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Social Media for Supply Chain Risk Management

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Abstract - **With the rapid increase of online social network users worldwide, social media feeds have become a rich and valuable information resource and attract great attention across diversified domains. In social media data, there are abundant contents of two-way and interactive communication about products, demand, customer services and supply. This makes social media a valuable channel for listening to the voices from the market and measuring supply chain risks and new market trends for companies. In this study, we surveyed the potential value of social media in supply chain risk management (SCRM) and examined how they can be applied to SCRM systematically. We found that while such medium is very useful in supply chain risk management, it also brings along a new risk to supply chains, so called social media risk, as supply chain incidents may be rapidly transmitted and magnified through social media platforms worldwide. Accordingly, a new framework is proposed that assists the hiring of social media to serve supply chain risk management tasks.**

Keywords − **social media, supply chain risks, social-media-based supply chain risk management framework**

I. INTRODUCTION

Today, supply chains are becoming longer and more complex, due to the increasing trend of global outsourcing, integrated manufacturing processes among companies and shorter time-to-market windows. This in turn has increased supply chain risks and the likelihood of disruptions. Under such circumstances, supply chain risk management is extremely challenging, especially in a fast changing, volatile business environment. For better understanding and managing risks in supply chains, focal companies need to acquire information about the main entities, processes, market trends, customer interests, and marketing of products. With its real-time, reachable, high frequent and interactive characteristics, social media data may serve as a valuable resource for evaluating potential supply chain risks.

With the advent of social networking websites, consumer data is being accumulated in ways not possible before – people sharing their thoughts about products or services through social networks (e.g. in Facebook), via short text messages (e.g. in Twitter) or video/audio/text (e.g., in YouTube) [1]. As these data accumulate, social media analysis has become a hot topic and being increasingly applied to areas such as the management of emergent events, marketing strategy planning, customer service, etc. More and more companies are leveraging on these new social media tools to deliver better customer services, create better designs more cheaply, and provide better oversight [2][3]. The increasingly important social media motivates people to explore their applications in supply chain risk management.

We organize the paper as follows. First, we give an introduction about supply chain risks in Section II, we then review the utilization of social media for identifying supply chain risks. Next, we propose a social-media-based intelligent management framework as discussed in supply chain risk management aspects in Section IV. Finally, we conclude our study.

II. SUPPLY CHAIN RISKS

Supply chain risks have been classified into diversified types [4][5][6], like the source of risks, the consequence of risks, probability or frequency of risks, detectability of risks, etc. Considering the source of risks, there are three categories including external risks, internal risks and network-related risks [5][4]. External risks may involve political risks, natural risks, social risks and industry/market risks. Labor (strikes) or production (e.g. machine failure) to IT system uncertainties are categorized as internal risks as they usually occur within an organization's internal environment. Network-related risks in supply chain network structures [7] are mainly caused by insufficient information about other companies, interaction and cooperation among companies. The diversification in supply chain risks may bring challenges to identifying potential or hidden risks within supply chains. In the following section, we review how social media are being applied in supply chain risk management.

III. THE APPLICATIONS OF SOCIAL MEDIA IN SUPPLY CHAIN RISK MANAGEMENT

Today, the number of Facebook users is more than 1 billion [13]. And there are many more other social media sites like Friendster, Hi5, LinkedIn, MySpace, YouTube, and Twitter etc. These sites allow people to create, upload, share, and consume information and messages in many types. With the coupling of social media websites and information types, the whole world has become closer and more intensively connected [8]. The users of social media include individuals, companies and organizations [9][8][42] and the purpose of using social media differs from personal to business interest.

In business, social media have been used widely for many purposes, such as for social networking, promoting products, sourcing, customer service, and getting new customers [10], which involves many processes and entities of supply chains. Indeed, there are many examples [11][10][12][13][14][15] showing the applications of social media or indicating the potential of social media in supply chain risk management:

- **market uncertainty risk**

One obstacle in marketing is the risk from market uncertainty. Market uncertainty risk may be caused by the variation of economic cycles and the brand loyalty from their customers. Many companies have utilized social media marketing to build and maintain the brand loyalty of their customers [13] as it is easier to reach many of them through social media platforms. Also, it is recognized that social media has been changing the consumers' role in supply chains from that of a passive listener to a more active participant [16].

Confront to market uncertainty risk, companies had increased their social media budget for marketing [11][10][12][8]. There is a large untapped pool of consumers in social media websites, and they can now be reached quickly. Products may be promoted through social contacts, via the development of target groups, issue-by-issue advertising and promotion at social media websites. Another important reason for using social media in dealing with market risk is that most social media outlets can be accessed free of charge.

- **social risk and social media risk**

Although social media offers the opportunity for companies to network with customers for marketing purpose, they also bring along the added challenge of the need to maintain the reputation of brands and corporations [17][18][19]. For example, as in TripAdvisor, a main functionality is to rank or rate the popularity of services provided by the travel sector [20]. In the hospitality sector, hotel chains such as Starwood Hotels and Resorts have been leveraging the power of social media to manage risks in their supply chains, by staying connected with their guests and addressing customers' complaints and issues promptly [14][15]. In Tourism industry, it was estimated that online social media (reviews) influence over $10 billion a year in online travel purchases [21][20]. Online accountability can also be found on social media websites by rating/ranking entities in Tourism industry [20].

When Dave Carroll's guitar was broken onboard an United Airlines flight in 2008 and a music video about the incident was subsequently recorded and posted on YouTube [22], it is observed that a new supply chain risk is arising to companies with increasing social media footprint. We may call it the social media risk. As a new kind of external social risks, it may happen to any company involving its products, brands, services and overall reputation. One key feature about the risk that should be highlighted is, this risk may be amplified through social media platforms at a very fast speed.

- **natural disaster risk**

Social media may help capture public's attention to the risks associated with natural hazards [23]. Today, social media platforms play an increasingly important role for assisting responsiveness to natural disaster type of risks from companies and individuals in the community [24], providing vehicles for communication, collaboration, information sharing, and physical / virtual supports. As the case of a 7.1 magnitude earthquake off New Zealand's South Island on 4th September 2010, personal accounts and words of concern and support flooded pages on Facebook within hours of the event, and many images of earthquake damage quickly appeared on YouTube and Flickr. These social media platforms complement traditional media by providing affected companies with the latest information about the earthquake, updates on the rescue operations and evaluate how the event may affect their personnel, facilities and business etc through social media data.

In another case, Tweets, as a typical social media data, have been collected and analyzed for assisting natural disaster management for companies and organizations. In [25], tweets in Japan had been analyzed to detect the center and the trajectory of the earthquake locations. The detection model constructed can identify 96% of earthquake events at scale 3 and above and faster than the agency report.

- **public health risk**

Public health risk is a result of disease outbreak and uncoordinated and panicky efforts of individuals [26]. Past influenza pandemics such as the 2009 H1N1 outbreak have warned people of the unpredictability and potentially overwhelming impacts of disruptions [27]. During the H1N1 outbreak, tweets were not only used to disseminate information from credible sources, but also served as a source of opinions and experiences [28]. One of the lessons learned from this outbreak is that the importance of social media in the detection of and response to disease outbreak should not be underscored [29].

Food borne disease outbreaks are important public health events that also impact food supply chains significantly. In [30], it was showed that social media may play an important role when disseminating food recall messages. Also, it was pointed out that there was stronger response to organizational messages than to user-generated messages.

The real-time detection of and response to disease outbreak and other types of health related risks from individuals and health authorities may better prepare

companies to respond to health related concerns and risks within their supply chains.

- **labor risk**

Not only social media may involve with external supply chain risks, it may also link with the concern of internal supply chain risks. For example, instantaneous communication may be important for dealing with potential labor risk. Rai [31] had discussed the role of social media for engaging and communicating with employees beyond their given work sphere. This had shown the potential of social media for listening [32], managing and mitigating labor issues and risk for companies.

- **network-related risk**

In [33], it was showed that social media is useful for strengthening relationships and networks among small business entrepreneurs and customers. In another example, American Red Cross had used social media as a means to communicate and network with their key contacts [9] including volunteers, the media, younger audiences, and the community. Further, Prohaska [34] had discussed exploiting social media through web-based and mobile technologies to make enterprise communications more interactive within a virtual society or across multiple virtual societies involving customers, partners, vendors and employees.

IV. SOCIAL-MEDIA-BASED SUPPLY CHAIN RISK MANAGEMENT FRAMEWORK

Supply chain risk management is implementation of strategies to manage risks and uncertainties along the supply chain caused by, or impacting on, logistics related activities or resources [35][5]. SCRM process may be executed in four stages: 1) risk monitoring, 2) risk identification, 3) risk assessment, 4) risk mitigation including decision and implementation of risk management actions and optimization [36][37].

For supply chain risk management, social media enables companies and organizations to proactively monitor [29] and prepare for potential crises which may negatively affect their supply chains. Specifically, it may impact a company or organization's operation, financial health and reputation [17].

While the interest and study on SCRM are growing, constant risk monitoring and prompt risk identification remain the top challenging task in SCRM. Social media are visible in the form of consumer applications on top of various social media platforms, but significant use of social media tools may take place with the recognition of power of social media from most corporations, institutions, and organizations [38]. For assisting the usage of social media in SCRM, a framework to hire social media for supply chain risk management tasks is proposed and shown in Figure 1.

In this framework, individual or corporate users may first broadcast incident messages involving entities in a supply chain, then transmit and magnify via social contacts in multiple social media websites. In social media world, focal companies may build their own social media presence as corporate users and also have their own strategy for marketing and listening updates and trends through social media platforms. By collaborating with academic institutions, outsourcing to external consultancy companies or relying on their own social media analysis team, focal companies can monitor and extract specific information for examining their supply chain risks based on social media. Following the risk evaluation, corresponding mitigation strategies can be implemented through internal adjustments and network-based collaboration. Some implementations like dealing with customer complaints received through social media channels may also be conducted through the same social media channels [14][15].

In addition to being a new marketing channel, social media can also serve as a listening channel [39], which makes it useful in supply chain risk management as companies "listen" to customer reviews about their brands, products and services [3]. Social media can also help companies "listen" to their competitors and therefore help discover potential opportunities.
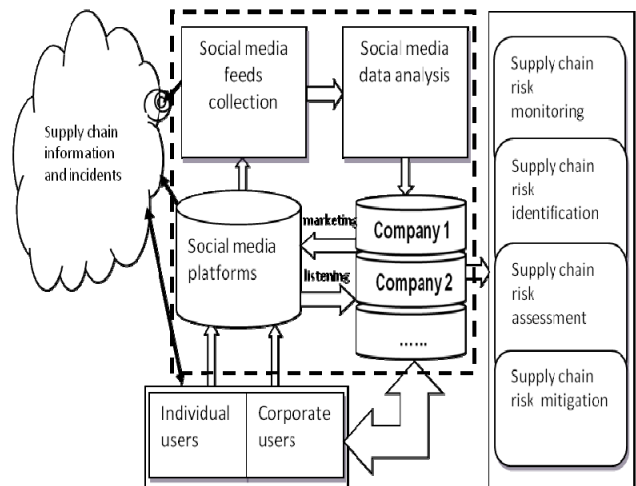

Figure 1. Social-media-based supply chain risk management framework

V. CONCLUSION

In this study, we had carried out a review on the applications of social media in supply chain risk management. We found that social media present a great value for SCRM as it provides an opportunity for managing supply chain risks from a new perspective. It

had been widely used for marketing, customer communications, and risk identification and management due to its timeliness, large pool of audience, relations and cost advantages. These advantages may have already best summarized the potential of social media applications for increasing the efficiencies, mitigating risks, reducing extra costs and emergency management due to disruptions in supply chains.

Despite its strength, social media also brings along a new type of risk as supply chain incidents may be quickly transmitted and magnified via social media platforms. Senior supply chain management should be alerted about the two sides of the power of social media. Also, challenges in the utilization of social media cannot be ignored including social media data accessibility, privacy issues, unbalanced age group coverage, awareness of social media usage from companies, the responsiveness and technical challenges for advanced analysis and denoising.

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