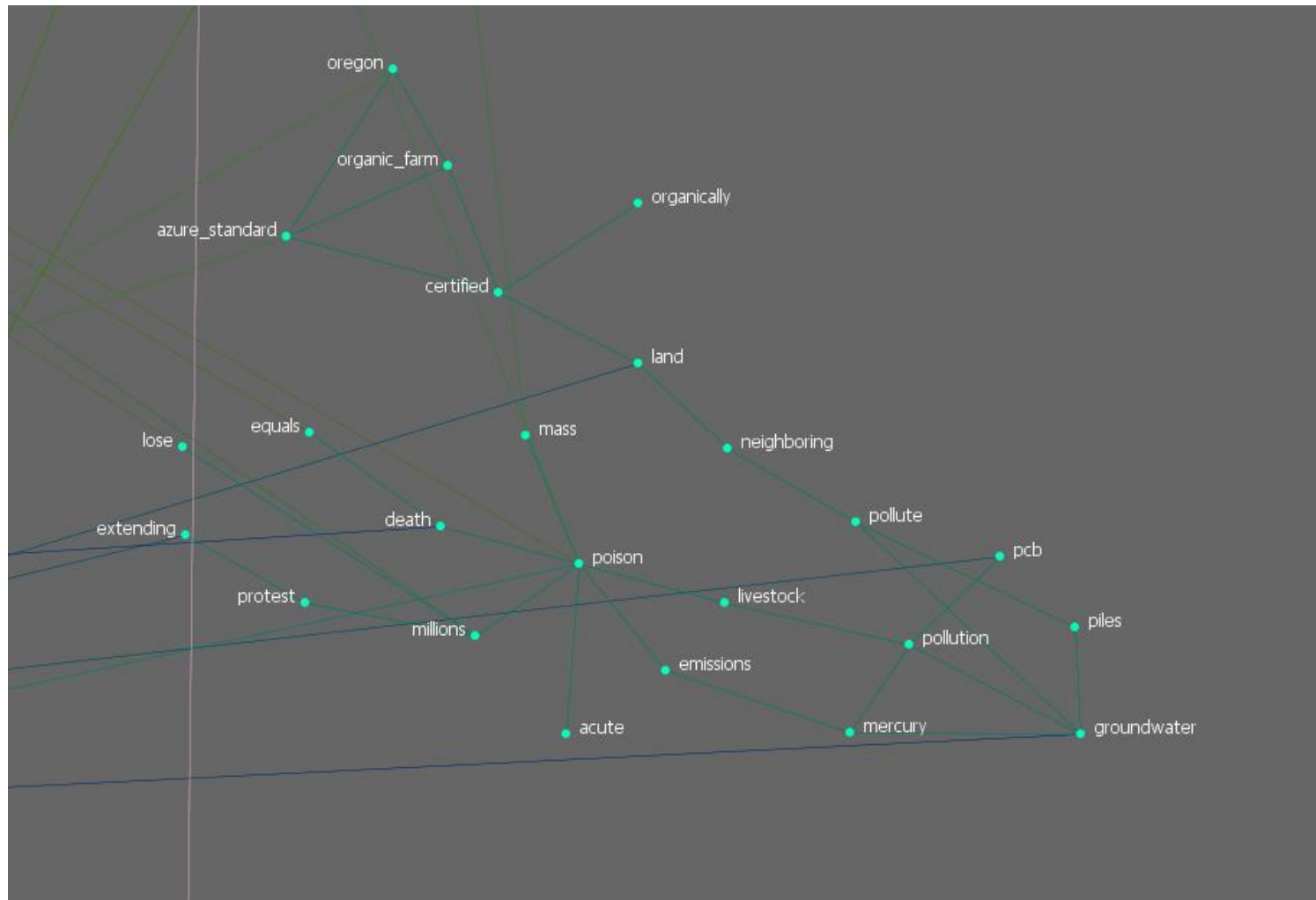
Figure E7

Network Group 7: Facebook of Occupy Monsanto
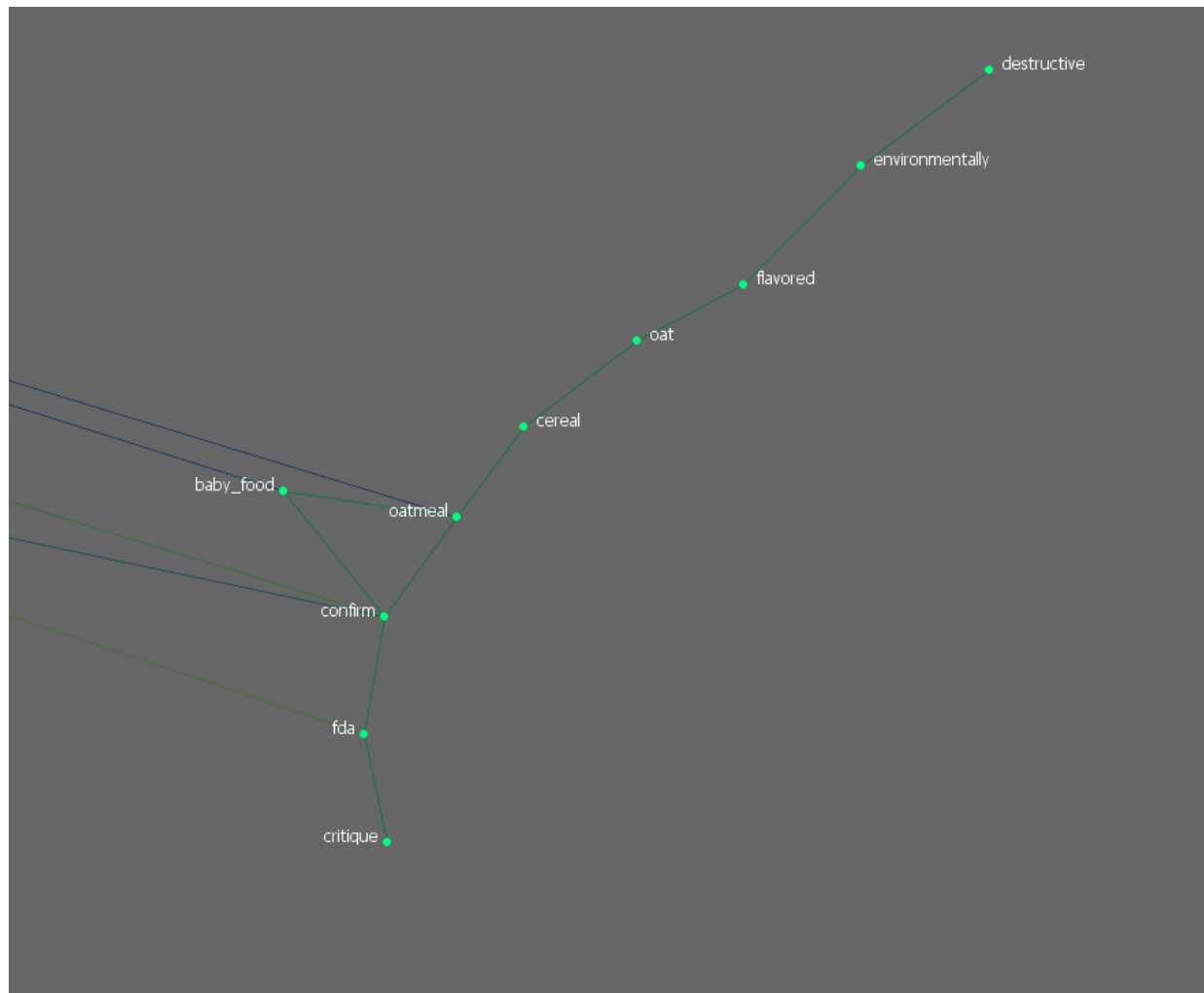
Figure E8

Network Group 8: Facebook of Occupy Monsanto
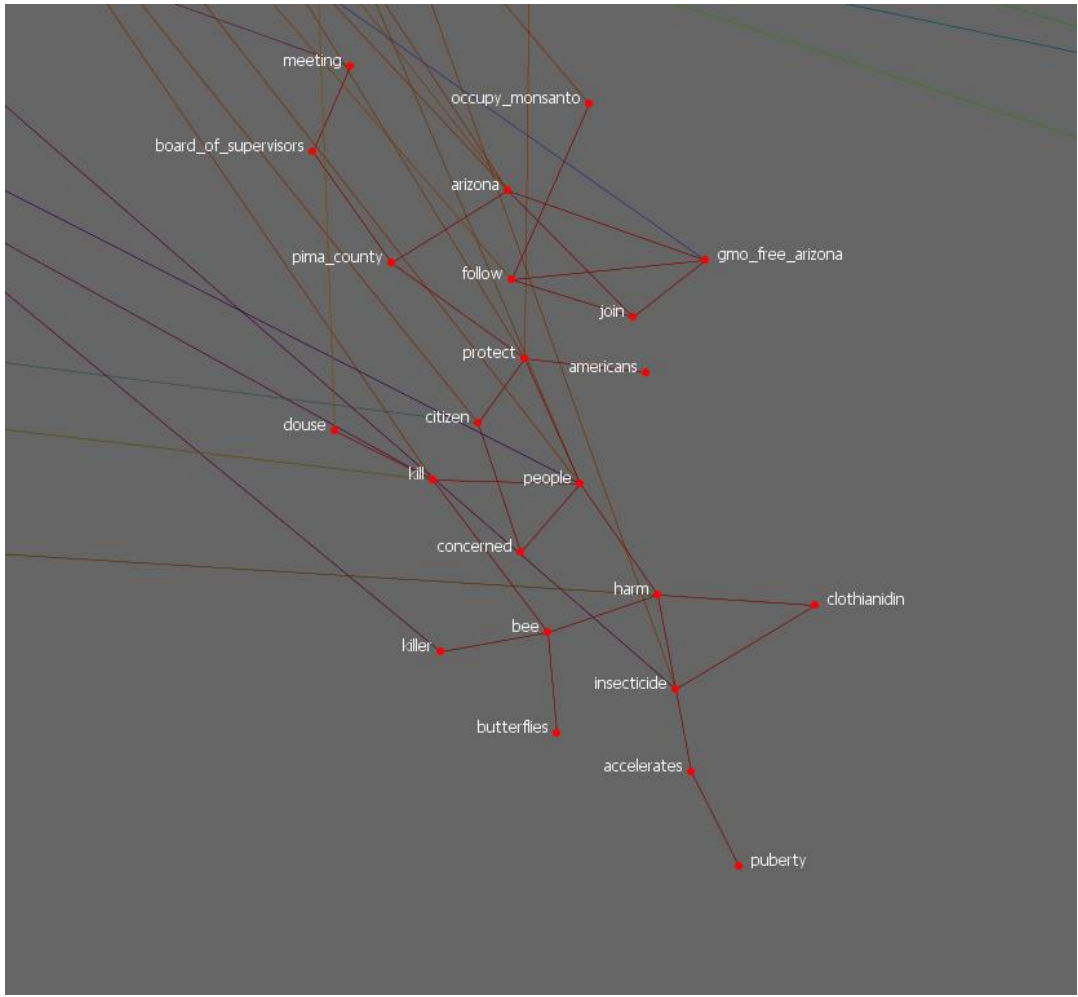
Figure E9

Network Group 9: Facebook of Occupy Monsanto
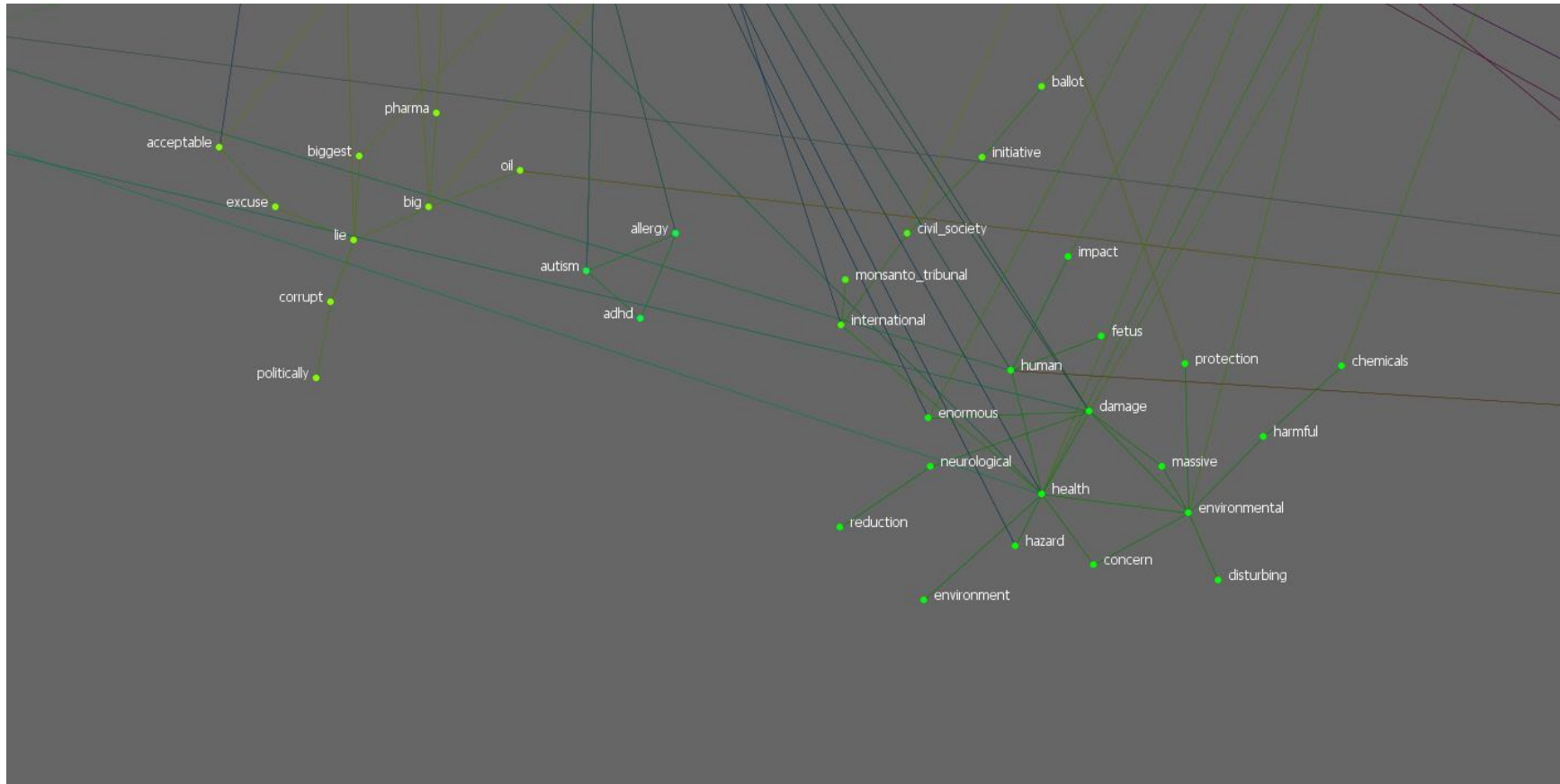
Figure E10

Network Group 10: Facebook of Occupy Monsanto
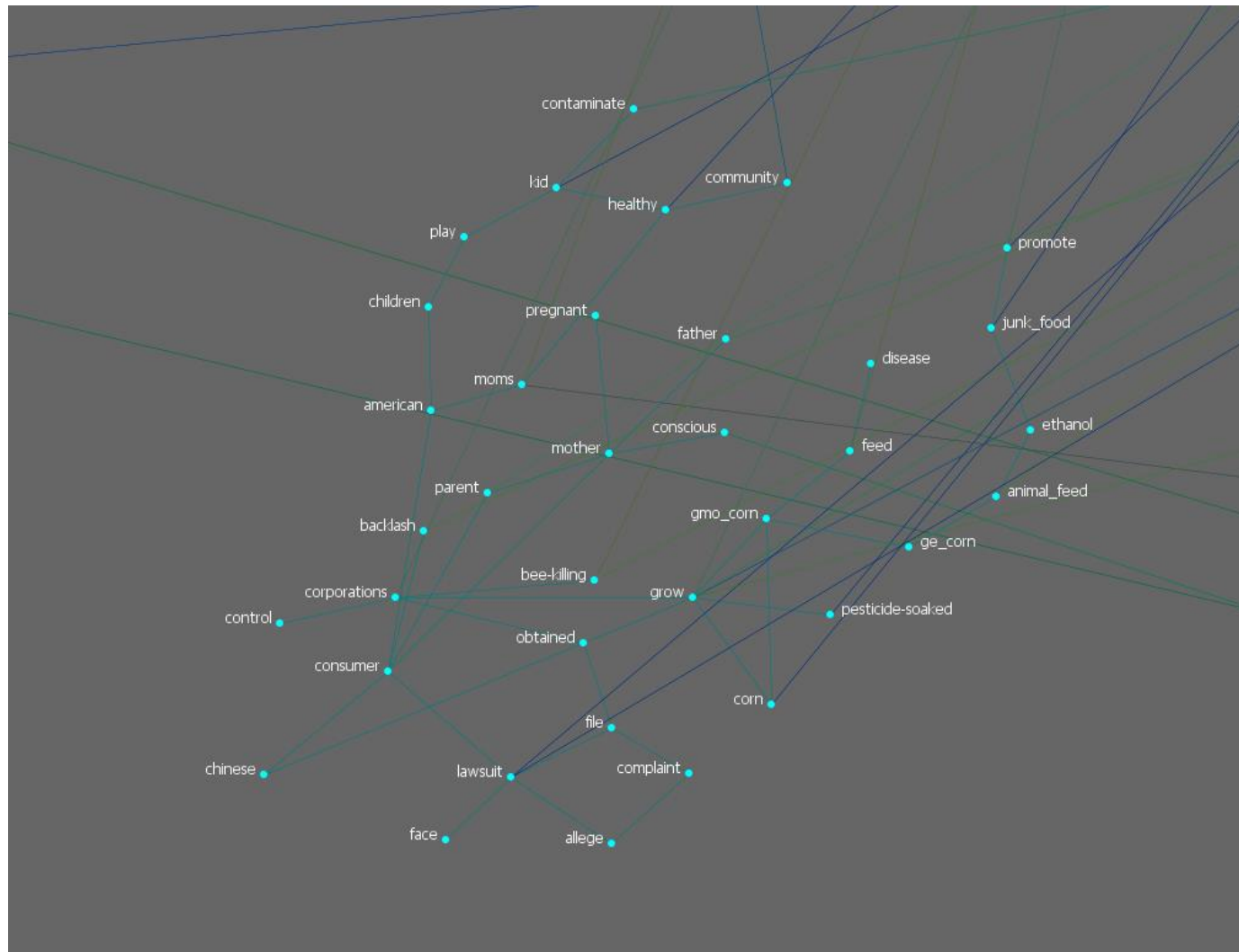
Figure E11

Network Group 11: Facebook of Occupy Monsanto
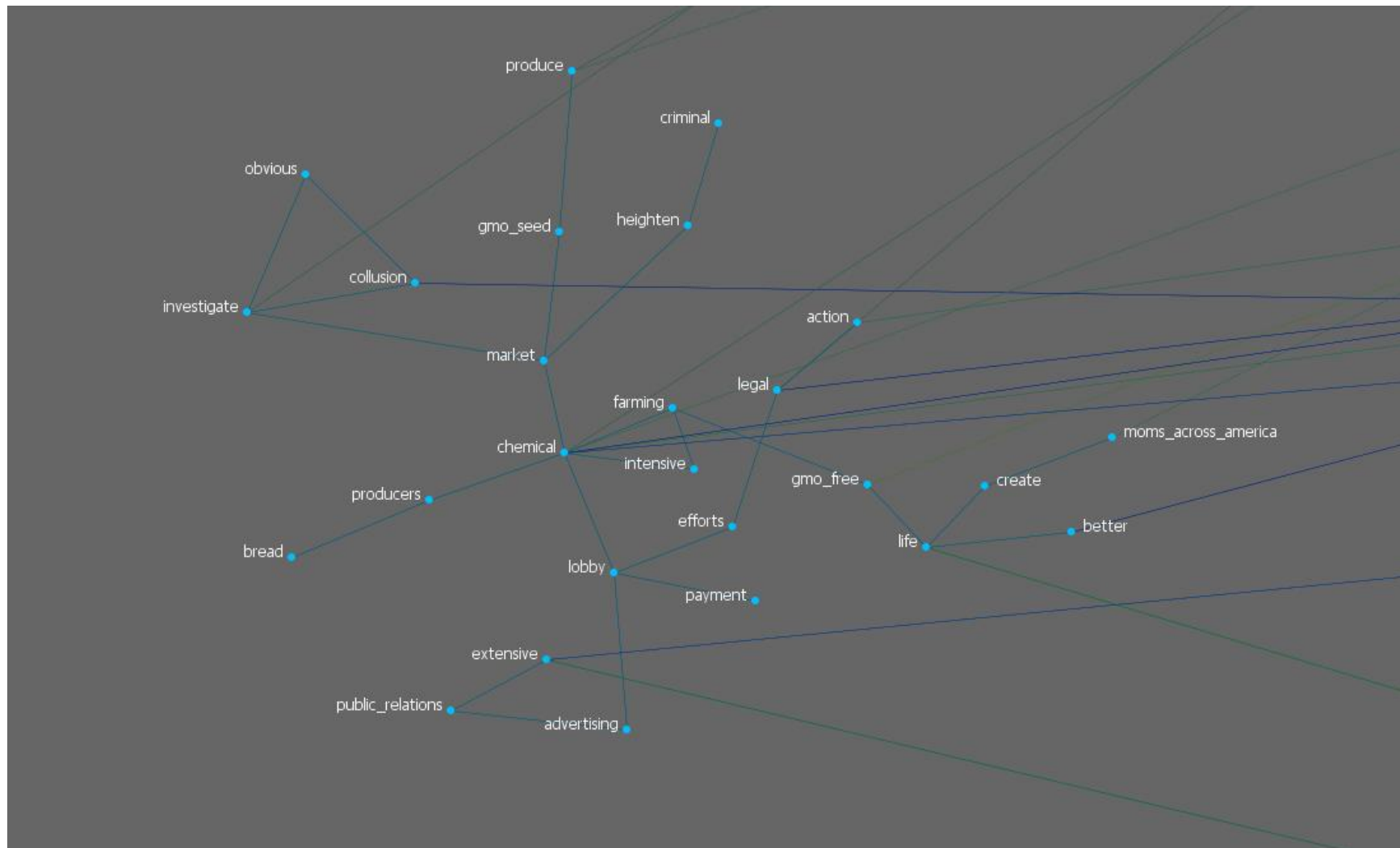
Figure E12

Network Group 12: Facebook of Occupy Monsanto
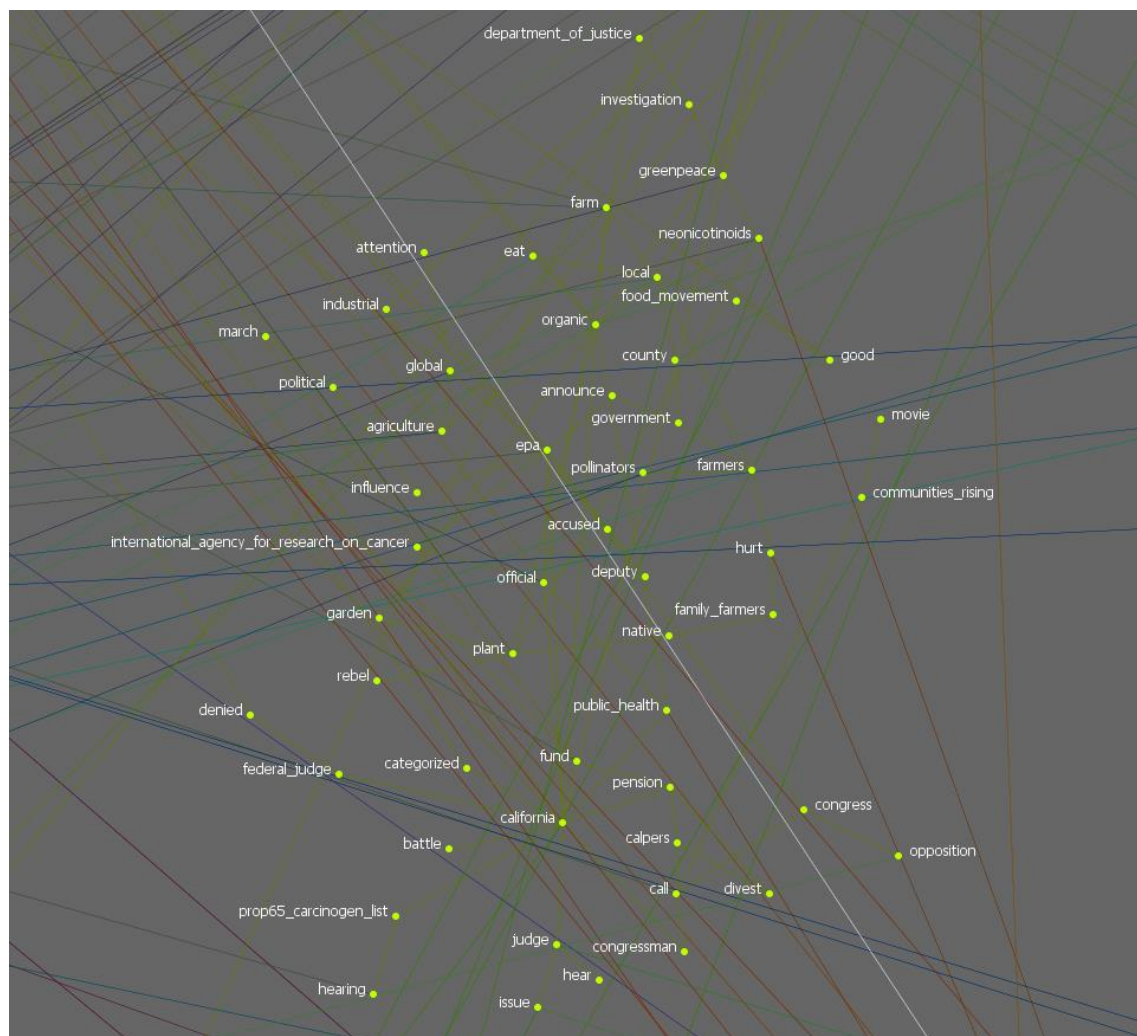
Figure E13

Network Group 13: Facebook of Occupy Monsanto
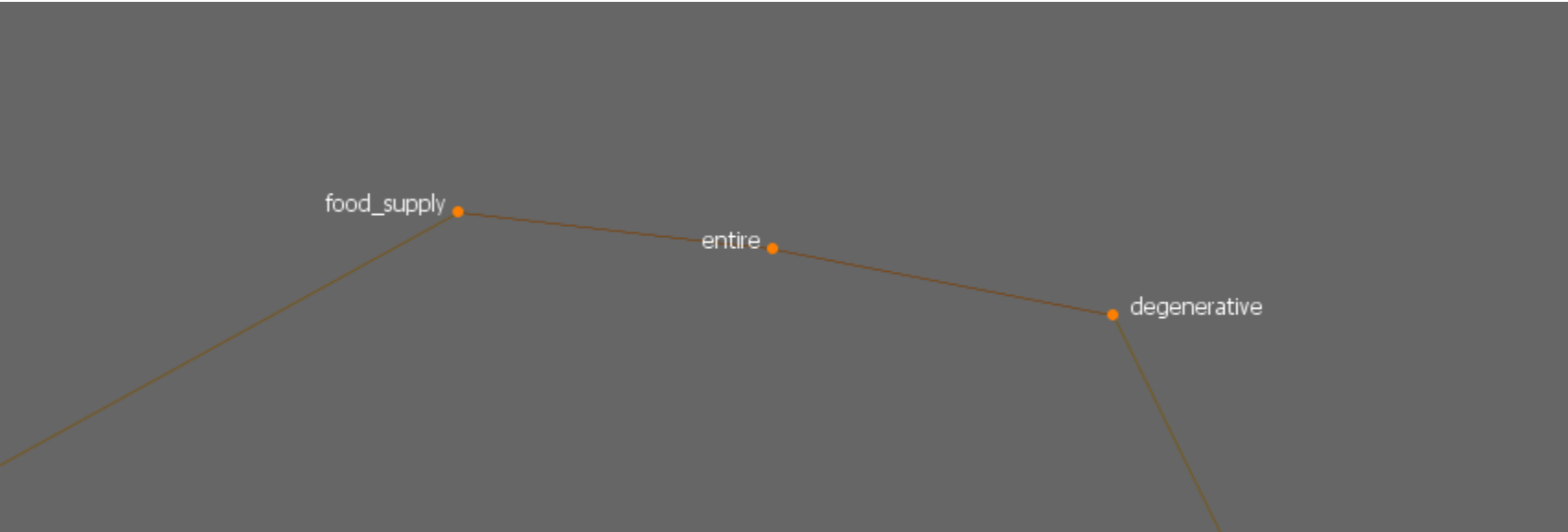
Table E1

Node Frequency: Facebook of Occupy Monsanto

Rank	Node	Frequency
1	monsanto	464
2	glyphosate	125
3	gmo	109
4	roundup	85
5	stop	66
6	out	61
7	food	60
8	bayer	55
9	no	55
10	epa	53
11	california	52
12	pima county	47
13	keep	43
14	tpp	42
15	occupy	41
16	cancer	40
17	farmers	38
18	pesticide	38
19	arizona	37
20	label	36
21	seed	34
22	hilary clinton	33
23	fight	32
24	herbicide	32
25	weedkiller	31
26	spray	30
27	industry	27
28	monsanto tribunal	27
29	tom vilsack	27
30	ban	26
31	health	26
32	united states	26
33	toxic	24
34	tucson	24
35	feed	22

Table E1 (cont'd)

Node Frequency: Facebook of Occupy Monsanto

Rank	Node	Frequency
36	lawsuit	22
37	crop	21
38	ingredient	21
39	bill	20
40	human	20
41	organic	20
42	poison	20
43	bayer-monsanto merger	19
44	biotech	19
45	chemical	19
46	cause	19
47	expose	19
48	safety	19
49	kill	18
50	crime	18

Table E2

Total-degree Centrality: Facebook of Occupy Monsanto

Rank	Node	Value	Unscaled
1	monsanto	0.017	680
2	gmo	0.007	292
3	glyphosate	0.005	208
4	keep	0.004	168
5	occupy	0.004	168
6	bayer	0.004	144
7	cancer	0.003	132
8	food	0.003	104
9	industry	0.002	96
10	california	0.002	88
11	herbicide	0.002	84
12	pesticide	0.002	80
13	ban	0.002	76
14	label	0.002	76
15	company	0.002	72
16	giant	0.002	72
17	health	0.002	72
18	organic	0.002	72
19	cause	0.002	68
20	gmo_free_canada	0.002	68
21	epa	0.002	64
22	allow	0.001	56
23	biotech	0.001	52
24	international	0.001	52
25	buy	0.001	48
26	chemical	0.001	48
27	gmo_labeling	0.001	48
28	pima_county	0.001	48
29	poison	0.001	48
30	arizona	0.001	44
31	boycott	0.001	44
32	consumer	0.001	44
33	grow	0.001	44
34	human	0.001	44
35	local	0.001	44

Table E2 (cont'd)

Total-degree Centrality: Facebook of Occupy Monsanto

Rank	Node	Value	Unscaled
36	official	0.001	44
37	gmo_free_usa	0.001	42
38	activists	9.938e-004	40
39	environmental	9.938e-004	40
40	expose	9.938e-004	40
41	fight	9.938e-004	40
42	pension	9.938e-004	40
43	protect	9.938e-004	40
44	contamination	8.945e-004	36
45	crop	8.945e-004	36
46	damage	8.945e-004	36
47	level	8.945e-004	36
48	agriculture	7.951e-004	32
49	agrochemical	7.951e-004	32
50	bill	7.951e-004	32
51	citizen	7.951e-004	32
52	contain	7.951e-004	32
53	farm	7.951e-004	32
54	groundwater	7.951e-004	32
55	harm	7.951e-004	32
56	hillary_clinton	7.951e-004	32
57	kill	7.951e-004	32
58	monsanto_tribunal	7.951e-004	32
59	no	7.951e-004	32
60	people	7.951e-004	32
61	rally	7.951e-004	32
62	bee	6.957e-004	28
63	carcinogen	6.957e-004	28
64	corporate	6.957e-004	28
65	crime	6.957e-004	28
66	force	6.957e-004	28
67	genetically_modified	6.957e-004	28
68	gerber	6.957e-004	28
69	healthy	6.957e-004	28
70	judge	6.957e-004	28

Table E3

Betweenness Centrality: Facebook of Occupy Monsanto

Rank	Node	Value	Unscaled
1	monsanto	0.387	57,741.719
2	gmo	0.256	38,277.754
3	food	0.169	25,286.922
4	health	0.105	15,739.965
5	cancer	0.102	15,168.695
6	glyphosate	0.096	14,324.099
7	chemical	0.061	9,093.994
8	california	0.056	8,419.640
9	company	0.053	7,907.411
10	allow	0.052	7,719.881
11	pesticide	0.049	7,335.000
12	problem	0.043	6,440.426
13	local	0.043	6,390.866
14	ban	0.042	6,323.432
15	herbicide	0.042	6,285.560
16	plant	0.041	6,110.964
17	contamination	0.040	6,024.843
18	damage	0.040	5,961.804
19	email	0.039	5,775.193
20	gmo_free_canada	0.036	5,340.324
21	epa	0.034	5,139.800
22	ask	0.032	4,802.657
23	link	0.031	4,627.373
24	labeling	0.029	4,345.456
25	hide	0.029	4,259.249
26	people	0.028	4,239.125
27	organic	0.028	4,178.517
28	lawsuit	0.028	4,115.906
29	grow	0.027	4,106.898
30	farm	0.027	4,066.238
31	gmo_labeling	0.027	3,960.522
32	oatmeal	0.026	3,922.054
33	marana_unified_school_district	0.025	3,738.317
34	kill	0.025	3,673.290
35	contain	0.024	3,624.671

Table E3 (cont'd)

Betweenness Centrality: Facebook of Occupy Monsanto

Rank	Node	Value	Unscaled
36	poison	0.024	3,596.373
37	industry	0.023	3,501.972
38	gerber	0.023	3,500.828
39	confirm	0.023	3,435.876
40	kid	0.023	3,415.744
41	call	0.022	3,217.041
42	birth_weight	0.021	3,098.521
43	giant	0.021	3,087.647
44	label	0.021	3,081.279
45	cereal	0.021	3,064
46	carcinogen	0.020	3,009.392
47	corporations	0.020	2,969.196
48	insecticide	0.019	2,902.065
49	business	0.019	2,853.729
50	multinational	0.019	2,816.977
51	international	0.019	2,795.424
52	corporate	0.018	2,746.366
53	promote	0.018	2,701.261
54	lie	0.018	2,654.259
55	azure_standard	0.017	2,560.752
56	neonicotinoids	0.017	2,513.458
57	keep	0.017	2,485.318
58	biopiracy	0.017	2,483.533
59	cause	0.016	2,399.623
60	oat	0.015	2,304
61	lobby	0.015	2,286.604
62	drift	0.015	2,256.445
63	groundwater	0.015	2,237.845
64	protect	0.015	2,228.360
65	pesticide-soaked	0.014	2,145.073
66	farmers	0.014	2,143.662
67	environmental	0.014	2,137.683
68	raise	0.014	2,076.175
69	cancer-causing	0.014	2,073.741
70	marana_municipal_complex_council_chambers	0.014	2,061.549

Table E4

Closeness Centrality: Facebook of Occupy Monsanto

Rank	Node	Value	Unscaled
1	monsanto	0.314	4.052e-004
2	gmo	0.297	3.837e-004
3	food	0.296	3.823e-004
4	company	0.274	3.541e-004
5	allow	0.272	3.516e-004
6	california	0.267	3.453e-004
7	biopiracy	0.265	3.422e-004
8	promote	0.264	3.413e-004
9	glyphosate	0.264	3.406e-004
10	president	0.263	3.404e-004
11	chemical	0.263	3.394e-004
12	multinational	0.262	3.390e-004
13	industry	0.260	3.356e-004
14	health	0.259	3.349e-004
15	pesticide	0.258	3.333e-004
16	potential	0.255	3.294e-004
17	gmo_crop	0.254	3.287e-004
18	kill	0.254	3.279e-004
19	biotech	0.253	3.274e-004
20	corporate	0.253	3.268e-004
21	ban	0.253	3.264e-004
22	hide	0.252	3.253e-004
23	genetically_modified	0.251	3.249e-004
24	plant	0.250	3.228e-004
25	help	0.250	3.226e-004
26	big	0.248	3.209e-004
27	activists	0.248	3.207e-004
28	arizona	0.248	3.207e-004
29	big_ag	0.248	3.207e-004
30	label	0.248	3.203e-004
31	link	0.248	3.201e-004
32	marijuana	0.247	3.191e-004
33	fund	0.247	3.187e-004
34	ask	0.246	3.185e-004
35	investigate	0.246	3.183e-004

Table E4 (cont'd)

Closeness Centrality: Facebook of Occupy Monsanto

Rank	Node	Value	Unscaled
36	patented	0.246	3.175e-004
37	propaganda	0.246	3.175e-004
38	effect	0.245	3.169e-004
39	hate	0.245	3.169e-004
40	keep	0.245	3.167e-004
41	local	0.245	3.165e-004
42	nestle	0.245	3.163e-004
43	categorized	0.244	3.155e-004
44	equals	0.244	3.151e-004
45	protection	0.243	3.145e-004
46	rally	0.242	3.133e-004
47	lie	0.242	3.131e-004
48	greenpeace	0.242	3.127e-004
49	gmo_free_canada	0.241	3.119e-004
50	accused	0.241	3.117e-004
51	cafos	0.241	3.111e-004
52	project_corn	0.241	3.108e-004
53	agriculture	0.240	3.104e-004
54	herbicide	0.240	3.102e-004
55	money	0.240	3.102e-004
56	babies	0.240	3.098e-004
57	lose	0.240	3.098e-004
58	never	0.240	3.098e-004
59	dupont	0.239	3.094e-004
60	occupy_monsanto	0.239	3.092e-004
61	bride_of_monsanto	0.239	3.090e-004
62	co-op	0.239	3.090e-004
63	denied	0.239	3.090e-004
64	limits	0.239	3.090e-004
65	malvinas	0.239	3.088e-004
66	quit	0.239	3.088e-004
67	argentina	0.239	3.086e-004
68	defeat	0.239	3.086e-004
69	marana_high_school	0.239	3.086e-004
70	cancer	0.239	3.085e-004

Table E5

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Occupy Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
1	monsanto	monsanto	monsanto
2	gmo	gmo	gmo
3	glyphosate	food	food
4	keep	health	company
5	occupy	cancer	allow
6	bayer	glyphosate	california
7	cancer	chemical	biopiracy
8	food	california	promote
9	industry	company	glyphosate
10	california	allow	president
11	herbicide	pesticide	chemical
12	pesticide	problem	multinational
13	ban	local	industry
14	label	ban	health
15	company	herbicide	pesticide
16	giant	plant	potential
17	health	contamination	gmo_crop
18	organic	damage	kill
19	cause	email	biotech
20	gmo_free_canada	gmo_free_canada	corporate
21	epa	epa	ban
22	allow	ask	hide
23	biotech	link	genetically_modified
24	international	labeling	plant
25	buy	hide	help
26	chemical	people	big
27	gmo_labeling	organic	activists
28	pima_county	lawsuit	arizona
29	poison	grow	big_ag
30	arizona	farm	label
31	boycott	gmo_labeling	link
32	consumer	oatmeal	marijuana
33	grow	marana_unified_school_district	fund
34	human	kill	ask
35	local	contain	investigate

Table E5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Occupy Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
36	official	poison	patented
37	gmo_free_usa	industry	propaganda
38	activists	gerber	effect
39	environmental	confirm	hate
40	expose	kid	keep
41	fight	call	local
42	pension	birth_weight	nestle
43	protect	giant	categorized
44	contamination	label	equals
45	crop	cereal	protection
46	damage	carcinogen	rally
47	level	corporations	lie
48	agriculture	insecticide	greenpeace
49	agrochemical	business	gmo_free_canada
50	bill	multinational	accused
51	citizen	international	cafos
52	contain	corporate	project_corn
53	farm	promote	agriculture
54	groundwater	lie	herbicide
55	harm	azure_standard	money
56	hillary_clinton	neonicotinoids	babies
57	kill	keep	lose
58	monsanto_tribunal	biopiracy	never
59	no	cause	dupont
60	people	oat	occupy_monsanto
61	rally	lobby	bride_of_monsanto
62	bee	drift	co-op
63	carcinogen	groundwater	denied
64	corporate	protect	limits
65	crime	pesticide-soaked	malvinas
66	force	farmers	quit
67	genetically_modified	environmental	argentina
68	gerber	raise	defeat

Table E5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Occupy Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
69	healthy	cancer-causing	marana_high_school
70	judge	marana_municipal_complex_council_chambers	cancer
71	labeling	investigate	epa
72	lawsuit	market	popular
73	marana_unified_school_district	pcc_board	neonicotinoids
74	mercury	agriculture	pesticide-soaked
75	nestle	federal	kid
76	plant	arizona	gerber
77	pollution	human	labeling
78	raise	nestle	produce
79	accountable	big_ag	organic
80	ask	level	group
81	autism	activists	corn
82	big	public	birth_weight
83	big_ag	expose	occupy
84	board_of_supervisors	protection	drift
85	cancer-causing	president	damage
86	civil_society	popular	afford
87	drift	parent	allergy
88	farmers	propaganda	liver_disease
89	fund	flavored	enormous
90	law	influence	ne
91	lie	greenpeace	carcinogenic
92	marijuana	birth	conspiracy
93	mother	official	degenerative
94	multinational	land	cancer-causing
95	neonicotinoids	rally	dangerous
96	propaganda	no	douse
97	public	issue	collusion
98	public_health	buy	bayer
99	agricultural	moms	carcinogen
100	allergy	gmo_crop	death

Appendix F

Figure F1

Network Group 1: Facebook of Monsanto

Figure F2

Network Group 2: Facebook of Monsanto
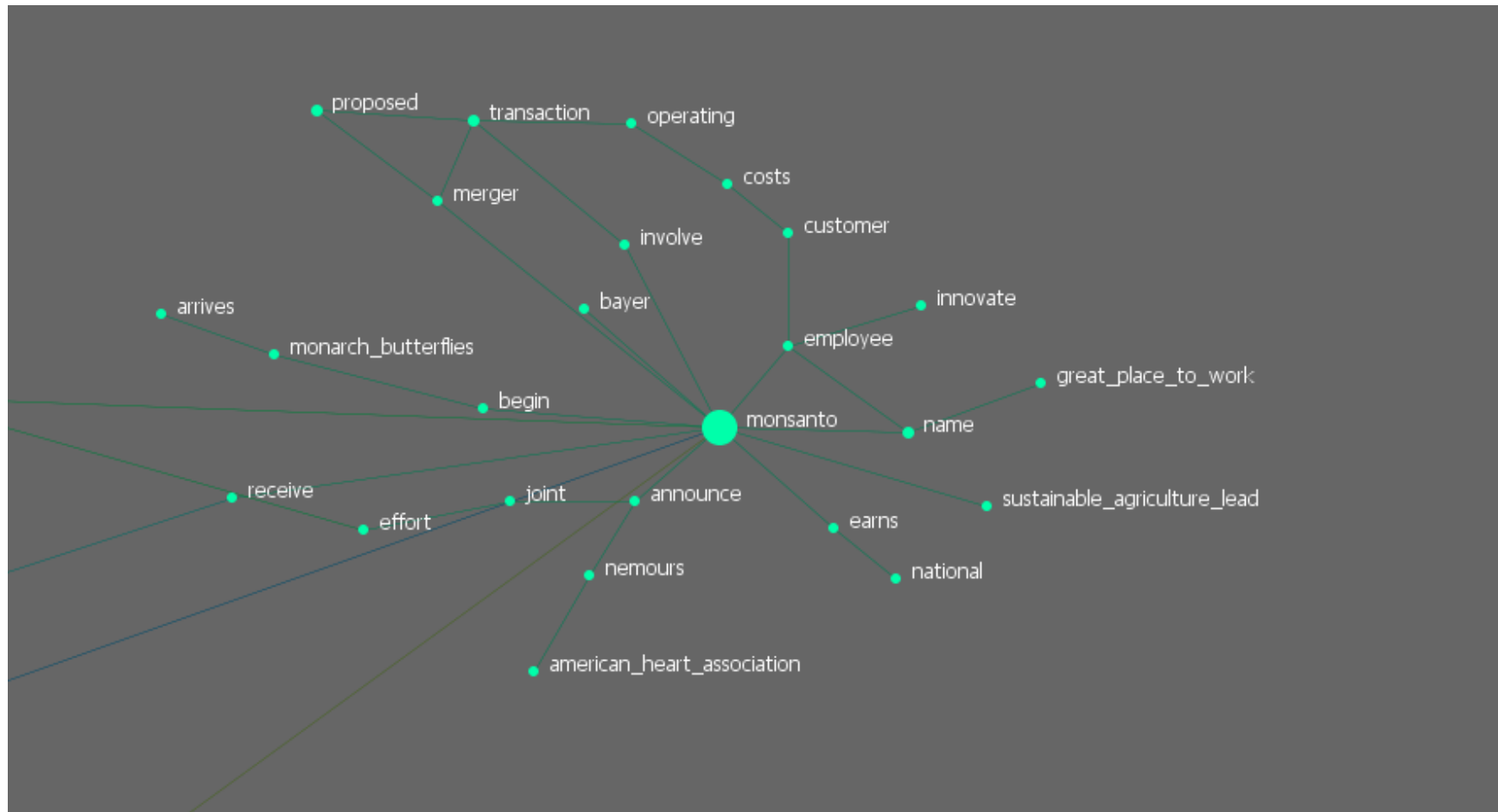
Figure F3

Network Group 3: Facebook of Monsanto
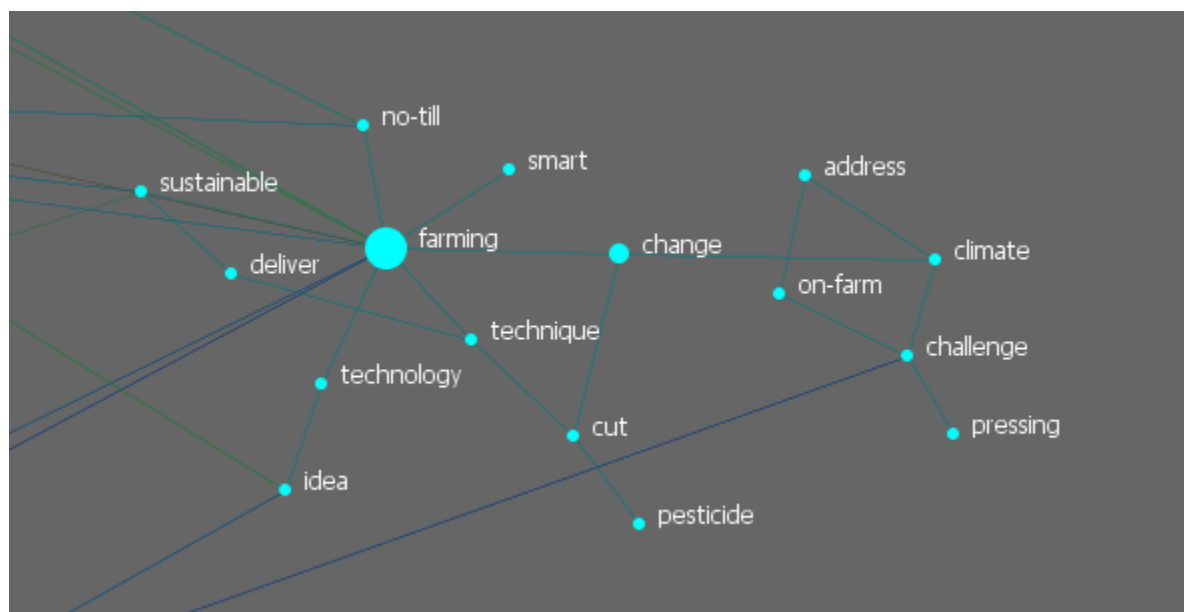
Figure F4

Network Group 4: Facebook of Monsanto
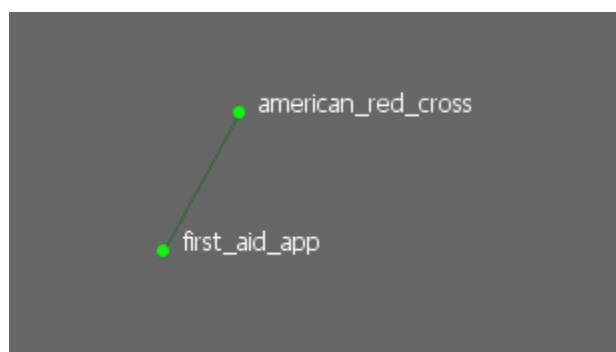
Figure F5

Network Group 5: Facebook of Monsanto
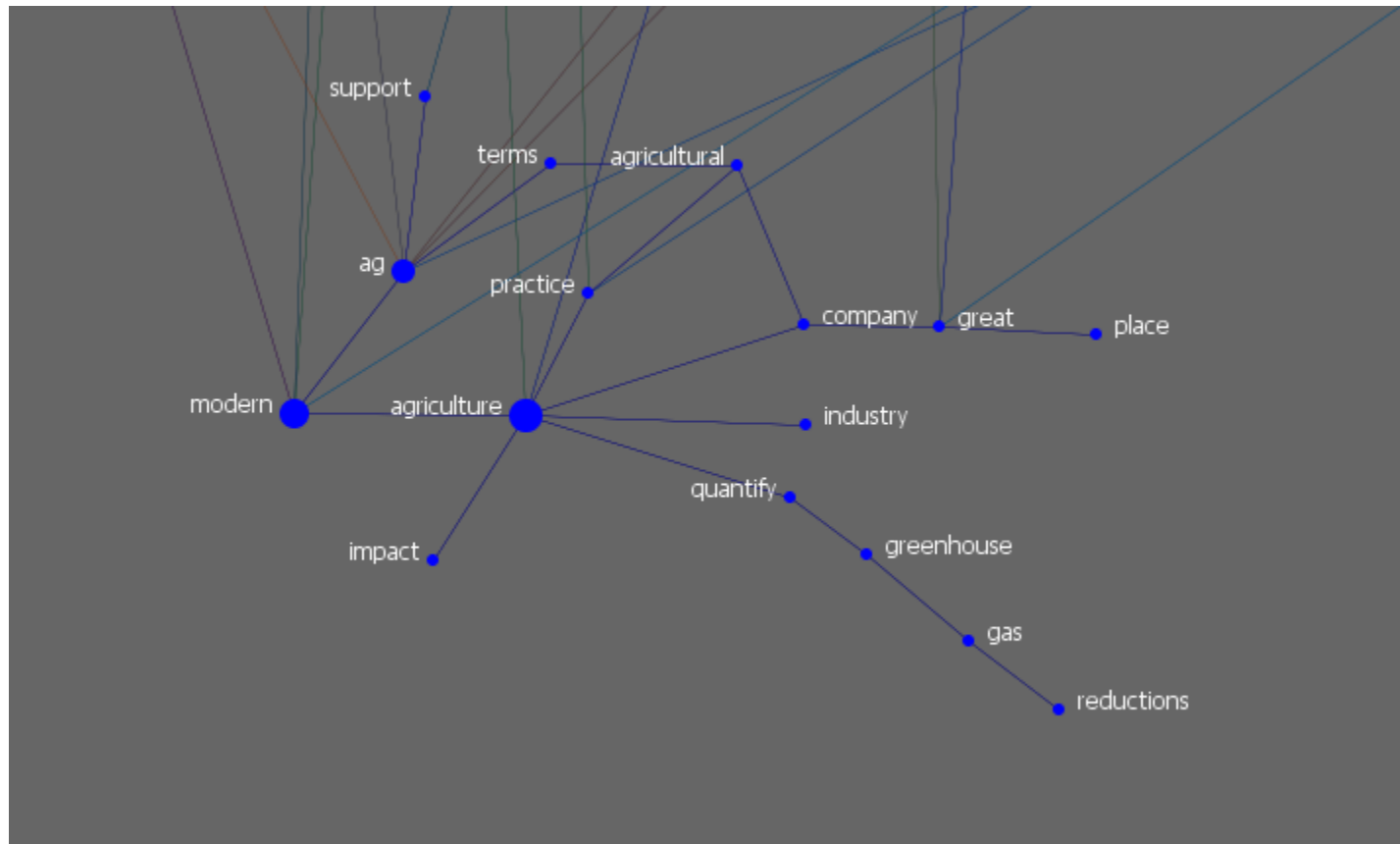
Figure F6

Network Group 6: Facebook of Monsanto
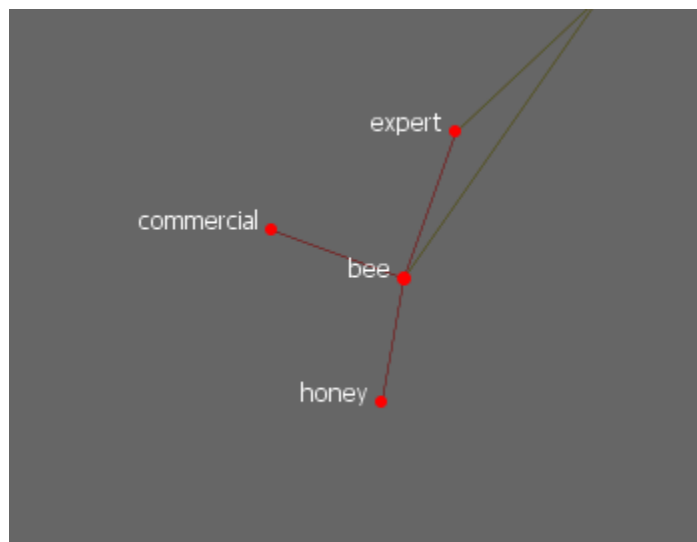
Figure F7

Network Group 7: Facebook of Monsanto
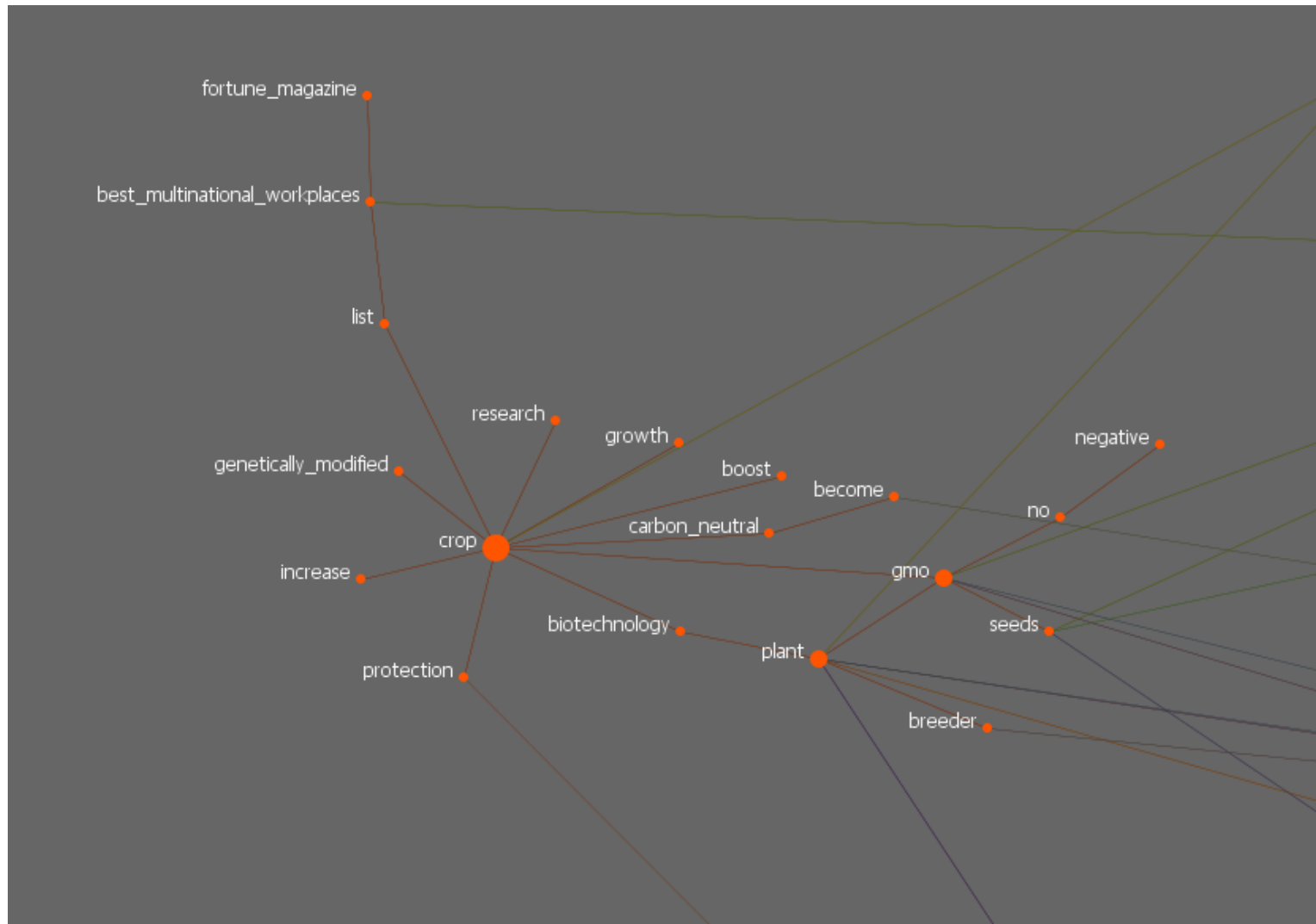
Figure F8

Network Group 8: Facebook of Monsanto
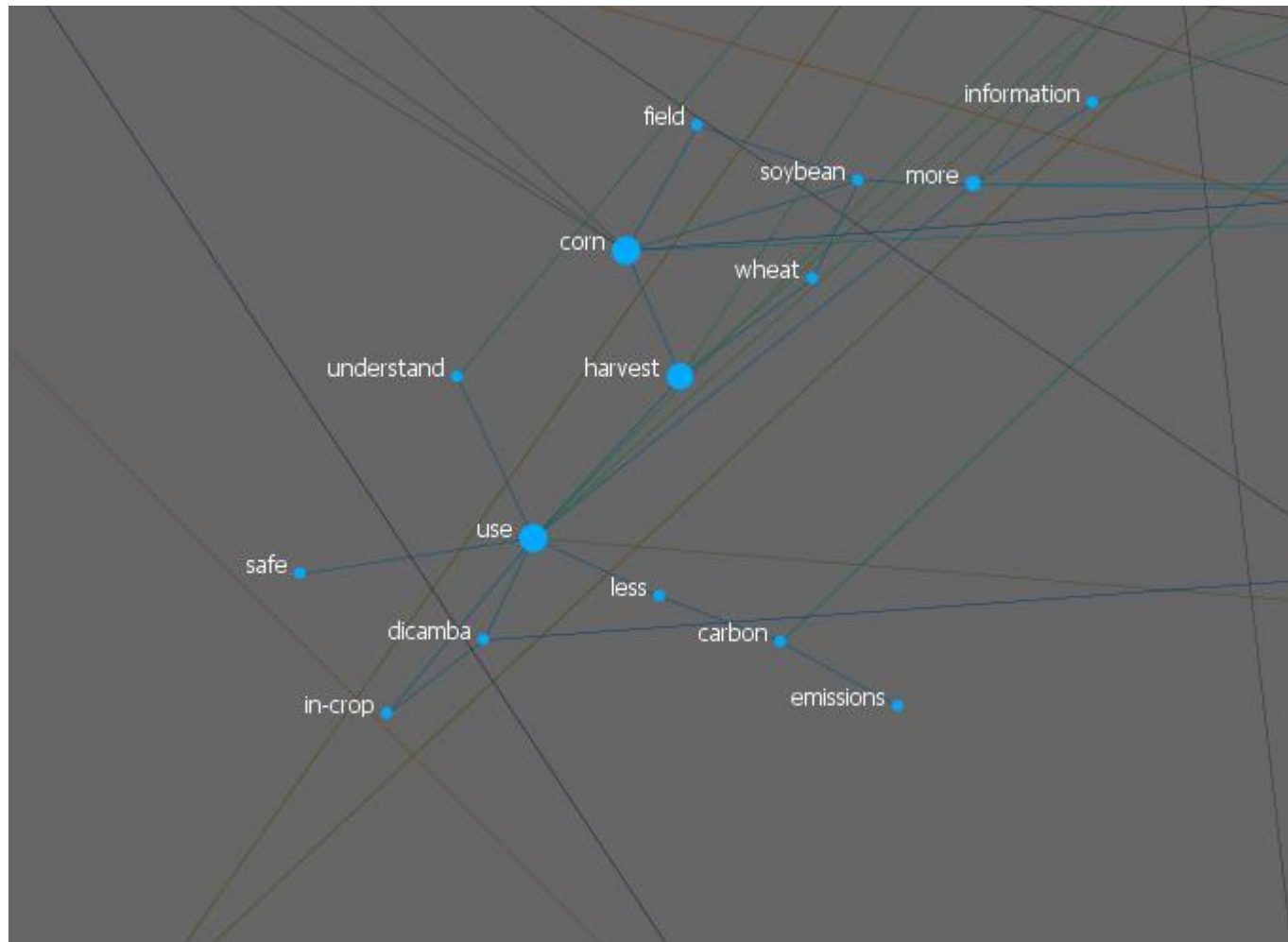
Figure F9

Network Group 9: Facebook of Monsanto

Figure F10

Network Group 10: Facebook of Monsanto
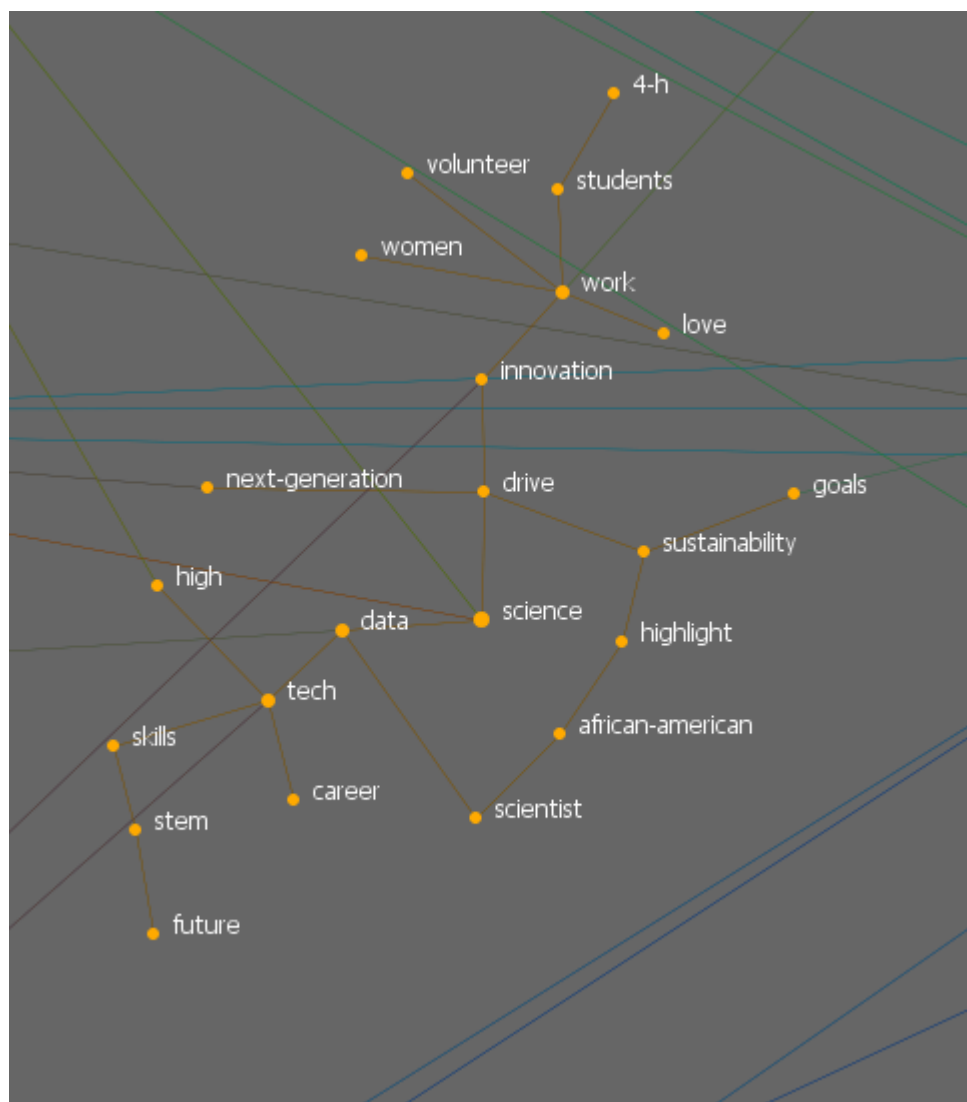
Figure F11

Network Group 11: Facebook of Monsanto

Figure F12

Network Group 12: Facebook of Monsanto
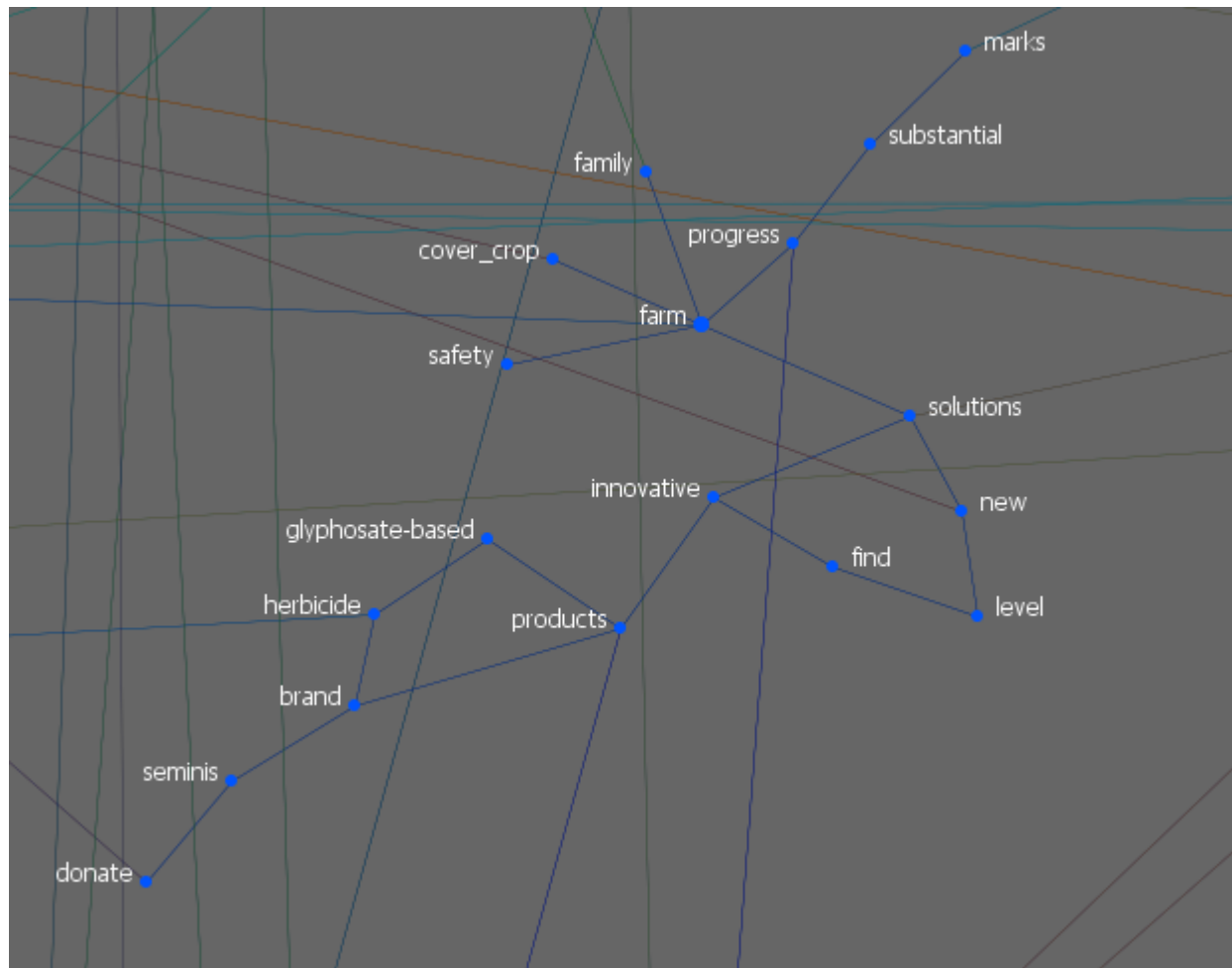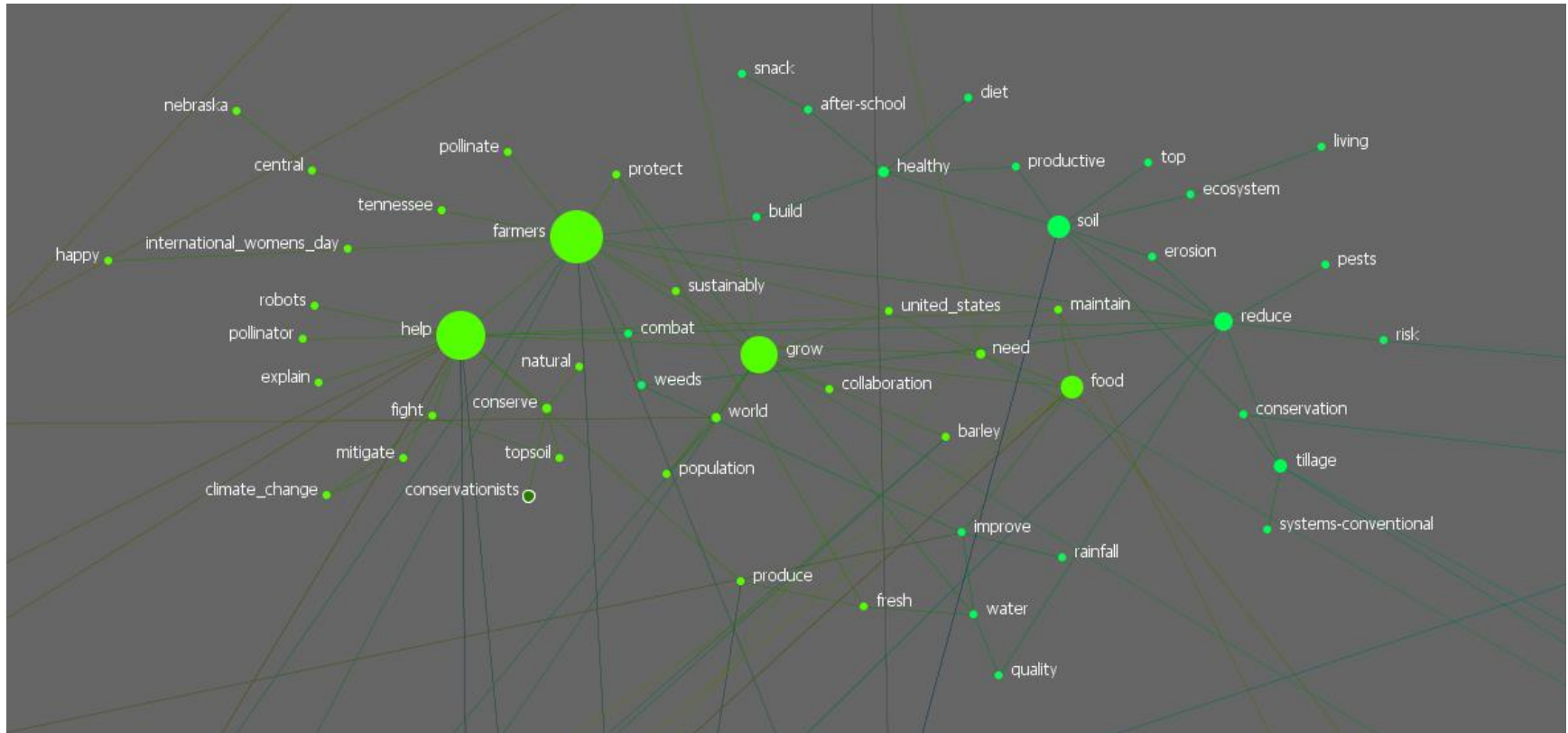
Table F1

Node Frequency: Facebook of Monsanto

Rank	Node	Frequency
1	monsanto	71
2	farmers	46
3	agriculture	41
4	more	37
5	help	33
6	grow	32
7	food	31
8	farming	26
9	crop	22
10	world	19
11	soil	18
12	harvest	17
13	plant	17
14	bee	15
15	farm	15
16	gmo	13
17	impact	13
18	ag	12
19	happy	12
20	modern	12
21	technology	12
22	employee	11
23	new	11
24	science	11
25	transaction	11
26	change	10
27	name	10
28	cover_crop	9
29	need	9
30	no	9
31	reduce	9
32	robots	9
33	scientist	9
34	united_states	9
35	climate_change	8

Table F1 (cont'd)

Node Frequency: Facebook of Monsanto

Rank	Node	Frequency
36	data	8
37	future	8
38	protect	8
39	celebrate	7
40	epa	7
41	less	7
42	planet	7
43	produce	7
44	seeds	7
45	bayer	6
46	climate	6
47	sustainability	6
48	carbon_neutral	5
49	conservation	5
50	challenge	5

Table F2

Total-degree Centrality: Facebook of Monsanto

Rank	Node	Value	Unscaled
1	farmers	0.014	116
2	help	0.013	108
3	grow	0.010	84
4	farming	0.008	64
5	monsanto	0.008	64
6	agriculture	0.006	52
7	crop	0.006	52
8	food	0.006	52
9	soil	0.006	52
10	corn	0.006	48
11	modern	0.006	48
12	use	0.006	48
13	harvest	0.005	44
14	reduce	0.005	44
15	ag	0.005	38
16	gmo	0.004	36
17	plant	0.004	36
18	change	0.004	32
19	tillage	0.004	32
20	farm	0.003	28
21	healthy	0.003	28
22	more	0.003	28
23	science	0.003	28
24	bee	0.003	24
25	conserve	0.003	24
26	data	0.003	24
27	name	0.003	24
28	need	0.003	24
29	people	0.003	24
30	proposed	0.003	24
31	tech	0.003	24
32	transaction	0.003	24
33	work	0.003	24
34	world	0.003	24
35	billion	0.002	20

Table F2 (cont'd)

Total-degree Centrality: Facebook of Monsanto

Rank	Node	Value	Unscaled
36	climate	0.002	20
37	conservation	0.002	20
38	great	0.002	20
39	improve	0.002	20
40	merger	0.002	20
41	seeds	0.002	20
42	sustainability	0.002	20
43	water	0.002	20
44	9	0.002	16
45	agricultural	0.002	16
46	barley	0.002	16
47	carbon	0.002	16
48	challenge	0.002	16
49	drive	0.002	16
50	employee	0.002	16
51	information	0.002	16
52	population	0.002	16
53	practice	0.002	16
54	products	0.002	16
55	progress	0.002	16
56	protect	0.002	16
57	provide	0.002	16
58	solutions	0.002	16
59	soybean	0.002	16
60	sustainable	0.002	16
61	wheat	0.002	16
62	access	0.001	12
63	african-american	0.001	12
64	announce	0.001	12
65	best_multinational_workplaces	0.001	12
66	better	0.001	12
67	brand	0.001	12
68	company	0.001	12
69	cut	0.001	12
70	dicamba	0.001	12

Table F3

Betweenness Centrality: Facebook of Monsanto

Rank	Node	Value	Unscaled
1	help	0.285	12,504.588
2	reduce	0.282	12,366.196
3	monsanto	0.237	10,406.076
4	farmers	0.174	7,637.037
5	risk	0.151	6,607.185
6	farming	0.119	5,232.912
7	gmo	0.102	4,481.123
8	ag	0.098	4,295.163
9	plant	0.092	4,047.597
10	use	0.091	4,008.681
11	crop	0.085	3,723.468
12	work	0.085	3,721.546
13	soil	0.083	3,629.665
14	agriculture	0.082	3,608.130
15	more	0.076	3,349.560
16	need	0.073	3,197.975
17	innovation	0.071	3,119.857
18	modern	0.069	3,022.007
19	practice	0.067	2,951.013
20	tech	0.064	2,792.017
21	people	0.060	2,649.210
22	milkweed	0.054	2,357.896
23	drive	0.050	2,180.810
24	provide	0.046	2,035.230
25	employee	0.046	2,031
26	data	0.044	1,936.718
27	corn	0.042	1,861.823
28	billion	0.042	1,823.795
29	grow	0.041	1,805.419
30	challenge	0.038	1,660.117
31	maintain	0.037	1,604.366
32	great	0.036	1,586.601
33	food	0.036	1,578.154
34	farm	0.034	1,510.625
35	science	0.033	1,452.115

Table F3 (cont'd)

Betweenness Centrality: Facebook of Monsanto

Rank	Node	Value	Unscaled
36	announce	0.030	1,302.183
37	healthy	0.030	1,298.100
38	technique	0.029	1,283.024
39	9	0.028	1,234
40	quantify	0.028	1,230
41	information	0.027	1,180.630
42	products	0.026	1,137.223
43	united_states	0.025	1,113.792
44	seeds	0.025	1,104.779
45	solutions	0.025	1,100.897
46	health	0.025	1,099.436
47	build	0.025	1,098.000
48	soybean	0.023	1,021.607
49	receive	0.023	1,009.360
50	understand	0.022	965.504
51	progress	0.021	919.886
52	bee	0.020	892.827
53	improve	0.020	891.316
54	carbon	0.020	888.492
55	high	0.020	866.109
56	new	0.019	846.208
57	conserve	0.019	826
58	begin	0.019	824
59	greenhouse	0.019	824
60	skills	0.019	824
61	tennessee	0.019	824
62	better	0.019	813.609
63	merger	0.018	805
64	family	0.018	795.322
65	marks	0.018	795.096
66	cut	0.018	792.845
67	tillage	0.018	782.843
68	dicamba	0.018	779.095
69	sustainable	0.017	754.693
70	substantial	0.016	703.101

Table F4

Closeness Centrality: Facebook of Monsanto

Rank	Node	Value	Unscaled
1	help	0.042	1.000e-004
2	reduce	0.042	9.964e-005
3	farmers	0.042	9.883e-005
4	need	0.041	9.821e-005
5	modern	0.041	9.815e-005
6	farming	0.041	9.796e-005
7	gmo	0.041	9.789e-005
8	practice	0.041	9.743e-005
9	more	0.041	9.724e-005
10	united_states	0.041	9.720e-005
11	maintain	0.041	9.718e-005
12	risk	0.041	9.718e-005
13	produce	0.041	9.701e-005
14	soil	0.041	9.697e-005
15	corn	0.041	9.681e-005
16	carbon	0.041	9.653e-005
17	plant	0.041	9.653e-005
18	seeds	0.041	9.653e-005
19	family	0.040	9.623e-005
20	weeds	0.040	9.621e-005
21	fight	0.040	9.617e-005
22	understand	0.040	9.617e-005
23	bee	0.040	9.615e-005
24	crop	0.040	9.614e-005
25	mitigate	0.040	9.608e-005
26	use	0.040	9.608e-005
27	explain	0.040	9.604e-005
28	no-till	0.040	9.604e-005
29	pollinator	0.040	9.604e-005
30	robots	0.040	9.604e-005
31	grow	0.040	9.601e-005
32	agriculture	0.040	9.582e-005
33	quality	0.040	9.577e-005
34	monsanto	0.040	9.575e-005
35	erosion	0.040	9.569e-005

Table F4 (cont'd)

Closeness Centrality: Facebook of Monsanto

Rank	Node	Value	Unscaled
36	pests	0.040	9.569e-005
37	farm	0.040	9.557e-005
38	harvest	0.040	9.546e-005
39	food	0.040	9.544e-005
40	sustainable	0.040	9.544e-005
41	people	0.040	9.542e-005
42	science	0.040	9.537e-005
43	sustainably	0.040	9.535e-005
44	combat	0.040	9.533e-005
45	soybean	0.040	9.529e-005
46	improve	0.040	9.520e-005
47	ag	0.040	9.518e-005
48	build	0.040	9.513e-005
49	international_womens_day	0.040	9.498e-005
50	pollinate	0.040	9.495e-005
51	tillage	0.040	9.495e-005
52	tech	0.040	9.482e-005
53	health	0.040	9.480e-005
54	less	0.040	9.480e-005
55	new	0.040	9.479e-005
56	drive	0.040	9.477e-005
57	high	0.040	9.471e-005
58	agricultural	0.040	9.468e-005
59	become	0.040	9.463e-005
60	solutions	0.040	9.463e-005
61	data	0.040	9.461e-005
62	great	0.040	9.459e-005
63	better	0.040	9.457e-005
64	support	0.040	9.450e-005
65	innovation	0.040	9.445e-005
66	technology	0.040	9.445e-005
67	technique	0.040	9.436e-005
68	idea	0.040	9.430e-005
69	barley	0.040	9.427e-005
70	smart	0.040	9.414e-005

Table F5

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
1	farmers	help	help
2	help	reduce	reduce
3	grow	monsanto	farmers
4	farming	farmers	need
5	monsanto	risk	modern
6	agriculture	farming	farming
7	crop	gmo	gmo
8	food	ag	practice
9	soil	plant	more
10	corn	use	united_states
11	modern	crop	maintain
12	use	work	risk
13	harvest	soil	produce
14	reduce	agriculture	soil
15	ag	more	corn
16	gmo	need	carbon
17	plant	innovation	plant
18	change	modern	seeds
19	tillage	practice	family
20	farm	tech	weeds
21	healthy	people	fight
22	more	milkweed	understand
23	science	drive	bee
24	bee	provide	crop
25	conserve	employee	mitigate
26	data	data	use
27	name	corn	explain
28	need	billion	no-till
29	people	grow	pollinator
30	proposed	challenge	robots
31	tech	maintain	grow
32	transaction	great	agriculture
33	work	food	quality
34	world	farm	monsanto
35	billion	science	erosion

Table F5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
36	climate	announce	pests
37	conservation	healthy	farm
38	great	technique	harvest
39	improve	9	food
40	merger	quantify	sustainable
41	seeds	information	people
42	sustainability	products	science
43	water	united_states	sustainably
44	9	seeds	combat
45	agricultural	solutions	soybean
46	barley	health	improve
47	carbon	build	ag
48	challenge	soybean	build
49	drive	receive	international_womens_day
50	employee	understand	pollinate
51	information	progress	tillage
52	population	bee	tech
53	practice	improve	health
54	products	carbon	less
55	progress	high	new
56	protect	new	drive
57	provide	conserve	high
58	solutions	begin	agricultural
59	soybean	greenhouse	become
60	sustainable	skills	solutions
61	wheat	tennessee	data
62	access	better	great
63	african-american	merger	better
64	announce	family	support
65	best_multinational_workplaces	marks	innovation
66	better	cut	technology
67	brand	tillage	technique
68	company	dicamba	idea
69	cut	sustainable	barley
70	dicamba	substantial	smart

Table F5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Facebook of Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
71	erosion	world	no
72	expert	no-till	work
73	field	fight	cover_crop
74	fight	company	biotechnology
75	fresh	next-generation	company
76	gas	productive	fresh
77	goals	best_multinational_workplaces	breeder
78	greenhouse	innovative	nutrition
79	health	weeds	protection
80	herbicide	sustainability	carbon_neutral
81	highlight	produce	next-generation
82	idea	support	information
83	in-crop	nutrition	receive
84	innovation	nutritious	progress
85	innovative	access	productive
86	maintain	list	ecosystem
87	new	agricultural	planet
88	no-till	biotechnology	top
89	nutrition	after-school	milkweed
90	produce	central	donate
91	quality	earns	products
92	scientist	ecosystem	world
93	sustainably	feed	access
94	technique	free	marks
95	tennessee	gas	list
96	terms	international_womens_day	protect
97	united_states	monarch_butterflies	dicamba
98	weeds	name	terms
99	protection	nemours	water
100	address	no	conserve

Appendix G

Figure G1

Network Group 1: Twitter of Monsanto
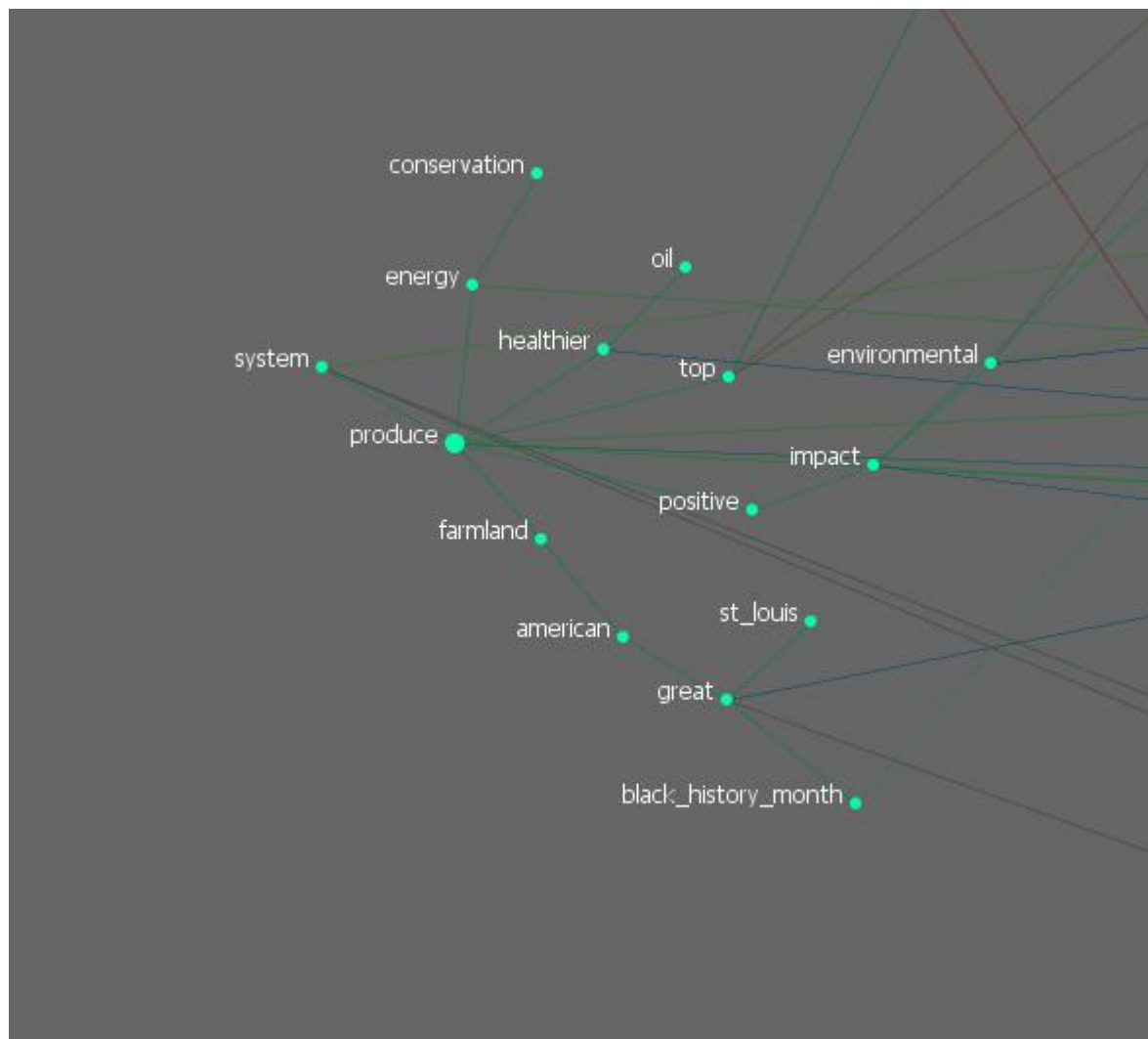
Figure G2

Network Group 2: Twitter of Monsanto
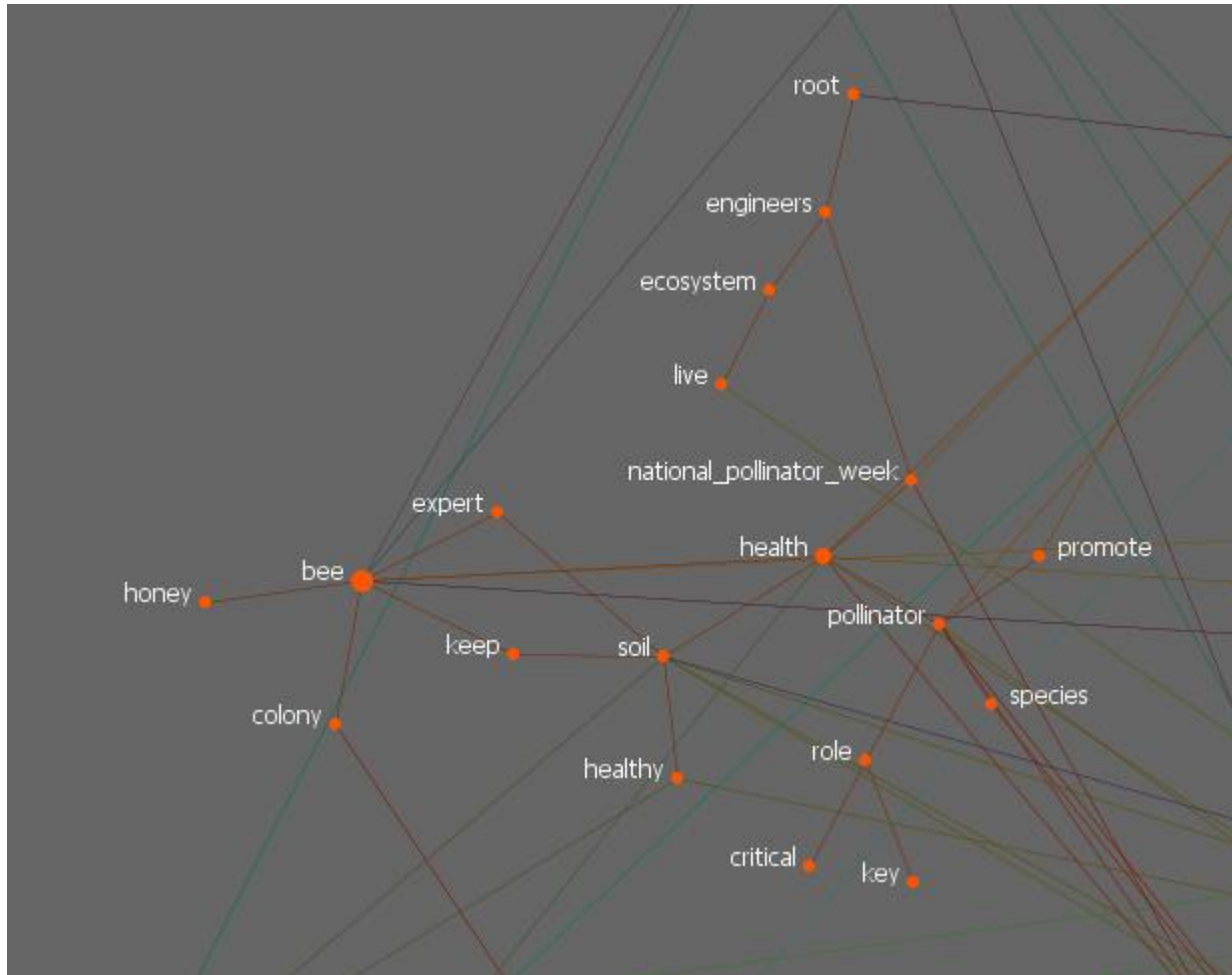
Figure G3

Network Group 3: Twitter of Monsanto
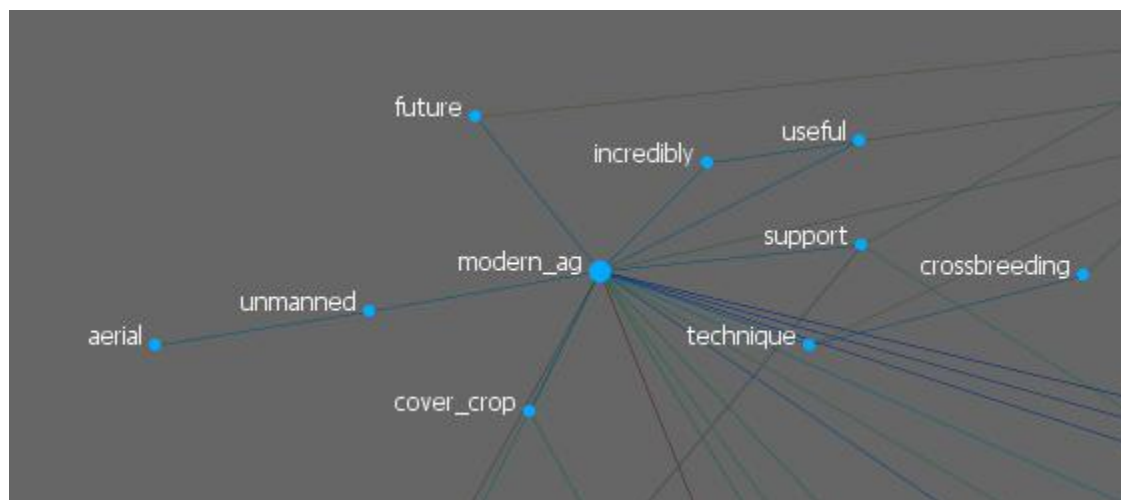
Figure G4

Network Group 4: Twitter of Monsanto
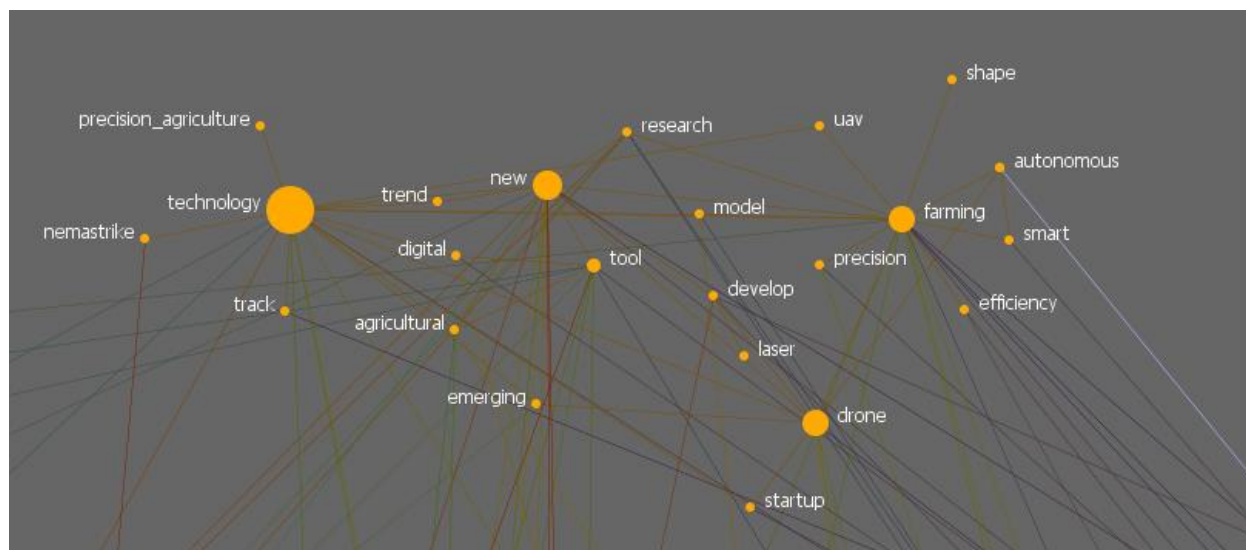
Figure G5

Network Group 5: Twitter of Monsanto

Figure G6

Network Group 6: Twitter of Monsanto
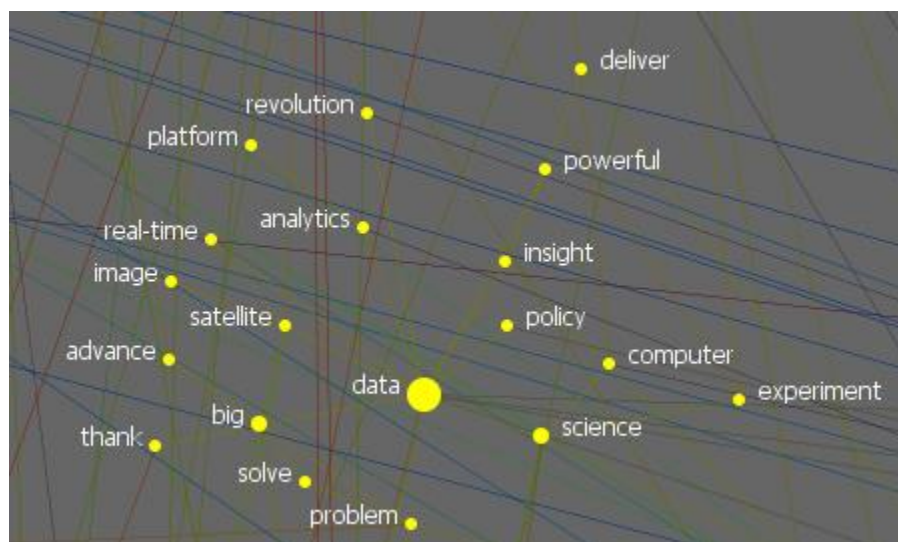
Figure G7

Network Group 7: Twitter of Monsanto
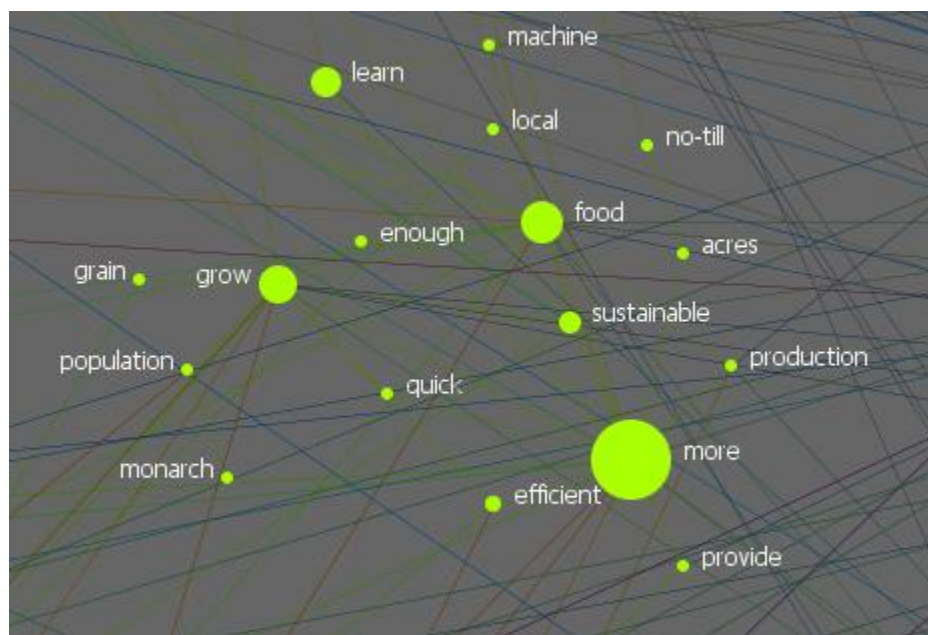
Figure G8

Network Group 8: Twitter of Monsanto
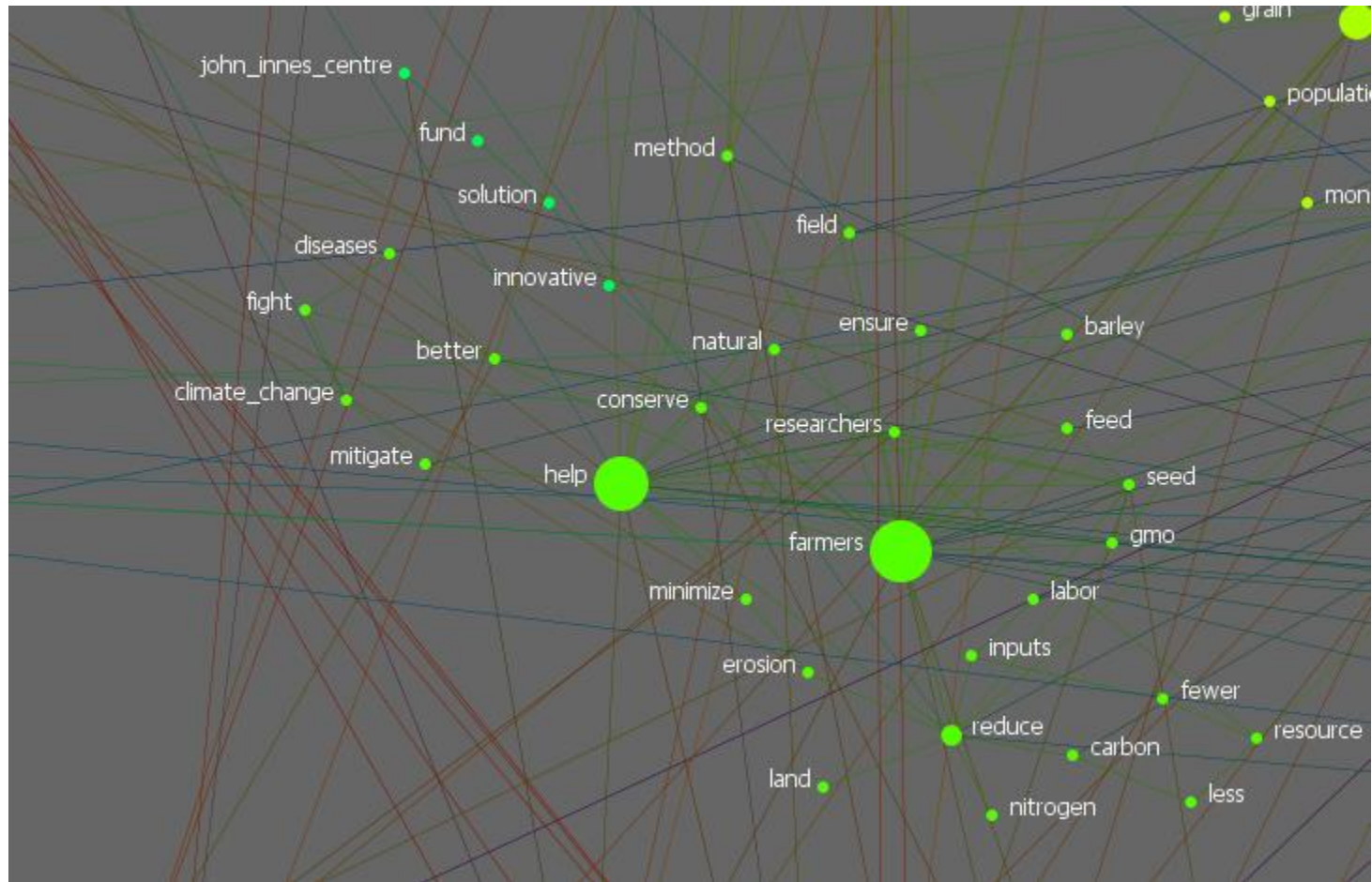
Figure G9

Network Group 9: Twitter of Monsanto
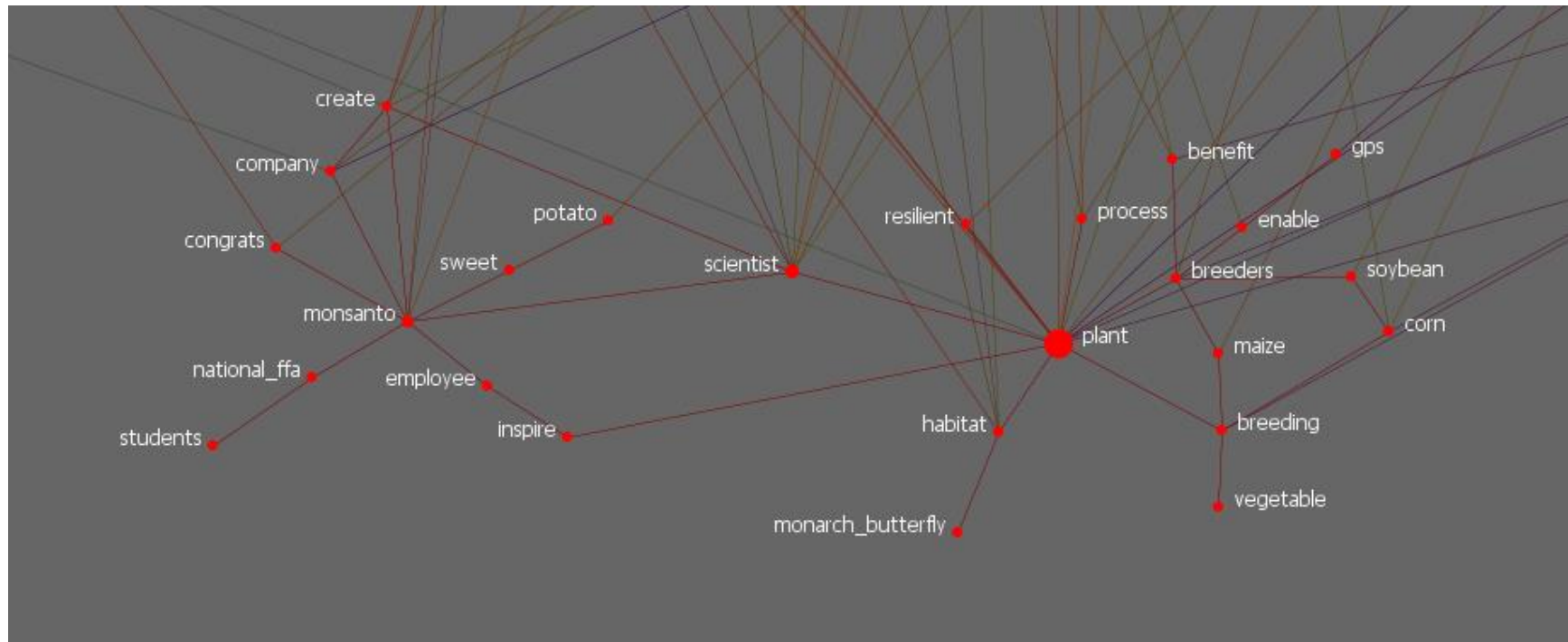
Figure G10

Network Group 10: Twitter of Monsanto
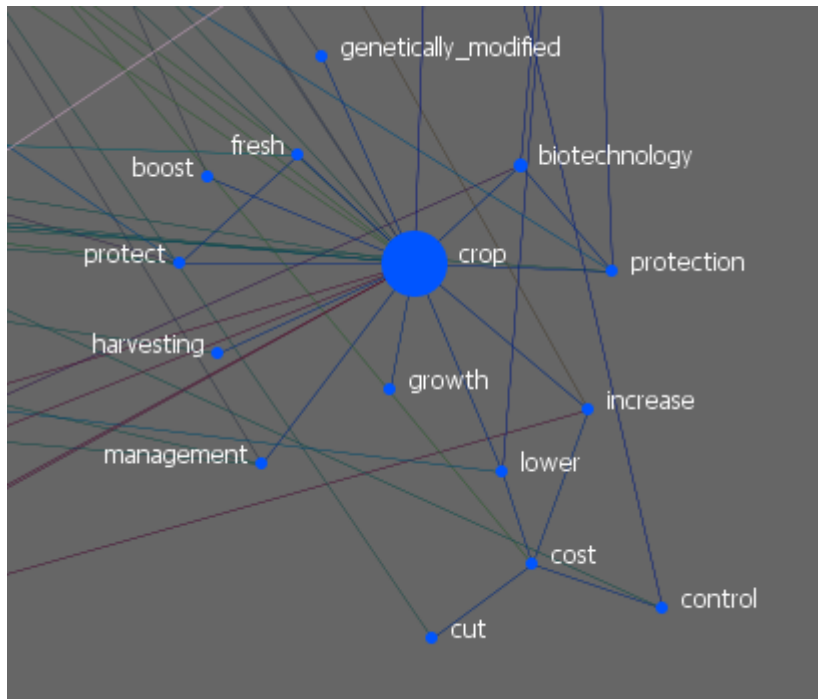
Figure G11

Network Group 11: Twitter of Monsanto
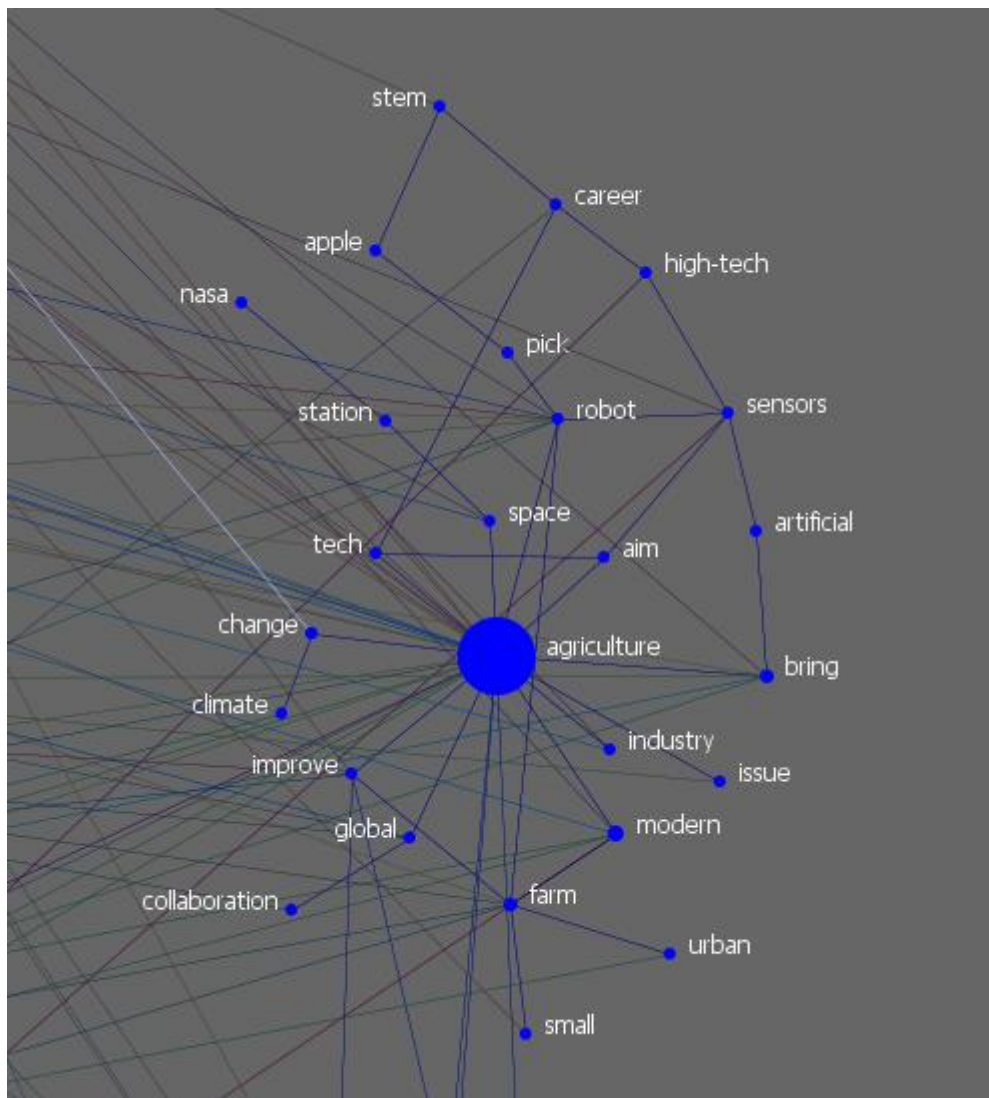
Figure G12

Network Group 12: Twitter of Monsanto
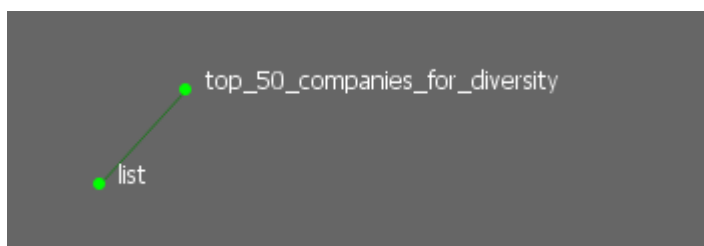
Table G1

Node Frequency: Twitter of Monsanto

Rank	Node	Frequency
1	agriculture	166
2	farmers	164
3	more	113
4	technology	109
5	farming	91
6	monsanto	84
7	help	83
8	use	80
9	crop	79
10	food	78
11	new	75
12	grow	72
13	modern ag	68
14	farm	66
15	plant	63
16	drone	57
17	data	53
18	world	51
19	scientist	42
20	future	41
21	robot	38
22	science	35
23	bee	33
24	field	32
25	change	30
26	innovation	30
27	soil	30
28	water	29
29	tool	28
30	researchers	24
31	research	24
32	improve	23
33	produce	23
34	ag	22
35	feed	22

Table G1 (cont'd)

Node Frequency: Twitter of Monsanto

Rank	Node	Frequency
36	space	22
37	efficient	21
38	health	21
39	tech	21
40	industry	20
41	modern	20
42	reduce	20
43	students	20
44	sustainable	20
45	cover crop	19
46	stem	19
47	develop	18
48	gmo	18
49	weed	17
50	biotechnology	15

Table G2

Total-degree Centrality: Twitter of Monsanto

Rank	Node	Value	Unscaled
1	more	0.018	340
2	agriculture	0.017	332
3	crop	0.015	284
4	farmers	0.015	284
5	technology	0.014	272
6	help	0.013	248
7	food	0.010	184
8	grow	0.009	172
9	new	0.009	168
10	farming	0.008	152
11	plant	0.008	152
12	data	0.008	148
13	drone	0.008	148
14	learn	0.007	132
15	bee	0.005	104
16	modern_ag	0.005	100
17	reduce	0.005	100
18	sustainable	0.005	100
19	produce	0.005	96
20	tool	0.004	84
21	big	0.004	76
22	efficient	0.004	76
23	health	0.004	76
24	modern	0.004	76
25	science	0.004	72
26	scientist	0.004	72
27	ag	0.004	70
28	biotechnology	0.004	68
29	innovation	0.004	68
30	bring	0.003	64
31	farm	0.003	64
32	monsanto	0.003	64
33	improve	0.003	60
34	robot	0.003	60
35	better	0.003	56

Table G2 (cont'd)

Total-degree Centrality: Twitter of Monsanto

Rank	Node	Value	Unscaled
36	protection	0.003	56
37	soil	0.003	56
38	production	0.003	52
39	research	0.003	52
40	digital	0.002	48
41	drive	0.002	48
42	space	0.002	48
43	tech	0.002	48
44	breeders	0.002	44
45	challenge	0.002	44
46	satellite	0.002	44
47	seed	0.002	44
48	sensors	0.002	44
49	conserve	0.002	40
50	develop	0.002	40
51	method	0.002	40
52	pollinator	0.002	40
53	real-world	0.002	40
54	change	0.002	36
55	field	0.002	36
56	habitat	0.002	36
57	honey	0.002	36
58	machine	0.002	36
59	technique	0.002	36
60	top	0.002	36
61	agricultural	0.002	32
62	breeding	0.002	32
63	create	0.002	32
64	farmland	0.002	32
65	feed	0.002	32
66	barley	0.001	28
67	career	0.001	28
68	ensure	0.001	28
69	industry	0.001	28
70	mitigate	0.001	28

Table G3

Betweenness Centrality: Twitter of Monsanto

Rank	Node	Value	Unscaled
1	farmers	0.181	7,880.886
2	modern_ag	0.173	7,505.913
3	agriculture	0.155	6,751.747
4	help	0.092	4,007.462
5	new	0.086	3,723.196
6	more	0.085	3,683.340
7	grow	0.084	3,663.773
8	scientist	0.084	3,655.728
9	farming	0.078	3,410.845
10	plant	0.068	2,963.523
11	crop	0.066	2,863.126
12	food	0.063	2,731.372
13	create	0.061	2,647.438
14	monsanto	0.058	2,508.060
15	technology	0.052	2,267.320
16	robot	0.050	2,182.707
17	pollinator	0.045	1,948.382
18	company	0.041	1,800.862
19	great	0.038	1,632.504
20	bee	0.037	1,612.465
21	bring	0.035	1,528.584
22	protect	0.034	1,482.974
23	reduce	0.034	1,463.967
24	tool	0.034	1,463.451
25	data	0.031	1,350.602
26	drone	0.031	1,345.065
27	develop	0.030	1,284.124
28	seed	0.028	1,206.721
29	innovation	0.024	1,060.390
30	space	0.023	1,015.621
31	cover_crop	0.023	1,013.657
32	modern	0.022	957.759
33	method	0.021	904.401
34	provide	0.021	900.771
35	habitat	0.020	884.829

Table G3 (cont'd)

Betweenness Centrality: Twitter of Monsanto

Rank	Node	Value	Unscaled
36	research	0.020	878.843
37	problem	0.019	845.965
38	role	0.019	822
39	farm	0.017	742.524
40	national_pollinator_week	0.017	736.168
41	corn	0.017	735.944
42	conserve	0.017	722.255
43	global	0.016	713.825
44	soil	0.016	689.618
45	better	0.015	671.834
46	enable	0.015	666.037
47	climate_change	0.015	650.123
48	model	0.015	643.716
49	support	0.014	629.469
50	population	0.014	609.896
51	ag	0.014	605.901
52	top	0.014	600.484
53	resource	0.014	597.721
54	process	0.014	594.822
55	health	0.014	594.244
56	impact	0.014	590.535
57	field	0.013	580.878
58	system	0.013	575.122
59	healthier	0.013	564.132
60	science	0.012	521.504
61	innovative	0.012	519.029
62	breeders	0.012	507.654
63	produce	0.011	484.771
64	breeding	0.011	474.671
65	lower	0.010	454.866
66	production	0.010	443.496
67	revolution	0.010	436.169
68	thank	0.010	417.027
69	energy	0.009	412.500
70	national_ffa	0.009	412

Table G4

Closeness Centrality: Twitter of Monsanto

Rank	Node	Value	Unscaled
1	farmers	0.020	4.861e-005
2	modern_ag	0.020	4.854e-005
3	agriculture	0.020	4.853e-005
4	scientist	0.020	4.849e-005
5	new	0.020	4.846e-005
6	farming	0.020	4.836e-005
7	more	0.020	4.836e-005
8	help	0.020	4.833e-005
9	field	0.020	4.830e-005
10	create	0.020	4.829e-005
11	protect	0.020	4.824e-005
12	tool	0.020	4.823e-005
13	drone	0.020	4.821e-005
14	grow	0.020	4.819e-005
15	robot	0.020	4.819e-005
16	modern	0.020	4.816e-005
17	innovation	0.020	4.815e-005
18	plant	0.020	4.813e-005
19	method	0.020	4.812e-005
20	management	0.020	4.811e-005
21	protection	0.020	4.810e-005
22	data	0.020	4.808e-005
23	gmo	0.020	4.808e-005
24	technology	0.020	4.806e-005
25	bring	0.020	4.802e-005
26	crop	0.020	4.802e-005
27	process	0.020	4.801e-005
28	food	0.020	4.800e-005
29	national_pollinator_week	0.020	4.800e-005
30	reduce	0.020	4.799e-005
31	company	0.020	4.799e-005
32	innovative	0.020	4.799e-005
33	impact	0.020	4.798e-005
34	farm	0.020	4.791e-005
35	lower	0.020	4.791e-005

Table G4 (cont'd)

Closeness Centrality: Twitter of Monsanto

Rank	Node	Value	Unscaled
36	precision	0.020	4.791e-005
37	system	0.020	4.791e-005
38	agricultural	0.020	4.790e-005
39	develop	0.020	4.790e-005
40	science	0.020	4.790e-005
41	support	0.020	4.790e-005
42	seed	0.020	4.789e-005
43	benefit	0.020	4.789e-005
44	model	0.020	4.789e-005
45	future	0.020	4.787e-005
46	harvesting	0.020	4.787e-005
47	local	0.020	4.787e-005
48	autonomous	0.020	4.786e-005
49	bee	0.020	4.784e-005
50	biotechnology	0.020	4.782e-005
51	enable	0.020	4.781e-005
52	pollinator	0.020	4.780e-005
53	computer	0.020	4.779e-005
54	goal	0.020	4.777e-005
55	health	0.020	4.777e-005
56	conserve	0.020	4.776e-005
57	useful	0.020	4.776e-005
58	researchers	0.020	4.774e-005
59	better	0.020	4.773e-005
60	monsanto	0.020	4.772e-005
61	revolution	0.020	4.770e-005
62	breeders	0.020	4.769e-005
63	provide	0.020	4.769e-005
64	global	0.020	4.768e-005
65	live	0.020	4.768e-005
66	production	0.020	4.768e-005
67	top	0.020	4.767e-005
68	urban	0.020	4.766e-005
69	habitat	0.020	4.766e-005
70	soybean	0.020	4.765e-005

Table G5

Top Scoring Nodes Side-By-Side for Centrality Measures: Twitter of Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
1	more	farmers	farmers
2	agriculture	modern_ag	modern_ag
3	crop	agriculture	agriculture
4	farmers	help	scientist
5	technology	new	new
6	help	more	farming
7	food	grow	more
8	grow	scientist	help
9	new	farming	field
10	farming	plant	create
11	plant	crop	protect
12	data	food	tool
13	drone	create	drone
14	learn	monsanto	grow
15	bee	technology	robot
16	modern_ag	robot	modern
17	reduce	pollinator	innovation
18	sustainable	company	plant
19	produce	great	method
20	tool	bee	management
21	big	bring	protection
22	efficient	protect	data
23	health	reduce	gmo
24	modern	tool	technology
25	science	data	bring
26	scientist	drone	crop
27	ag	develop	process
28	biotechnology	seed	food
29	innovation	innovation	national_pollinator_week
30	bring	space	reduce
31	farm	cover_crop	company
32	monsanto	modern	innovative
33	improve	method	impact
34	robot	provide	farm
35	better	habitat	lower

Table G5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Twitter of Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
36	protection	research	precision
37	soil	problem	system
38	production	role	agricultural
39	research	farm	develop
40	digital	national_pollinator_week	science
41	drive	corn	support
42	space	conserve	seed
43	tech	global	benefit
44	breeders	soil	model
45	challenge	better	future
46	satellite	enable	harvesting
47	seed	climate_change	local
48	sensors	model	autonomous
49	conserve	support	bee
50	develop	population	biotechnology
51	method	ag	enable
52	pollinator	top	pollinator
53	real-world	resource	computer
54	change	process	goal
55	field	health	health
56	habitat	impact	conserve
57	honey	field	useful
58	machine	system	researchers
59	technique	healthier	better
60	top	science	monsanto
61	agricultural	innovative	revolution
62	breeding	breeders	breeders
63	create	produce	provide
64	farmland	breeding	global
65	feed	lower	live
66	barley	production	production
67	career	revolution	top
68	ensure	thank	urban
69	industry	energy	habitat
70	mitigate	national_ffa	soybean

Table G5 (cont'd)

Top Scoring Nodes Side-By-Side for Centrality Measures: Twitter of Monsanto

Rank	Total-degree Centrality	Betweenness Centrality	Closeness Centrality
71	protect	station	corn
72	aim	unmanned	smart
73	boost	sustainable	cover_crop
74	climate	american	space
75	computer	john_innes_centre	policy
76	corn	increase	unmanned
77	cost	gmo	incredibly
78	efficiency	mitigate	carbon
79	emerging	sensors	learn
80	energy	goal	fresh
81	fight	protection	research
82	fresh	improve	john_innes_centre
83	global	tech	great
84	goal	agricultural	platform
85	impact	labor	advance
86	maize	congrats	image
87	station	engineers	feed
88	track	management	emerging
89	advance	insight	insight
90	autonomous	inspire	problem
91	benefit	fresh	satellite
92	carbon	minimize	soil
93	company	stem	minimize
94	environmental	pick	uav
95	erosion	future	experiment
96	gmo	barley	change
97	grain	local	sustainable
98	great	big	acres
99	healthy	cost	no-till
100	increase	high-tech	resilient

Appendix H

Table H1

Descriptive Statistics: Social Media Use (SMU)

Items for SMU	N	Mean	SD
I have seen information about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	102	4.28	2.08
I have searched for information about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	102	2.51	1.94
I have clicked "like" to a post about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	102	2.14	1.67
I have commented on a post about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	102	2.09	1.64
I have shared a post about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	102	2.01	1.66
I have discussed BP with others on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	102	2.39	1.87

Table H2

Results of Factor Analysis: Social Media Use (SMU)

Items for Social Media Use (SMU)	Factor Loading	
	1	2
Factor 1: Consuming SMU		
I have seen information about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	0.26	**0.52**
I have searched for information about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	0.35	**0.92**
I have clicked "like" to a post about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	0.46	**0.63**
Factor 2: Contributing SMU		
I have commented on a post about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	**0.90**	0.35
I have shared a post about BP on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	**0.79**	0.45
I have discussed BP with others on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	**0.77**	0.40

Table H3

Results of Factor Analysis: Organization-Stakeholder Dialogic Communication (OSDC)

Items for Organization-Stakeholder Dialogic Communication (OSDC)	Factor Loading		
	1	2	3
Factor 1: Transparency and genuineness			
The information shared by BP on its Facebook is transparent (transparency 1).	**0.73**	0.29	0.41
The information shared by BP on its Facebook is clear and straightforward (transparency 2).	**0.79**	0.27	0.38
The information shared by BP on its Facebook is complete (transparency 3).	**0.71**	0.27	0.47
BP is honest in its communication with people on its Facebook (genuineness 1).	**0.80**	0.27	0.42
BP is sincere in its communication with people on its Facebook (genuineness 2).	**0.81**	0.26	0.41
The messages posted by BP on its Facebook are authentic (genuineness 3).	**0.73**	0.29	0.44
BP is always trying to provide useful information to people on its Facebook (commitment 1).	**0.60**	0.48	0.40
Factor 2: Interactivity and responsiveness			
The communication between BP and people on its Facebook flows both ways (interactivity 1).	0.30	**0.72**	0.39
BP invites people to communicate on its Facebook (interactivity 2).	0.21	**0.62**	0.36
BP responds to people's general comments promptly on its Facebook (responsiveness 1).	0.21	**0.74**	0.36
BP responds to people's questions and concerns promptly on its Facebook (responsiveness 2).	0.29	**0.78**	0.28
BP pays attention to what people say on its Facebook (responsiveness 3).	0.14	**0.69**	0.29

Table H3 (cont'd)

Results of Factor Analysis: Organization-Stakeholder Dialogic Communication (OSDC)

Items for Organization-Stakeholder Dialogic Communication (OSDC)	Factor Loading		
	1	2	3
Factor 2: Interactivity and responsiveness (cont'd)			
BP is easy to talk to on its Facebook (openness 1).	0.38	**0.69**	0.36
BP is always there to reply to comments from people on its Facebook (commitment 2).	0.27	**0.75**	0.38
BP is always there to address concerns from people on its Facebook (commitment 3).	0.41	**0.73**	0.31
Factor 3: Empathy			
BP is empathetic in understanding feelings of people on its Facebook (empathy 1).	0.45	0.43	**0.72**
BP tries to understand problems from the perspectives of people on its Facebook (empathy 2).	0.50	0.39	**0.68**
BP considers how people might feel at that moment on its Facebook (empathy 3).	0.38	0.41	**0.71**

Table H4

Results of Factor Analysis: Organizational Image

Items for Organizational Image	Factor Loading					
	1	2	3	4	5	6
Factor 1: Benefiting the society						
BP actively engages in activities to benefit the society (social responsibility 1).	**0.62**	0.03	-0.04	-0.28	0.15	-0.03
BP encourages employees to conduct volunteer work to benefit the society (social responsibility 3).	**0.69**	-0.05	-0.03	-0.06	-0.03	-0.09
BP makes huge investment in the United States (supports American economy 1).	**0.65**	-0.01	-0.28	0.10	-0.03	-0.03
BP works to make America stronger (supports American economy 2).	**0.82**	-0.06	0.11	0.03	0.18	-0.08
BP supports a large number of jobs across America (supports American economy 3).	**0.66**	0.06	-0.23	0.01	-0.05	-0.04
BP supports economies in many states in America (supports American economy 4).	**0.65**	-0.05	-0.21	0.00	0.03	-0.09
BP is a good place to work (good workplace 1) **(deleted)**.	**0.60**	0.02	0.10	-0.10	0.22	-0.21
BP is a company committed to inclusion and diversity (good workplace 2) **(deleted)**.	**0.64**	0.01	0.00	-0.15	0.18	-0.09
BP works hard to drive gender equality in the workplace (good workplace 3) **(deleted)**.	**0.66**	-0.02	-0.04	-0.04	0.16	-0.07

Table H4 (cont'd)

Results of Factor Analysis: Organizational Image

Items for Organizational Image	Factor Loading					
	1	2	3	4	5	6
Factor 2: Oil spill						
BP's 2010 Deepwater Horizon oil spill was catastrophic (oil spill 1).	0.02	**0.92**	-0.11	-0.05	0.00	0.07
BP's 2010 Deepwater Horizon oil spill severely harmed local businesses (oil spill 2).	-0.03	**0.91**	0.02	-0.09	0.01	-0.02
BP's 2010 Deepwater Horizon oil spill brought extensive environmental damage to the Gulf of Mexico (oil spill 3).	0.08	**0.97**	0.01	0.07	0.07	0.01
Factor 3: Leadership and competence						
BP is a leader in the energy industry (industry leader 1).	0.05	0.06	**-0.71**	0.07	0.24	0.05
BP continues to make major contributions to the energy industry (industry leader 3).	0.09	0.06	**-0.63**	-0.15	0.21	-0.07
BP maintains highly advanced infrastructures (competence 1).	-0.02	0.01	**-0.68**	-0.14	0.05	-0.15
BP is technologically advanced in its operations and explorations (competence 2).	-0.04	-0.05	**-0.73**	-0.15	0.03	-0.16
BP maintains high production capacity (competence 3).	0.01	0.07	**-0.60**	0.11	-0.05	-0.26
Factor 4: Harming the environment						
BP is not truly committed to environmental protection and restoration (harms environment 1).	-0.24	0.08	-0.03	**0.75**	-0.06	-0.02
BP is among the top environmental, health, and safety violators (harms environment 2).	0.15	-0.02	0.01	**0.74**	-0.01	0.05
BP does not care about environmental impacts in its operations (harms environment 3).	-0.30	0.03	0.07	**0.67**	-0.07	-0.01

Table H4 (cont'd)

Results of Factor Analysis: Organizational Image

| Items for Organizational Image	Factor Loading					
	1	2	3	4	5	6
Factor 5: Safety						
Safety is the No.1 core value of BP (safety 1).	0.18	-0.02	-0.11	-0.02	**0.66**	-0.07
BP builds safety into everything from design through operations (safety 2).	0.19	-0.01	-0.08	-0.08	**0.69**	-0.08
BP always maintains safety in its operations (safety 3).	0.06	-0.05	-0.02	-0.14	**0.73**	-0.16
BP's practices are always safe (safety 4).	-0.04	-0.02	-0.09	-0.19	**0.74**	-0.14
Factor 6: Performance/effectiveness						
BP maintains good financial performance every year (performance/effectiveness 1).	-0.03	-0.05	0.05	0.05	0.09	**-0.94**
BP maintains marketing growth every year (performance/effectiveness 2).	0.09	-0.01	-0.07	0.01	0.11	**-0.75**
BP is building a business that is more efficient (performance/effectiveness 3).	0.18	-0.04	-0.10	-0.19	-0.07	**-0.61**
BP maintains strong operational performance every year (performance/effectiveness 4).	0.04	0.04	-0.14	-0.01	0.04	**-0.76**

Figure H1
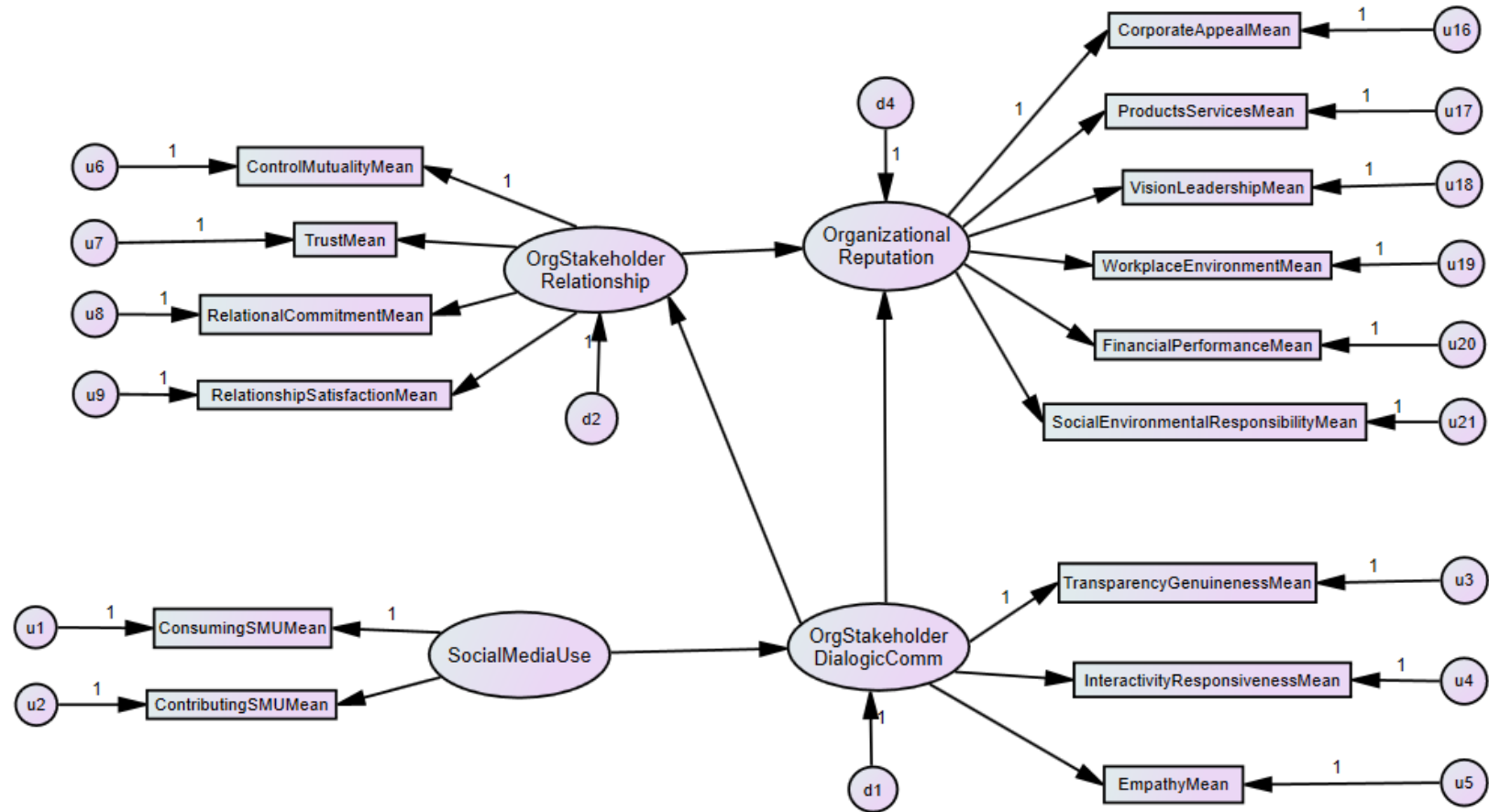
The Model Testing Effects on Organizational Reputation: The Case of BP
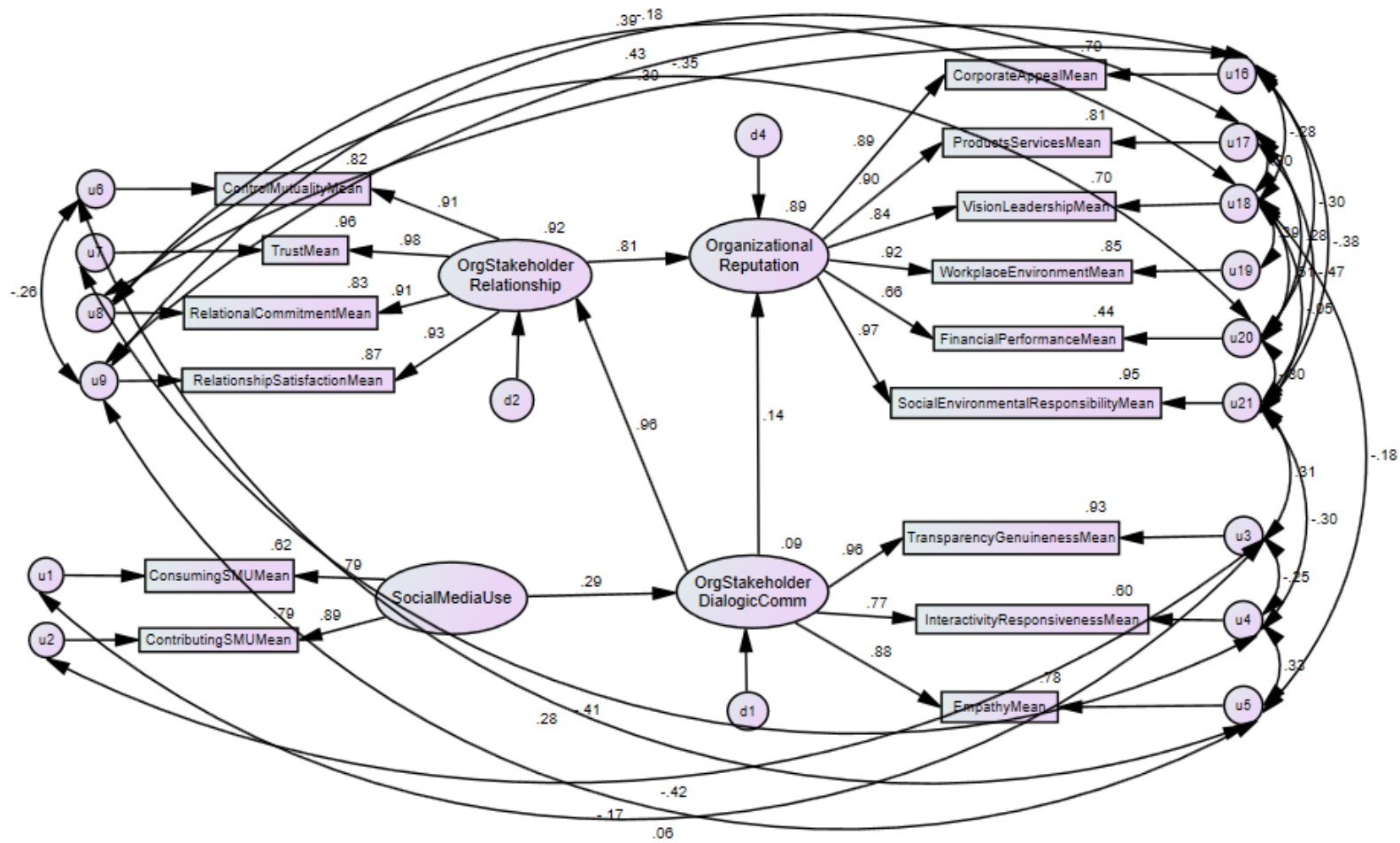
Table H5

Parameter Estimates, Regression Weights, and Standardized Regression Weights: The Revised Model in Figure H2

Effects			Estimate	S.E.	C.R.	P	Standardized Estimate
OSDC	←	SMU	0.33	0.13	2.62	.009	0.30
OSR	←	OSDC	0.79	0.05	15.08	***	0.96
OR	←	OSR	1.01	0.23	4.32	***	0.81
OR	←	OSDC	0.14	0.19	0.77	.444	0.14
ConsumingSMUMean	←	SMU	1.00				0.79
RelationshipSatisfactionMean	←	OSR	1.21	0.08	14.64	***	0.93
RelationalCommitmentMean	←	OSR	1.20	0.08	15.30	***	0.91
TrustMean	←	OSR	1.27	0.07	19.58	***	0.98
ControlMutualityMean	←	OSR	1.00				0.91
CorporateAppealMean	←	OR	1.00				0.89
ProductsServicesMean	←	OR	0.75	0.06	13.65	***	0.90
WorkplaceEnvironmentMean	←	OR	0.88	0.06	14.69	***	0.92
ContributingSMUMean	←	SMU	1.13	0.37	3.07	.002	0.89
VisionLeadershipMean	←	OR	0.69	0.07	10.22	***	0.84
FinancialPerformanceMean	←	OR	0.45	0.06	7.09	***	0.66
SocialEnvironmentalResponsibilityMean	←	OR	1.06	0.07	15.20	***	0.97
InteractivityResponsivenessMean	←	OSDC	0.61	0.06	10.20	***	0.77
TransparencyGenuinenessMean	←	OSDC	1.00				0.96
EmpathyMean	←	OSDC	0.87	0.05	15.89	***	0.88

Note. SMU refers to social media use; OSDC refers to organization-stakeholder dialogic communication; OSR refers to organization-stakeholder relationship; and OR refers to organizational reputation

Table H6

Squared Multiple Correlations: The Revised Model in Figure H2

Indicators and Latent Variables	Estimate
OSDC	0.09
OSR	0.92
OR	0.89
SocialEnvironmentalResponsibilityMean	0.95
FinancialPerformanceMean	0.44
WorkplaceEnvironmentMean	0.85
VisionLeadershipMean	0.70
ProductsServicesMean	0.81
CorporateAppealMean	0.79
ControlMutualityMean	0.82
TrustMean	0.96
RelationalCommitmentMean	0.83
RelationshipSatisfactionMean	0.87
ConsumingSMUMean	0.62
ContributingSMUMean	0.79
EmpathyMean	0.78
InteractivityResponsivenessMean	0.60
TransparencyGenuinenessMean	0.93

Table H7

Direct and Indirect Effects: The Revised Model in Figure H2

Predictor	Response	Direct Effects	Indirect Effects	Total Effects	Standardized Direct Effects	Standardized Indirect Effects	Standardized Total Effects
SMU	OSDC	0.33	0.00	0.33	0.30	0.00	0.30
SMU	OSR	0.00	0.26	0.26	0.00	0.28	0.28
SMU	OR	0.00	0.31	0.31	0.00	0.27	0.27
OSDC	OSR	0.79	0.00	0.79	0.96	0.00	0.96
OSDC	OR	0.14	0.80	0.94	0.14	0.78	0.92
OSR	OR	1.01	0.00	1.01	0.81	0.00	0.81

Figure H3

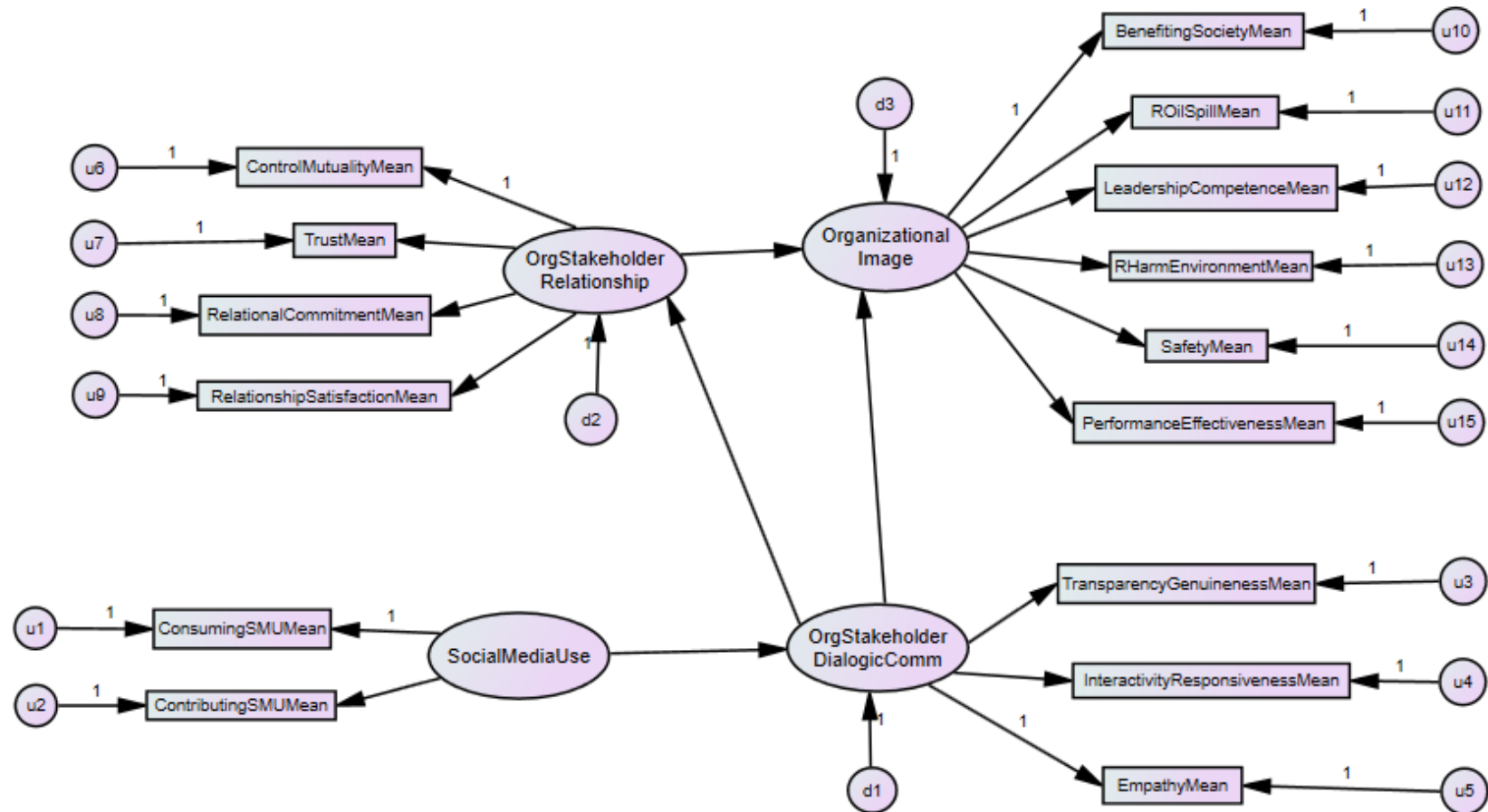*The Model Testing Effects on Organizational Image: The Case of BP*

Figure H4

The Revised Model Testing Effects on Organizational Image: The Case of BP
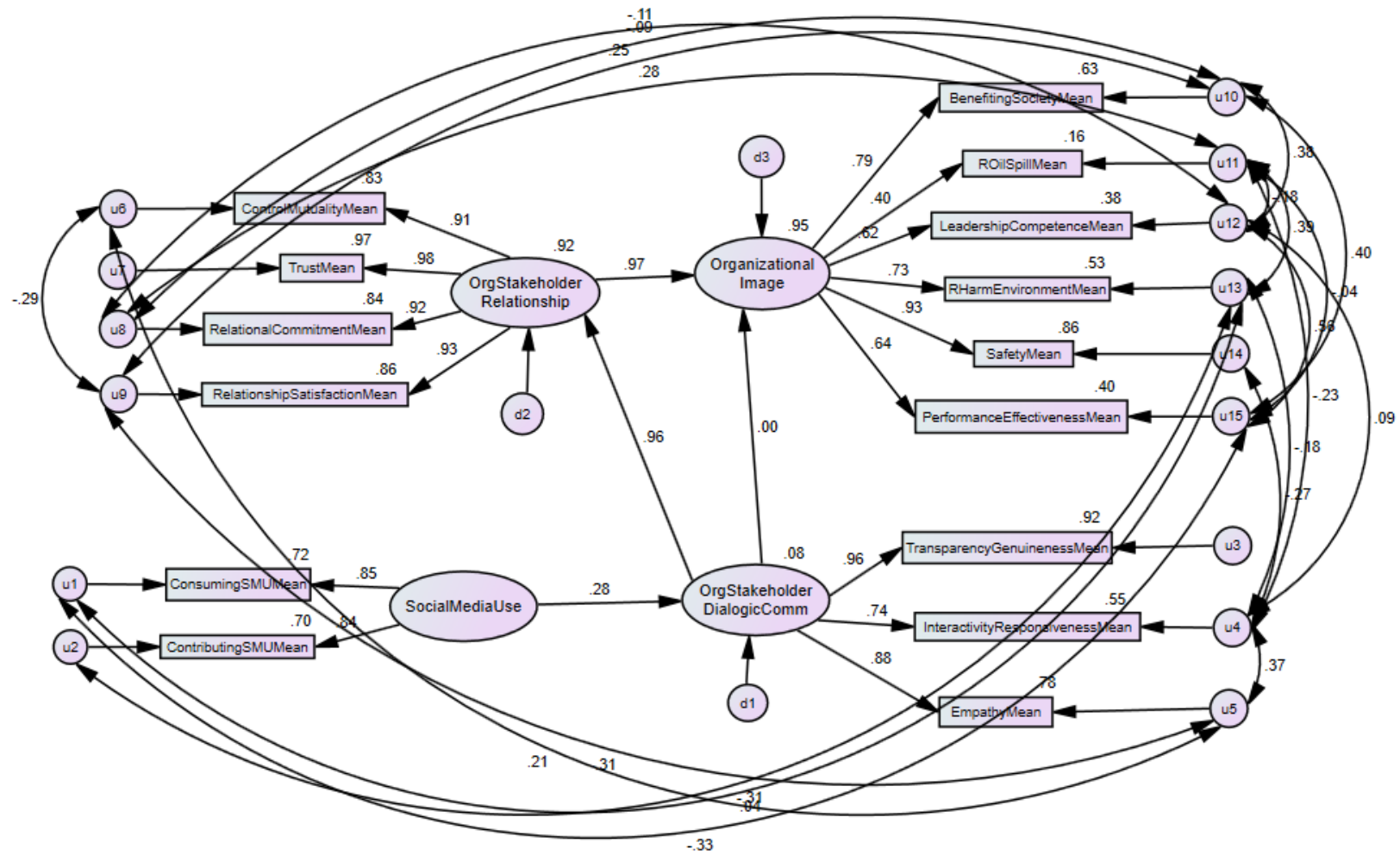
Table H8

Parameter Estimates, Regression Weights, and Standardized Regression Weights: The Revised Model in Figure H4

Effects			Estimate	S.E.	C.R.	P	Standardized Estimate
OSDC	←	SMU	0.30	0.12	2.40	.016	0.28
OSR	←	OSDC	0.80	0.05	15.05	***	0.96
OI	←	OSDC	0.00	0.14	0.02	.983	0.00
OI	←	OSR	0.80	0.19	4.36	***	0.97
ConsumingSMUMean	←	SMU	1.00				0.85
RelationshipSatisfactionMean	←	OSR	1.20	0.08	14.39	***	0.93
RelationalCommitmentMean	←	OSR	1.22	0.08	15.84	***	0.92
TrustMean	←	OSR	1.27	0.06	20.12	***	0.99
ControlMutualityMean	←	OSR	1.00				0.91
BenefitingSocietyMean	←	OI	1.00				0.79
ROilSpillMean	←	OI	0.45	0.11	4.05	***	0.40
RHarmEnvironmentMean	←	OI	1.21	0.15	8.06	***	0.73
ContributingSMUMean	←	SMU	0.98	0.32	3.11	.002	0.84
LeadershipCompetenceMean	←	OI	0.57	0.07	8.13	***	0.62
SafetyMean	←	OI	1.55	0.14	11.14	***	0.93
PerformanceEffectivenessMean	←	OI	0.65	0.08	8.54	***	0.64
InteractivityResponsivenessMean	←	OSDC	0.58	0.06	10.28	***	0.74
TransparencyGenuinenessMean	←	OSDC	1.00				0.96
EmpathyMean	←	OSDC	0.88	0.06	15.86	***	0.89

Note. SMU refers to social media use; OSDC refers to organization-stakeholder dialogic communication; OSR refers to organization-stakeholder relationship; and OI refers to organizational image.

Table H9

Squared Multiple Correlations: The Revised Model in Figure H4

Indicators and Latent Variables	Estimate
OSDC	0.08
OSR	0.92
OI	0.95
PerformanceEffectivenessMean	0.40
SafetyMean	0.86
RHarmEnvironmentMean	0.53
LeadershipCompetenceMean	0.38
ROilSpillMean	0.16
BenefitingSocietyMean	0.63
ControlMutualityMean	0.83
TrustMean	0.97
RelationalCommitmentMean	0.84
RelationshipSatisfactionMean	0.86
ConsumingSMUMean	0.72
ContributingSMUMean	0.70
EmpathyMean	0.78
InteractivityResponsivenessMean	0.55
TransparencyGenuinenessMean	0.92

Table H10

Direct and Indirect Effects: The Revised Model in Figure H4

| Predictor	Response	Direct Effects	Indirect Effects	Total Effects	Standardized Direct Effects	Standardized Indirect Effects	Standardized Total Effects
SMU	OSDC	0.30	0.00	0.30	0.28	0.00	0.28
SMU	OSR	0.00	0.24	0.24	0.00	0.27	0.27
SMU	OI	0.00	0.19	0.19	0.00	0.27	0.27
OSDC	OSR	0.80	0.00	0.80	0.96	0.00	0.96
OSDC	OI	0.00	0.64	0.64	0.00	0.93	0.93
OSR	OI	0.80	0.00	0.80	0.97	0.00	0.97

Figure H5

The Model Testing the Relationship between Organizational Image and Organizational

Reputation: The Case of BP

Figure H6

The Revised Model Testing the Relationship between Organizational Image and Organizational

Reputation: The Case of BP
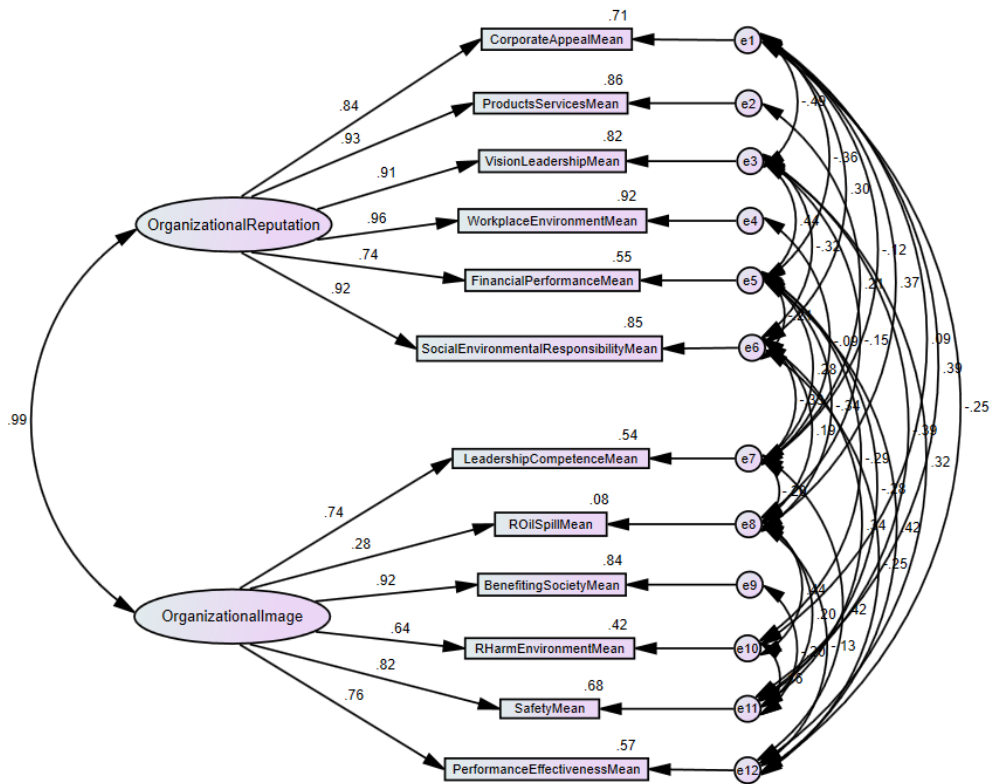
Appendix I

Table I1

Descriptive Statistics: Social Media Use (SMU)

Items for SMU	N	Mean	SD
I have seen information about Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	100	4.90	1.92
I have searched for information about Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	100	3.51	2.15
I have clicked "like" to a post about Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	100	3.19	2.33
I have commented on a post about Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	100	2.91	2.16
I have shared a post about Monsanto on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).2	100	2.70	2.03
I have discussed Monsanto with others on social media (e.g., Facebook, Twitter, YouTube, Instagram, etc.).	100	3.33	2.23

Table I2

Results of Factor Analysis: Organization-Stakeholder Dialogic Communication (OSDC)

Items for Organization-Stakeholder Dialogic Communication (OSDC)	Factor Loading				
	1	2	3	4	5
Factor 1: Responsiveness and commitment					
Occupy Monsanto responds to people's general comments promptly on its Facebook (responsiveness 1).	**0.88**	0.13	0.15	0.17	0.02
Occupy Monsanto responds to people's questions and concerns promptly on its Facebook (responsiveness 2).	**0.90**	0.10	0.19	0.08	0.03
Occupy Monsanto pays attention to what people say on its Facebook (responsiveness 3).	**0.72**	0.26	0.27	0.30	0.02
Occupy Monsanto is easy to talk to on its Facebook (openness 1).	**0.67**	0.23	0.26	0.32	0.18
Occupy Monsanto is always there to reply to comments from people on its Facebook (commitment 2).	**0.89**	0.15	0.24	-0.07	-0.01
Occupy Monsanto is always there to address concerns from people on its Facebook (commitment 3).	**0.85**	0.22	0.24	0.07	0.04
Factor 2: Interactivity and responsiveness					
The information shared by Occupy Monsanto on its Facebook is transparent (transparency 1).	0.33	**0.62**	0.23	0.08	0.41
The information shared by Occupy Monsanto on its Facebook is clear and straightforward (transparency 2).	0.19	**0.64**	0.28	0.13	0.33
Occupy Monsanto is honest in its communication with people on its Facebook (genuineness 1).	0.20	**0.76**	0.17	0.17	0.29
Occupy Monsanto is sincere in its communication with people on its Facebook (genuineness 2).	0.25	**0.71**	0.14	0.28	0.24

Table I2 (cont'd)

Results of Factor Analysis: Organization-Stakeholder Dialogic Communication (OSDC)

Items for Organization-Stakeholder Dialogic Communication (OSDC)	Factor Loading				
	1	2	3	4	5
Factor 2: Interactivity and responsiveness (cont'd)					
The messages posted by Occupy Monsanto on its Facebook are authentic (genuineness 3).	0.24	**0.75**	0.19	0.19	0.30
Occupy Monsanto is always trying to provide useful information to people on its Facebook (commitment 1).	0.07	**0.73**	0.29	0.18	0.00
Factor 3: Empathy and respect					
Occupy Monsanto is empathetic in understanding feelings of people on its Facebook (empathy 1).	0.46	0.26	**0.63**	0.05	0.33
Occupy Monsanto acknowledges the legitimacy of the needs and goals of people on its Facebook (respect 2).	0.28	0.29	**0.67**	0.11	0.11
Occupy Monsanto respects people's opinions even if they were different from its own on its Facebook (respect 3).	0.29	0.15	**0.74**	0.11	-0.04
Factor 4: Interactivity					
Occupy Monsanto invites people to communicate on its Facebook (interactivity 2).	0.21	0.19	0.10	**0.83**	0.08
Occupy Monsanto welcomes people's comments on its Facebook (interactivity 3).	0.24	0.09	0.13	**0.76**	0.18
Occupy Monsanto gives people opportunities to share their opinions on its Facebook (openness 3).	-0.12	0.36	0.16	**0.69**	0.15

Table I2 (cont'd)

Results of Factor Analysis: Organization-Stakeholder Dialogic Communication (OSDC)

Items for Organization-Stakeholder Dialogic Communication (OSDC)	Factor Loading				
	1	2	3	4	5
Factor 5: Equality					
People have equal power with Occupy Monsanto when communicating on its Facebook (equality 1).	0.15	0.35	0.16	0.36	**0.73**
Occupy Monsanto does not attempt to seek control over people on its Facebook (equality 2).	-0.13	0.20	-0.04	0.07	**0.81**
Occupy Monsanto is not arrogant in its communication with people on its Facebook (equality 3).	0.09	0.22	0.50	0.02	**0.63**

Table I3

Results of Factor Analysis: Organization Image

Items for Organizational Image	Factor Loading			
	1	2	3	4
Factor 1: Protecting environment and social responsibility				
Monsanto is a company committed to environmental protection (protects environment 1).	**0.72**	0.12	-0.26	0.49
Monsanto cares about healthy soils and water (protects environment 2).	**0.70**	0.13	-0.33	0.49
Monsanto helps promote biodiversity (protects environment 3).	**0.72**	0.24	-0.31	0.29
Monsanto helps reduce carbon emissions (protects environment 4).	**0.74**	0.20	-0.28	0.36
Monsanto actively engages in activities to benefit the society (social responsibility 1).	**0.67**	0.26	-0.30	0.46
Monsanto benefits local communities (social responsibility 3).	**0.71**	0.25	-0.24	0.45
Monsanto prioritizes social responsibility over profits (social responsibility 4).	**0.77**	0.03	-0.24	0.45
Factor 2: Leader in modern agriculture				
Monsanto develops new agricultural technology to increase the efficiency of food production (feeds the world 2).	0.13	**0.68**	-0.16	0.13
Monsanto makes contributions to meet increasing global food needs (feeds the world 3).	0.29	**0.73**	-0.04	0.26
Monsanto plays a leading role in developing modern agricultural technology (leader in modern agriculture 1).	0.08	**0.83**	-0.05	0.19
Monsanto brings innovative solutions in farming (leader in modern agriculture 2).	0.20	**0.82**	-0.14	0.15

Table I3 (cont'd)

Results of Factor Analysis: Organization Image

Items for Organizational Image	Factor Loading			
	1	2	3	4
Factor 2: Leader in modern agriculture (cont'd)				
Monsanto is at the forefront of efforts to modernize agriculture (leader in modern agriculture 3).	0.15	**0.83**	-0.11	0.22
Monsanto is a leading agricultural company (leader in modern agriculture 4).	-0.20	**0.70**	-0.08	0.23
Monsanto helps farmers address challenges in farming (helps farmers 1).	0.20	**0.61**	-0.12	0.49
Factor 3: Harmful products and being extremely profit-driven/greedy				
Monsanto's products do harm to human health (harmful products 1).	-0.07	-0.11	**0.89**	-0.20
Monsanto's products do harm to the environment (harmful products 2).	-0.37	-0.13	**0.76**	-0.11
Monsanto's products endanger food security (harmful products 3).	0.03	-0.16	**0.67**	-0.21
Monsanto's products are dangerous (harmful products 4).	0.01	-0.08	**0.92**	-0.25
Monsanto conducts propaganda to hide safety concerns about its products (extremely profit-driven/greedy 1).	-0.33	-0.11	**0.74**	-0.02
Monsanto attempts to influence policy makers to promote unsafe products (extremely profit-driven/greedy 2).	-0.38	-0.08	**0.65**	-0.24
Monsanto considers corporate profit to be more important than human and environmental health (extremely profit-driven/greedy 3).	-0.53	-0.06	**0.64**	-0.08
Monsanto considers corporate profit to be more important than food safety (extremely profit-driven/greedy 4).	-0.39	-0.02	**0.74**	-0.07

Table I3 (cont'd)

Results of Factor Analysis: Organization Image

Items for Organizational Image	Factor Loading			
	1	2	3	4
Factor 4: Good workplace/great company				
Monsanto is a great place to work (good workplace/great company 1).	0.34	0.30	-0.29	**0.61**
Monsanto is a company committed to inclusion and diversity (good workplace/great company 2).	0.34	0.34	-0.25	**0.69**
Monsanto supports working women professionally and personally (good workplace/great company 3).	0.32	0.25	-0.31	**0.66**
Monsanto is one of the world's most admired companies (good workplace/great company 4).	0.59	0.12	-0.23	**0.61**

Figure I1

The Model Testing Effects on Organizational Reputation: The Case of Monsanto

Figure I2

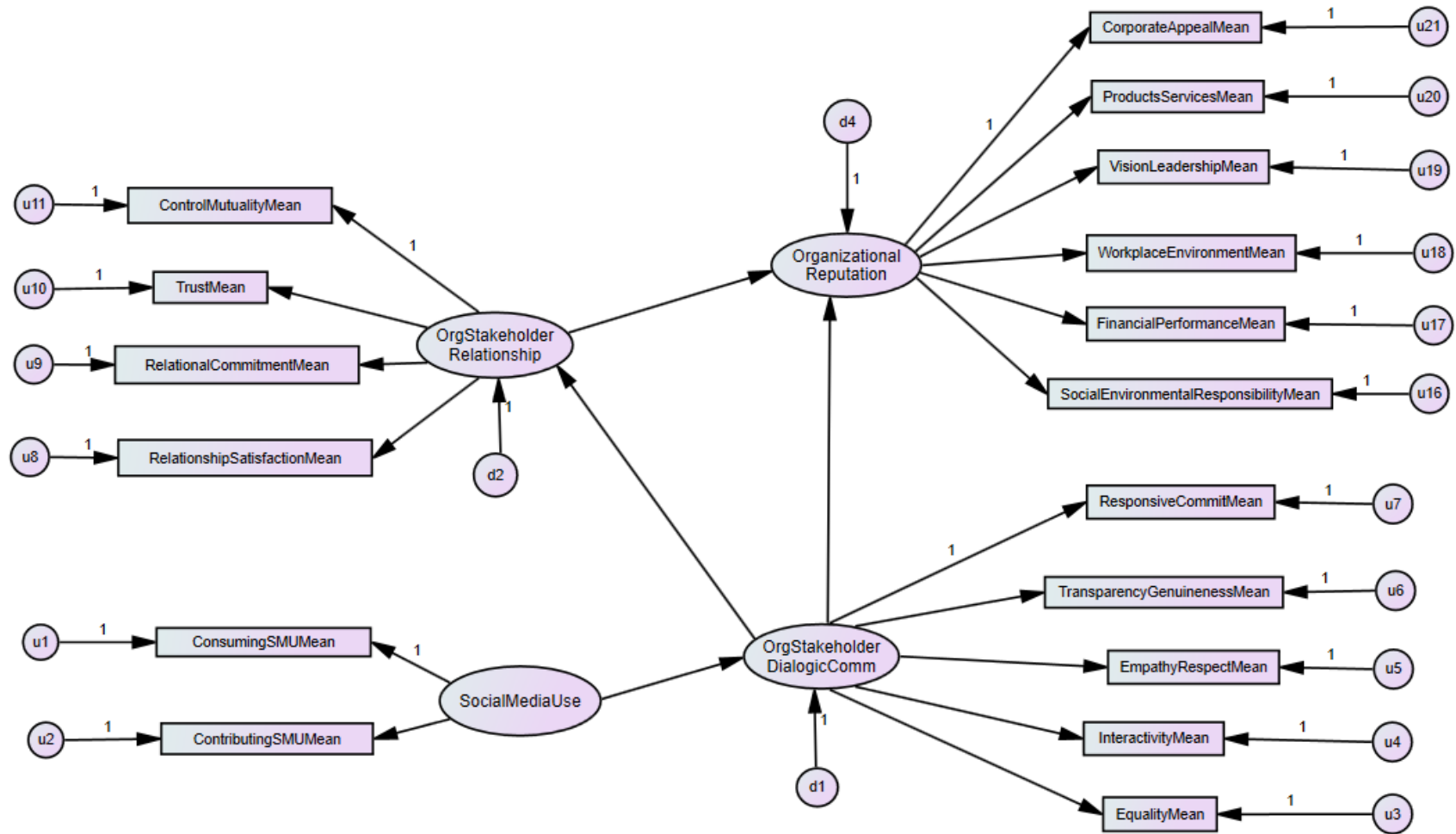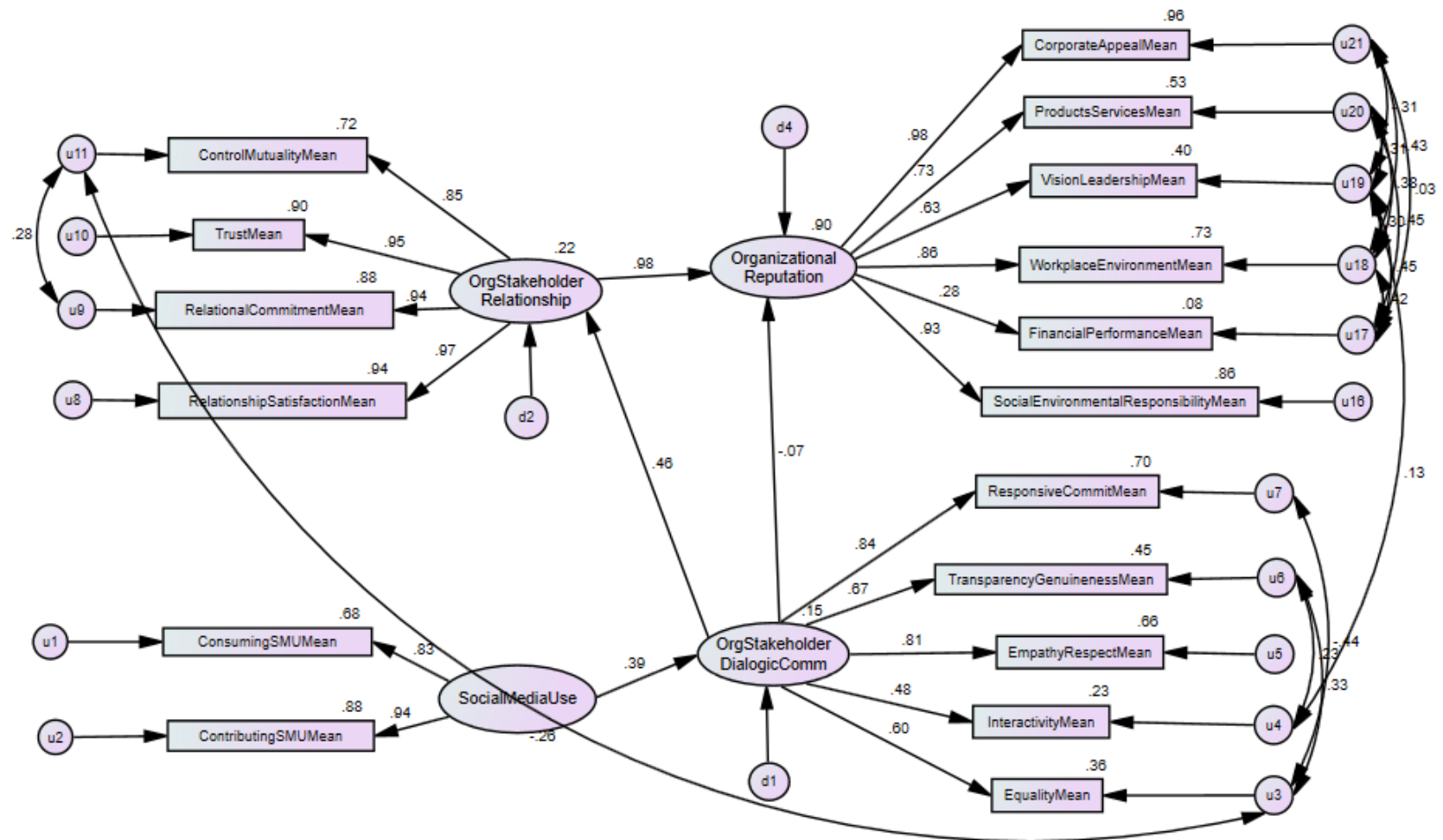*The Revised Model Testing Effects on Organizational Reputation: The Case of Monsanto*

Table I4

Parameter Estimates, Regression Weights, and Standardized Regression Weights: The Revised Model in Figure I2

Effects			Estimate	S.E.	C.R.	P	Standardized Estimate
OSDC	←	SMU	0.32	0.09	3.46	***	0.39
OSR	←	OSDC	0.40	0.09	4.31	***	0.46
OR	←	OSDC	-0.11	0.07	-1.47	.142	-0.07
OR	←	OSR	1.77	0.14	12.91	***	0.98
ResponsiveCommitMean	←	OSDC	1.00				0.84
TransparencyGenuinenessMean	←	OSDC	0.57	0.09	6.66	***	0.67
EmpathyRespectMean	←	OSDC	0.74	0.09	8.01	***	0.81
InteractivityMean	←	OSDC	0.35	0.07	4.64	***	0.48
EqualityMean	←	OSDC	0.60	0.12	5.00	***	0.60
ConsumingSMUMean	←	SMU	1.00				0.83
RelationshipSatisfactionMean	←	OSR	1.64	0.11	14.76	***	0.97
RelationalCommitmentMean	←	OSR	1.62	0.10	15.92	***	0.94
TrustMean	←	OSR	1.42	0.10	14.06	***	0.95
ControlMutualityMean	←	OSR	1.00				0.85
CorporateAppealMean	←	OR	1.00				0.98
ProductsServicesMean	←	OR	0.55	0.05	10.09	***	0.73
WorkplaceEnvironmentMean	←	OR	0.69	0.05	13.50	***	0.86
ContributingSMUMean	←	SMU	1.24	0.26	4.71	***	0.94
VisionLeadershipMean	←	OR	0.41	0.06	7.39	***	0.63
FinancialPerformanceMean	←	OR	0.15	0.06	2.77	.006	0.28
SocialEnvironmentalResponsibilityMean	←	OR	0.89	0.04	20.93	***	0.93

Table I5

*Squared Multiple Correlations: The Revised Model in Figure I2*

Indicators and Latent Variables	Estimate
OSDC	0.15
OSR	0.22
OR	0.90
SocialEnvironmentalResponsibilityMean	0.86
FinancialPerformanceMean	0.08
WorkplaceEnvironmentMean	0.73
VisionLeadershipMean	0.40
ProductsServicesMean	0.53
CorporateAppealMean	0.96
ControlMutualityMean	0.72
TrustMean	0.90
RelationalCommitmentMean	0.88
RelationshipSatisfactionMean	0.94
ConsumingSMUMean	0.68
ContributingSMUMean	0.88
EqualityMean	0.36
InteractivityMean	0.23
EmpathyRespectMean	0.66
TransparencyGenuinenessMean	0.45
ResponsiveCommitMean	0.70

Table I6

Direct and Indirect Effects: The Revised Model in Figure I2

Predictor	Response	Direct Effects	Indirect Effects	Total Effects	Standardized Direct Effects	Standardized Indirect Effects	Standardized Total Effects
SMU	OSDC	0.32	0.00	0.32	0.39	0.00	0.39
SMU	OSR	0.00	0.13	0.13	0.00	0.18	0.18
SMU	OR	0.00	0.19	0.19	0.00	0.15	0.15
OSDC	OSR	0.40	0.00	0.40	0.46	0.00	0.46
OSDC	OR	-0.11	0.70	0.59	-0.07	0.46	0.39
OSR	OR	1.77	0.00	1.77	0.98	0.00	0.98

Figure I3

The Model Testing Effects on Organizational Image: The Case of Monsanto

Figure I4

The Revised Model Testing Effects on Organizational Image: The Case of Monsanto
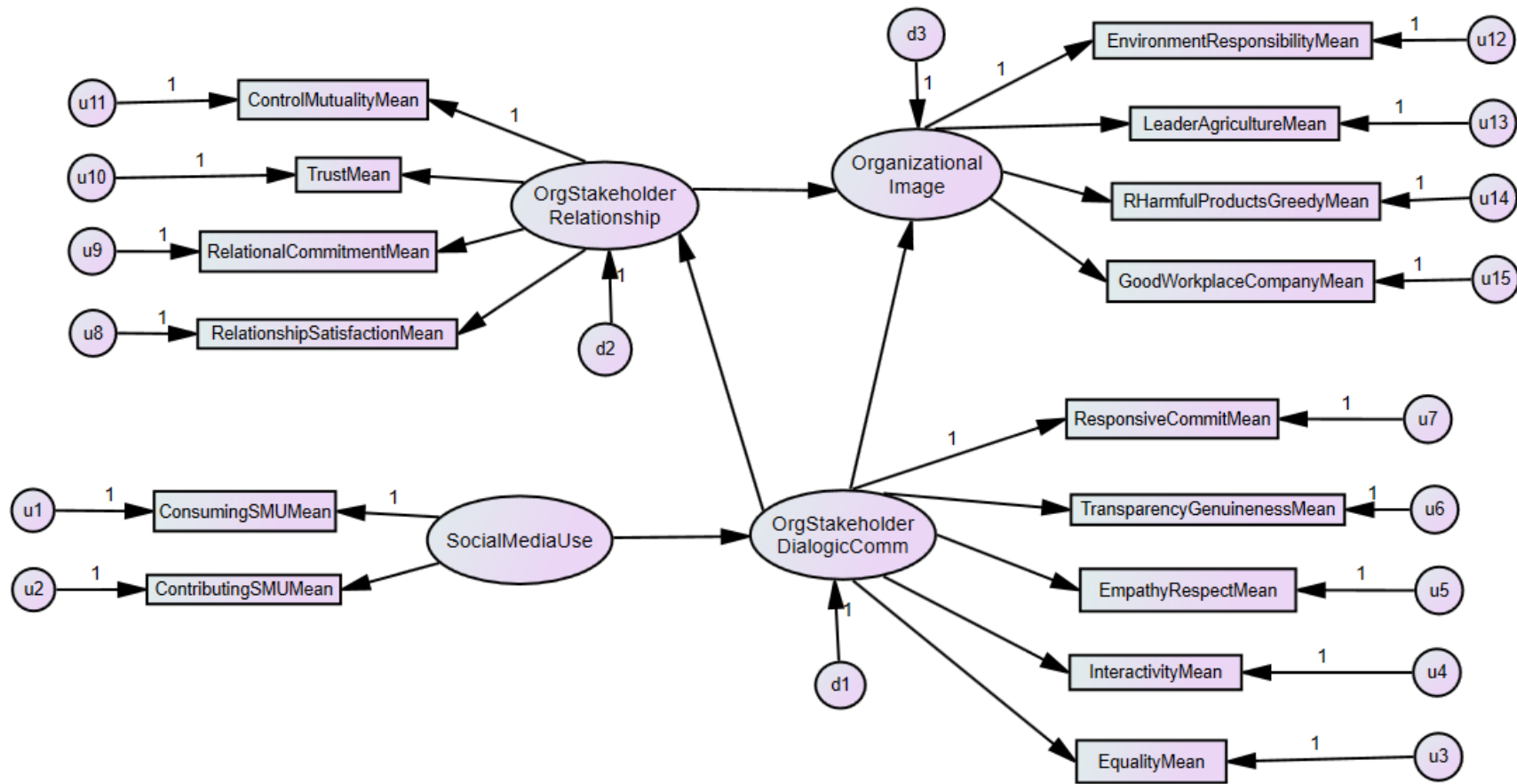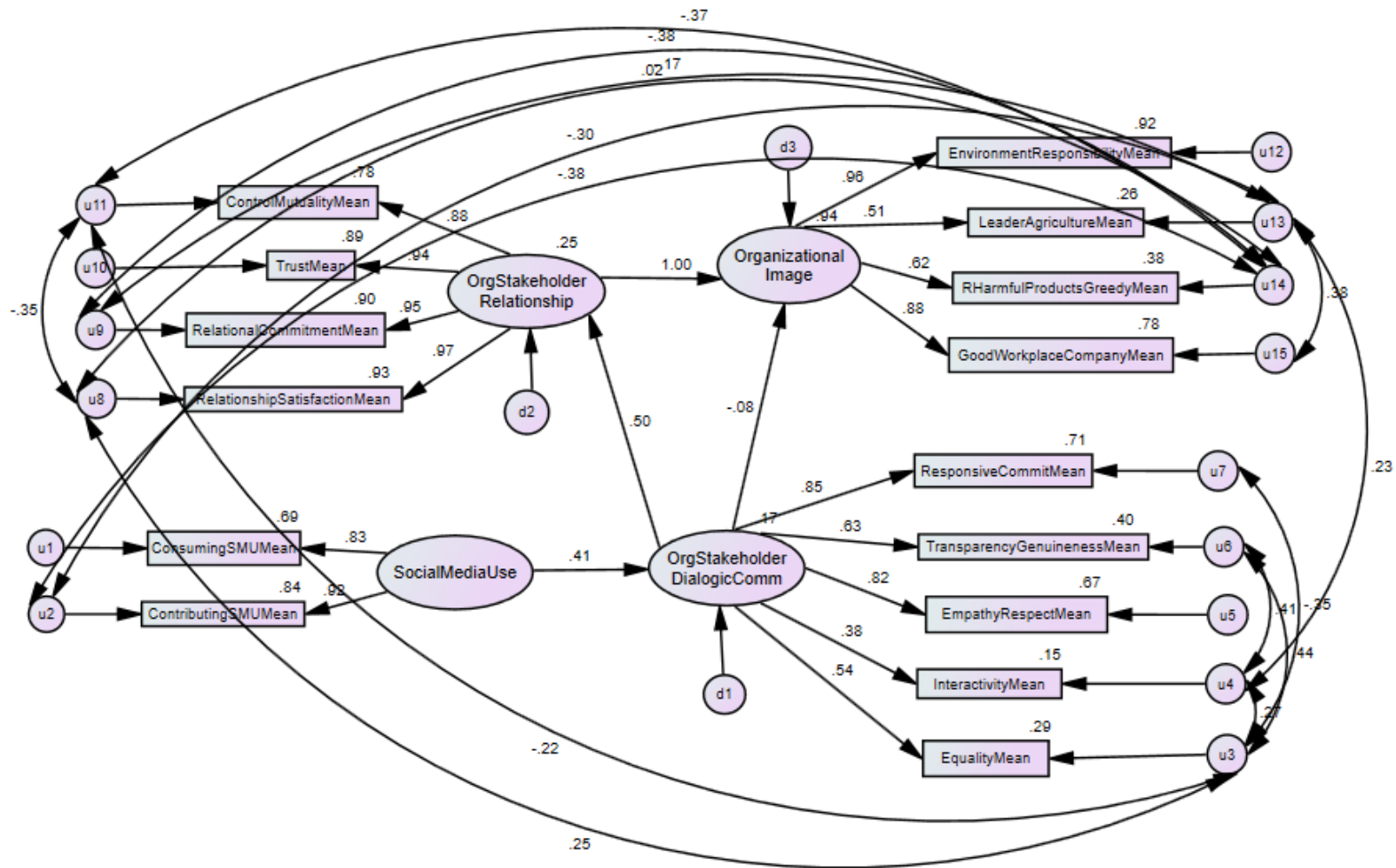
Table I7

Parameter Estimates, Regression Weights, and Standardized Regression Weights: The Revised Model in Figure I4

Effects			Estimate	S.E.	C.R.	P	Standardized Estimate
OSDC	←	SMU	0.34	0.09	3.62	***	0.41
OSR	←	OSDC	0.44	0.09	4.65	***	0.50
OI	←	OSDC	-0.11	0.07	-1.54	.124	-0.08
OI	←	OSR	1.61	0.12	14.04	***	1.00
ResponsiveCommitMean	←	OSDC	1.00				0.85
TransparencyGenuinenessMean	←	OSDC	0.54	0.09	6.21	***	0.63
EmpathyRespectMean	←	OSDC	0.74	0.09	7.92	***	0.82
InteractivityMean	←	OSDC	0.28	0.08	3.68	***	0.38
EqualityMean	←	OSDC	0.54	0.12	4.62	***	0.54
ConsumingSMUMean	←	SMU	1.00				0.83
RelationshipSatisfactionMean	←	OSR	1.58	0.11	15.01	***	0.97
RelationalCommitmentMean	←	OSR	1.56	0.10	15.75	***	0.95
TrustMean	←	OSR	1.36	0.09	15.52	***	0.94
ControlMutualityMean	←	OSR	1.00				0.88
EnvironmentResponsibilityMean	←	OI	1.00				0.96
LeaderAgricultureMean	←	OI	0.38	0.06	5.94	***	0.51
GoodWorkplaceCompanyMean	←	OI	0.74	0.05	15.85	***	0.88
ContributingSMUMean	←	SMU	1.17	0.24	4.96	***	0.92
RHarmfulProductsGreedyMean	←	OI	0.46	0.06	7.59	***	0.62

Table I8

Squared Multiple Correlations: The Revised Model in Figure I4

Indicators and Latent Variables	Estimate
OSDC	0.17
OSR	0.25
OI	0.94
GoodWorkplaceCompanyMean	0.78
RHarmfulProductsGreedyMean	0.38
LeaderAgricultureMean	0.26
EnvironmentResponsibilityMean	0.92
ControlMutualityMean	0.78
TrustMean	0.89
RelationalCommitmentMean	0.90
RelationshipSatisfactionMean	0.93
ConsumingSMUMean	0.69
ContributingSMUMean	0.84
EqualityMean	0.29
InteractivityMean	0.15
EmpathyRespectMean	0.67
TransparencyGenuinenessMean	0.40
ResponsiveCommitMean	0.72

Table I9

Direct and Indirect Effects: The Revised Model in Figure I4

Predictor	Response	Direct Effects	Indirect Effects	Total Effects	Standardized Direct Effects	Standardized Indirect Effects	Standardized Total Effects
SMU	OSDC	0.34	0.00	0.34	0.41	0.00	0.41
SMU	OSR	0.00	0.15	0.15	0.00	0.20	0.20
SMU	OI	0.00	0.20	0.20	0.00	0.17	0.17
OSDC	OSR	0.44	0.00	0.44	0.50	0.00	0.50
OSDC	OI	-0.11	0.71	0.60	-0.08	0.50	0.42
OSR	OI	1.61	0.00	1.61	1.00	0.00	1.00

Figure I5

The Model Testing the Relationship between Organizational Image and Organizational

Reputation: The Case of Monsanto
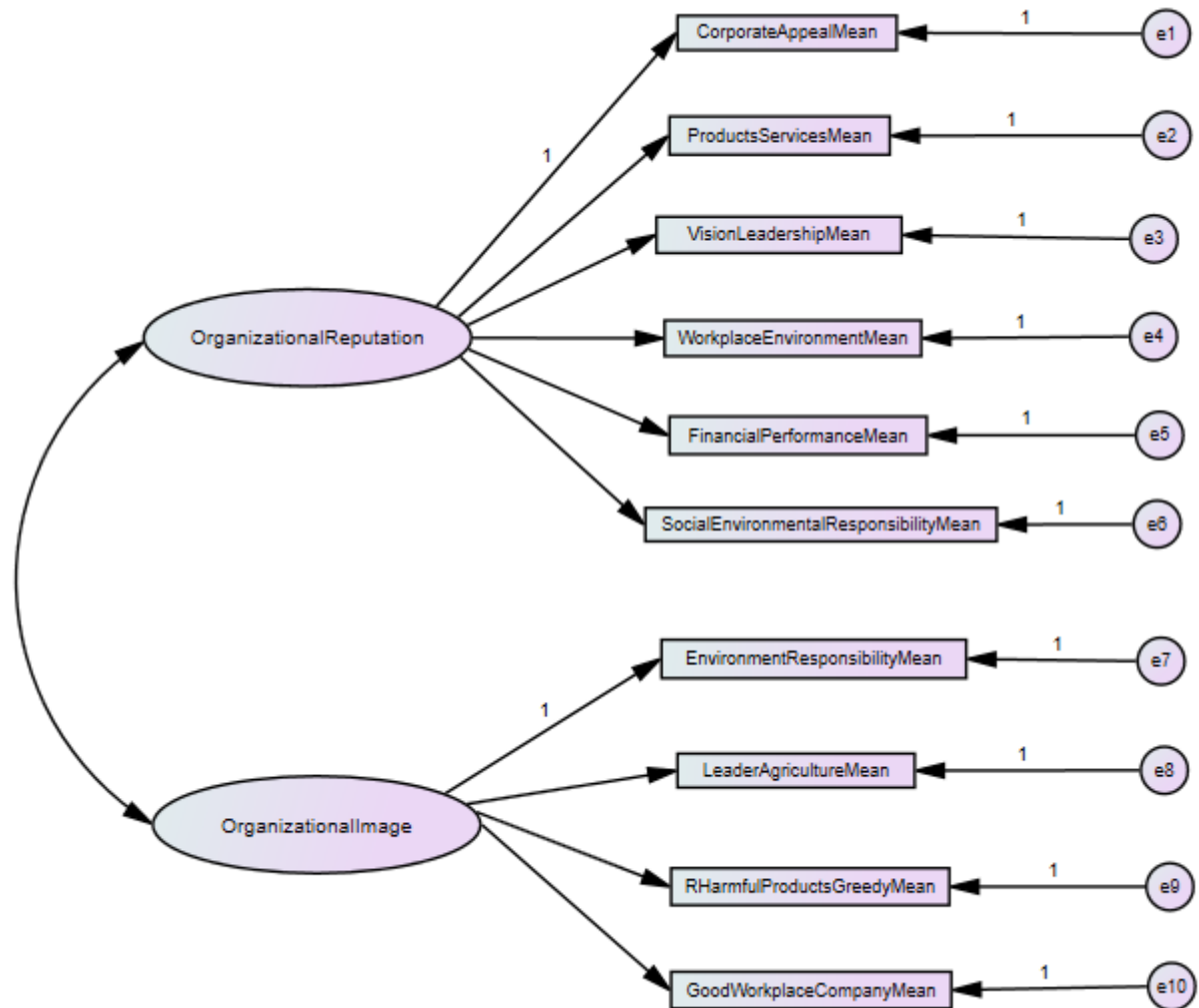
Figure I6

The Revised Model Testing the Relationship between Organizational Image and

Organizational Reputation: The Case of Monsanto
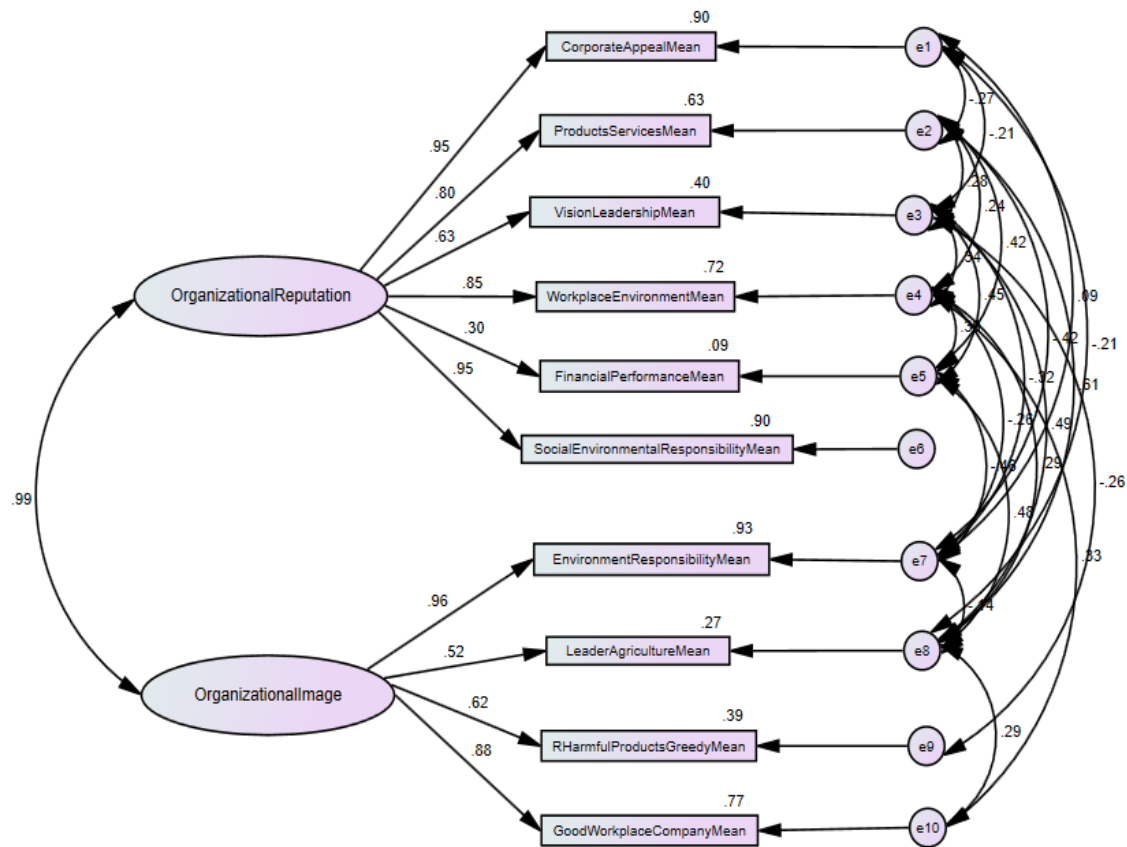
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[i] Initially the researcher contacted organizations to see whether links to the online questionnaires could be posted on the relevant social media sites as posts or comments; however, no permission was obtained. Then the researcher attempted to contact fans or followers of the sites directly and received no response from most of them. Very few people responded and expressed they did not trust the messages. The effort to contact organizations and users resulted in almost zero participation and the decision to use more general respondents through MTurk was turned to when these preferred options were no longer viable.