International Journal of Information Management 33 (2013) 464–472

Contents lists available at SciVerse ScienceDirect

International Journal of Information Management

journal homepage: www.elsevier.com/locate/ijinfomgt

Social media competitive analysis and text mining: A case study in the pizza industry

Wu He[a,*], Shenghua Zha[b,1], Ling Li[a,c,2]

[a] Department of Information Technology and Decision Sciences, College of Business and Public Administration, Old Dominion University, Norfolk, VA 23529, USA
[b] Center for Instructional Technology, James Madison University, Harrisonburg, VA 22807, USA
[c] College of Business and Public Administration, Old Dominion University, Norfolk, VA 23529, USA

ARTICLE INFO

Article history:
Received 27 September 2012
Accepted 2 January 2013
Available online 4 February 2013

Keywords:
Social media
Facebook
Twitter
Case study
Pizza industry
Competitive analysis
Competitive intelligence
Competitor intelligence
Actionable intelligence
Text mining
Content analysis

ABSTRACT

Social media have been adopted by many businesses. More and more companies are using social media tools such as Facebook and Twitter to provide various services and interact with customers. As a result, a large amount of user-generated content is freely available on social media sites. To increase competitive advantage and effectively assess the competitive environment of businesses, companies need to monitor and analyze not only the customer-generated content on their own social media sites, but also the textual information on their competitors' social media sites. In an effort to help companies understand how to perform a social media competitive analysis and transform social media data into knowledge for decision makers and e-marketers, this paper describes an in-depth case study which applies text mining to analyze unstructured text content on Facebook and Twitter sites of the three largest pizza chains: Pizza Hut, Domino's Pizza and Papa John's Pizza. The results reveal the value of social media competitive analysis and the power of text mining as an effective technique to extract business value from the vast amount of available social media data. Recommendations are also provided to help companies develop their social media competitive analysis strategy.

1. Introduction

Social media have profoundly changed our lives and how we interact with one another and the world around us (Qualman, 2009; Safko & Brake, 2009). Recent research indicates that more and more people are using social media applications such as Facebook and Twitters for various reasons such as making new friends, socializing with old friends, receiving information, and entertaining themselves (Kaplan & Haenlein, 2010; Keckley & Hoffman, 2010; Park, Kee, & Valenzuela, 2009; Raacke & Bonds-Raacke, 2008; Shih, 2009). As a result, many large companies are adopting social media to accommodate this growing trend in order to gain business values such as driving customer traffic, increasing customer loyalty and retention, increasing sales and revenues, improving customer satisfaction, creating brand awareness and building reputation (Culnan, McHugh, & Zubillaga, 2010; Kietzmann, Hermkens, McCarthy, & Silvestre, 2011; Sinderen & Almeida, 2011; Weber, 2009). Typical activities supported by social media applications include branding (advertising, marketing, and content delivery), sales, customer care and support, product development and innovation (Culnan, McHugh, & Zubillaga, 2010; Di Gangi, Wasko, & Hooker, 2010). An example is that many hotel chains such as Starwood Hotels and Resorts have been leveraging the power of social media in recent years to stay connected with guests, seek feedback from guests on their service, address customers' complaints and issues, and help potential guests make their travel decision (Lanz, Fischhof, & Lee, 2010; Lollis, 2011; Müller, 2011).

The wide adoption of social media tools has generated a wealth of textual data, which contain hidden knowledge for businesses to leverage for a competitive edge. In particular, marketers can dig into the vast amount of social media data to detect and discover new knowledge (e.g., brand popularity) and interesting patterns, understand what their competitors are doing and how the industry is changing, and use the findings and improved understanding to achieve competitive advantage against their competitors (Dey, Haque, Khurdiya, & Shroff, 2011; Governatori & Iannella, 2011). Decision makers can also use the findings to develop new products or services and make informed strategic and operational decisions. It is believed that competitive intelligence can help organizations to

* Corresponding author. Tel.: +1 757 683 5008; fax: +1 757 683 5639.
E-mail addresses: whe@odu.edu (W. He), zhasx@jmu.edu (S. Zha), lli@odu.edu (L. Li).
[1] Tel.: +1 540 568 4852.
[2] Tel.: +1 757 683 6455; fax: +1 757 683 5639.

0268-4012/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ijinfomgt.2013.01.001

realize strengths and weaknesses, enhance business effectiveness, and improve customer satisfaction (Lau, Lee & Ho, 2005). Competitive intelligence is defined to be "the art of defining, gathering and analyzing intelligence about competitor's products, promotions, sales etc. from external sources" (Dey, Haque, Khurdiya, & Shroff, 2011). A successful organization should have the ability to process all available information (e.g., customers' opinions, product prices from competitors, reviews of services and products), identify what has happened and predict what will happen in the immediate future. As many companies are not familiar with social media competitive intelligence (Dai, Kakkonen, & Sutinen, 2011) and analysis and lack enough understanding of the process of mining social media data, the authors conducted a case study to illustrate how social media data can be transformed into knowledge through text mining.

The remainder of the paper is organized as follows. Section 2 is a brief review of text mining. Section 3 explains the research questions explored in this paper, the context of the study, details its methodological approach (samples and procedures) as well as the key findings. Section 4 discusses the findings in depth. Section 5 discusses the implications and recommendation for social media competitive analysis. Section 6 concludes with suggestions for future research.

2. A brief review of text mining

Text mining is an emerging technology that attempts to extract meaningful information from unstructured textual data. Text mining is an extension of data mining to textual data (Ananiadou, 2008; Liu, Cao, & He, 2011; Romero & Ventura, 2010; Zafra & Ventura, 2009; Zeng et al., 2012b). Study indicates that an estimated 80% of an organization's information is contained in text documents, such as emails, memos, customer correspondence, and reports (Tan, 1999). To glean useful information from a large number of textual documents quickly, it has become imperative to use automated computer techniques (He, 2013a; Liu, Cao, & He, 2011). Text mining is focused on finding useful models, trends, patterns, or rules from unstructured textual data such as text files, HTML files, chat messages and emails (Abdous & He, 2011; Chiang, Lin, & Chen, 2011; Hung & Zhang, 2008; Lin, Hsieh, & Chuang, 2009; Romero, Ventura, & Garcia, 2008). As an automated technique, text mining can be used to "efficiently and systematically identify, extract, manage, integrate, and exploit knowledge from texts" (Ananiadou, 2008). Different from traditional content analysis, text mining is mainly data driven and its main purpose is to automatically identify hidden patterns or trends in the data (Tsantis & Castellani, 2001) and then create interpretation or models that explain interesting patterns and trends in the textual data (Guo, Xu, Xiao, & Gong, 2012; Romero,Ventura, & Garcia, 2008).

Many researchers have successfully used text mining techniques to analyze large amounts of textual data in business (Ingvaldsen & Gulla, 2012), health science (Li, Ge, Zhou, & Valerdi, 2012) and educational domains (Abdous & He, 2011; Hung, 2012). Witten, Don, Dewsnip, and Tablan (2003) used text mining techniques to extract metadata from documents in a digital library and to enrich documents by marking up appropriate items in the text. They found that text mining can add additional values to the documents stored in the digital library and enrich the user experience. Tane, Schmitz, and Stumme (2004) used text mining to group e-learning resources and documents according to the similarities among different topics. Abdous and He (2011) used text mining techniques to analyze the online questions posted by video streaming students and identified a number of learning patterns and technology-related issues. Fuller, Biros, and Delen (2011) used text mining to detect deception and lies in real world data. Their results show that automated text mining techniques have the potential to aid those who must try to detect lies in text. Hung (2012) used clustering analysis as an exploratory technique to examine e-learning literature and visualized patterns by grouping sources that share similar words, attribute values and coding rules.

Some major applications of text mining include: clustering, information extraction (text summarization), and link analysis (He, Chee, Chong, & Rasnick, 2012; Hung, 2012; Ingvaldsen & Gulla, 2012; Wetzstein, Leitner, Rosenberg, Dustdar, & Leymann, 2011). In particular, clustering analysis is a well-studied technique in data mining (Lin, Hsieh, & Chuang, 2009) and has the advantage of uncovering unanticipated trends, correlations, or patterns from data (Ananiadou, 2008). Currently, there are a wide range of tools that can be used for text mining, such as the SPSS Modeler (formerly Clementine), Leximancer and the SAS Enterprise Miner. These tools use sophisticated computing paradigms including decision tree construction, rule induction, clustering, logic programming, and statistical algorithms to find insights and patterns from unstructured textual data (Abdous & He, 2011; Duan, Street, & Xu, 2011; Duan & Xu, 2012; Romero & Ventura, 2010; Zeng et al., 2012b). Due to the powerful capabilities of text mining, it is believed that applying text mining to social media data can yield interesting findings on human behavior and human interaction (Abdous, He, & Yen, 2012; Barbier & Liu, 2011; He, 2013b; Pang & Lee, 2008).

3. A case study

3.1. Research questions

Contents generated by users (UGCs) have been considered important in social media studies (Aggarwal, Gopal, Sankaranarayanan, & Singh, 2011; Akehurst, 2009).

This study examined the social media sites of the three largest pizza chains and applied text mining to analyze unstructured text content on their Facebook and Twitter sites. Specifically, the study attempts to answer the following questions:

- What patterns can be found from their Facebook sites respectively?
- What patterns can be found from their Twitter sites respectively?
- What are the main differences in terms of their Facebook and Twitter patterns?

3.2. Methodology

3.2.1. Context of the study

An influential IT study published in MIS quarterly by Chiasson and Davidson (2005) indicates that the food and restaurant industry received little attention in IT research and suggests that more attention to the food and restaurant industry in IS research is needed. As the U.S. Pizza industry is one of the first industries that has entered the social media arena for business purposes and has a large social media user base, we decided to conduct our social media competitive analysis with the three largest pizza chains: Pizza Hut, Domino's Pizza and Papa John's Pizza in our case study. An extensive Internet search also indicates that so far there is no academic article that investigates how large pizza chains are using social media to support their business although large pizza chains such as Papa John's, Domino's Pizza and Pizza Hut have been very active in social media marketing (Barrett, 2010).

According to *PMQ Pizza Magazine* (2010), the pizza industry represents 11.7% of all restaurants and accounts for more than 10% of all food service sales. The annual pizza sales are over $36 billions.

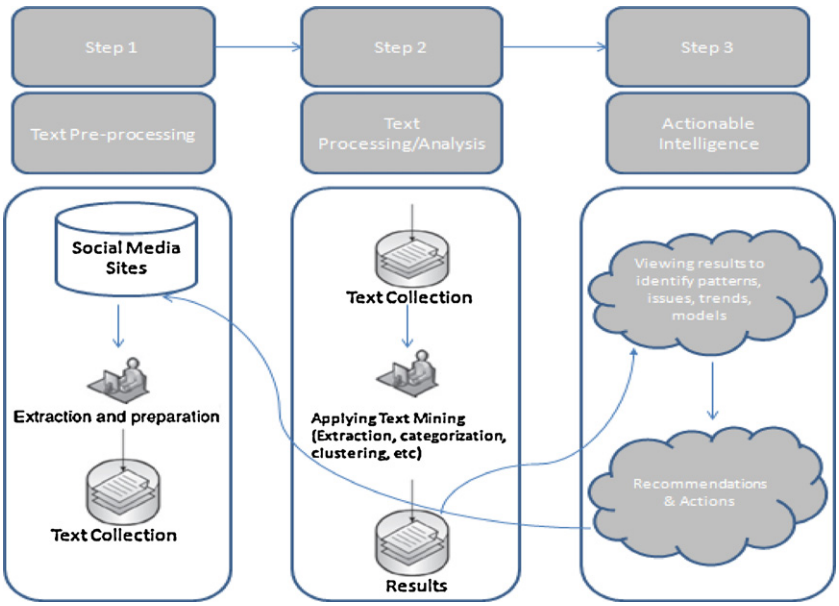

Fig. 1. Text mining process for social media content.

Adapted from Abdous & He, 2011.

Among so many pizza stores, the three largest pizza chains make up around 23% of the market share. In particular, Pizza Hut makes up 11.65%, Domino's make up 7.60% and Papa John's make up 4.23%.

Traditionally, pizza businesses promote sales to customers through various marketing channels such as direct mail, newspaper, magazines, print coupon, TV advertising. Due to the rapid development of the Internet and the widespread use of Facebook, Twitter and YouTube by customers, more and more pizza stores are promoting their pizza business via social media. According to the uses and gratifications theory (Katz, Blumler, & Gurevitch, 1973; West & Turner, 2010), people actively look for specific media outlets and information for gratification purposes. As social media becomes an increasingly popular media outlet among consumers (Bulik, 2008; Raacke & Bonds-Raacke, 2008), it becomes necessary for pizza businesses to set up social media presence for prospective customers. A survey of pizza industry experts (PMQ, 2010) identifies social media as a top trend in the pizza industry and points out that Facebook and Twitter will play an increasingly important role in the pizza industry. Another survey from the consumer research firm Market Force Information (Brandau, 2010) found that nearly half of the survey participants had looked for a restaurant recommendation by reading online reviews and information posted on blogs, Facebook and Twitters. The 2010 pizza franchise report (Franchise Direct, 2011) finds that 85% of pizza-chain sales are now tied to promotions and discounts mostly acquired through social media sites. In addition to creating social media sites, many pizza restaurants such as Pizza Hut and Domino's have assigned specific staff members with responsibilities to engage customers and build an online community. By using these social media applications, customers can engage in activities such as customizing pizzas, discussing pizza quality, tastes and deal information with peer customers, giving praise and complaints, providing feedback to pizza seller. On the other hand, many pizza restaurants are using social media as a customer service tool to listen to customers and address their concerns. Currently, large pizza chains are focusing their social media use on Facebook and Twitter.

3.2.2. Procedures

To answer the research questions, we conducted a social media competitive analysis for the Facebook and Twitter sites of the Big Three by following two phases. First, we collected quantitative data manually from their individual social media sites such as number of fans/followers, number of postings, comments, shares and likes, frequency of posting. Secondly, we applied text mining to analyze the text messages posted on their Facebook and Twitter sites in order to discover new knowledge and patterns, and to acquire a deeper understanding of how the three pizza chains are using social media in practice. As October is the busiest month of the year in the pizza industry (PMQ's Pizza Magazine, 2010, 2011), our study used the posts collected between October 1, 2011 and October 31, 2011 as the sample for text mining. The posts were saved into Excel Spreadsheets for analysis.

The text mining process includes multiple steps. We first did data pre-processing, in which raw data was transformed into a usable format, mainly by cleaning, assigning attributes, and integrating data. Subsequently, we applied various data mining and text mining techniques to examine the data sets in order to gain insights about participants' social media activities. Two leading tools in textual data analysis and mining, SPSS Clementine text mining tool and Nvivo 9, were used to facilitate the mining and analysis. We used the two software tools because we found each of the tools offers some advantages in certain features and functionalities. We mainly used SPSS Clementine's linguistic methods (extracting, grouping, indexing, etc.) to explore and extract key concepts, generate categories, and help us quickly gain insights from the textual data. We mainly used NVivo 9 software to conduct various query searches. The query searches are mainly used to test ideas, find interesting patterns, connections, and unusual information based on the research questions.

Fig. 1 lists the main steps for the text mining process used in our study. By following the three steps (pre-processing, applying text mining, and evaluating the mining results and recognize actionable information), we were able to identify new knowledge including patterns, issues and themes from the collected social media data. Oftentimes, applying text mining to data sets requires continuous

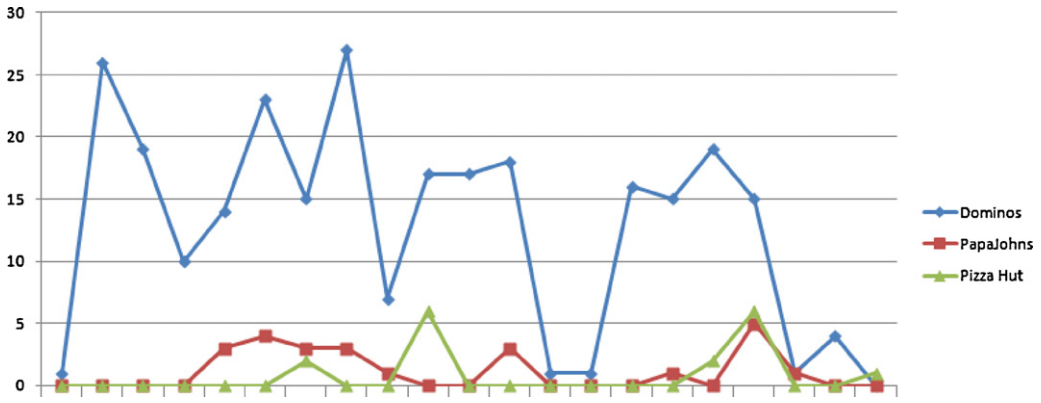

Fig. 2. Trend of tweets numbers in October for the Big Three.

evaluation and refinement to achieve the best results (Romero & Ventura, 2010; Zeng, Li, & Duan, 2012a).

3.3. Findings

3.3.1. Phase 1 findings

We collected quantitative data manually from their individual social media sites such as number of fans/followers, number of postings, comments and likes, frequency of posting, posting and response time. We are mainly interested in how many fans or followers a pizza chain had on their social media sites and the level of engagement (Table 1).

Below is the trend of tweets numbers in October, 2011 for the Big Three pizza chains: namely Domino's Pizza twitter site (http://twitter.com/dominos), Papa John's Pizza twitter site (http://twitter.com/PapaJohns), and Pizza Hut's twitter site (http://twitter.com/PizzaHut). Three hundred and seven (307) tweets were collected from the three twitter sites in total. Among them, Domino's Pizza' twitter site had the largest number of tweets; 266 messages were posted on their site. Papa John's posted 24 messages, while Pizza Hut posted 17 messages. Fig. 2 shows the number of messages posted on the three twitter sites in different days in October. As illustrated in the figure, the peak time of the tweets does not occur at the same time. A reason for the disparity is that the three pizza chains had different events and special offers such as deals, discounts and incentives at different days.

An analysis was also conducted on the Big Three pizza chains' Facebook pages between October 1, 2011 and October 31, 2011. A user can add information to a Facebook site in many ways, such as posting messages to the wall and uploading photos. A popular communication feature on Facebook was the wall post (Bender, Jimenez-Marroquin, & Jadad, 2011). A wall post is a blurb that can be posted by any user who visits the site (McCorkindale, 2010). The wall post can be publicly viewed by anyone who visits the site too (McCorkindale, 2010). Thus, our analysis mainly focused on the wall posts. A total of 135 wall posts were collected. Specifically, Domino's had 63 wall posts (around 2 posts on average per day); Papa John's had 37 wall posts (around 1.2 posts on average per day); Pizza Hut had 35 wall posts (around 1.1 posts on average per day). User comments, likes and shares under each wall post vary greatly from post to post. For example, a wall post on Domino's Facebook site – "*Who "LIKES" pizza for breakfast?*" received 998 comments, 13,700 likes and 36 shares from customers. Figs. 3–5 show the number of comments, likes and shares posted on the three Facebook sites in different days in October. Typically the customer engagement reaches the peak when the pizza chains poll customers with a question on Facebook. In total, Pizza Hut received 98,664 likes, 17,644 comments and 2208 shares; Domino's received 212,673 likes, 34,450 comments and 1141 shares; Papa John's received 32,347 likes, 5160 comments and 329 shares from customers during the month of October in 2011. Overall, Domino's had a higher level of engagement than its two competitors in terms of likes and comments from customers. But Pizza Hut received more shares from its customers than Domino's and Papa John's did.

Table 1
Social media use as of October 2011.

Rank number	Chain name	Facebook fans	Twitter followers
1	Pizza Hut	4,948,767	77,976
2	Domino's Pizza	4,328,185	118,563
3	Papa John's Pizza	1,991,857	36,166

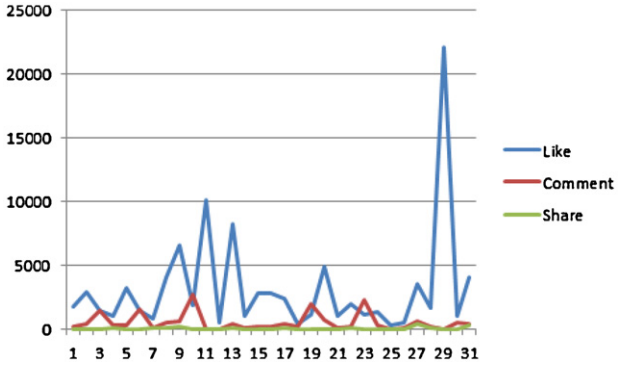

Fig. 3. Pizza Hut's customer engagement trend in October, 2011.

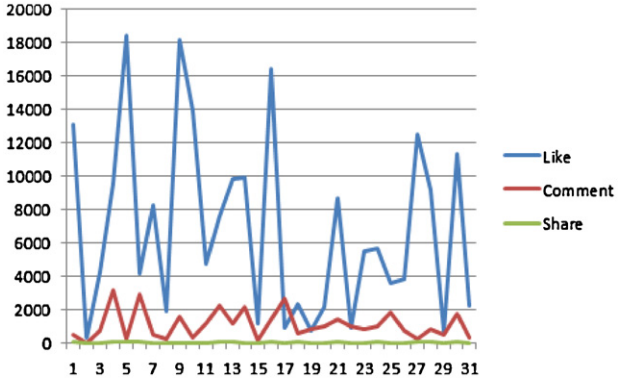

Fig. 4. Domino's customer engagement trend in October, 2011.

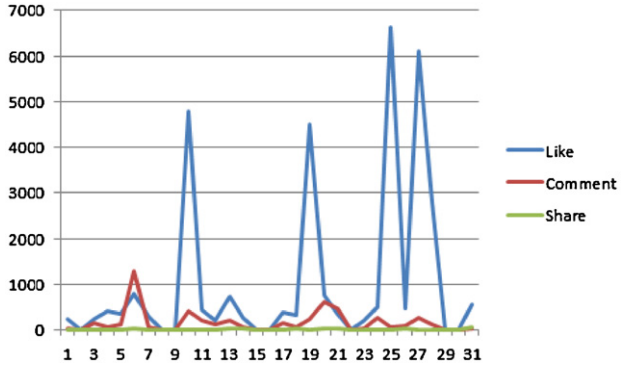

Fig. 5. Papa John's customer engagement trend in October, 2011.

3.3.2. Phase 2 findings

In phase 2, we applied text mining to the text we collected in order to discover new knowledge and patterns. Social media data are usually large, noisy and unstructured (Barbier & Liu, 2011). It would be tedious and time-consuming if we had to manually code a large amount of social media data. As there were no criteria available to compare the social media content of the three pizza chains, we decided to combine the textual data from the Big Three in order to discover main shared themes first. After themes were established, then we conducted query search based on each theme to examine and compare the detailed efforts of the Big Three. The results of the text mining are summarized as follows.

- Twitter results

To get a comprehensive understanding of our collected data, we combined the tweets of the Big Three for text mining. Five themes emerged in the tweets posted by the three pizza chains in October 2011. Subsequently, we did a lot of query searches based on the identified themes. A summary of the five themes is listed below.

(1) Ordering and delivering

A major theme we found is related to the online ordering and tracking services (around 31%). Customers shared their feelings and emotions including both positive experiences (appreciation and praise) and negative experiences (complaints). The posts also show that the Big Three chains are listening to what customers are saying and trying to address their needs by providing timely responses. Some representative comments are listed in Table 2.

(2) Pizza quality

Table 2
Examples related to ordering and delivering.

Topics	Examples
Customer sharing positive experiences with online ordering and delivery	*Having the iPhone app to order pizza is the greatest thing ever!! It's almost as awesome as delivery!* *You guys totally rock.*
Customer sharing negative experiences with online ordering and delivery	*Order did not have discount applied. I had to cancel the order for pizzas.* *Delivery so slow. Late almost 1 hour & 10 minutes.*
Responses from customer service representatives	*Thanks for the great feedback! We're so glad you like our iPhone app!* *Can you pls DM details and city where this happened? We take this seriously & I'd like to look into it. Thanks!* *We are very sorry for the experience you had! Can you pls DM your # so we can help make things right!*

Table 3
Examples related to the quality of their pizzas.

Topics	Examples
Customer sharing positive experiences with pizza quality	*Yummy, enjoy!*
Customer sharing negative experiences with pizza quality	*The pizza I ordered tasted a day old.* *The crust was burnt.* *My pizza had wrong topping!*
Responses from customer service representatives	*Very sorry for the wrong topping!! Can you pls follow & DM your name, phone, email and store info? I'd like to help!* *Thanks, glad you like them.*

Many messages (around 28%) were related to the quality of the pizzas such as its taste and ingredients. Some examples are given in Table 3.

(3) Feedback on customers' purchase decision

We found that a few messages were simply brief responses to customers' tweets about their purchasing decision. Generally, the pizza chains expressed their appreciation for their loyalty and at the same time used it as anecdotal evidence to grab other twitter readers' attention on their business. An example is that "Awesome, enjoy your pizza."

(4) Casual socialization tweets

We noticed that not every tweet posted by the three pizza chains was about the pizza business. They also occasionally posted socializations and greeting messages such as "Happy Friday", which created a friendly atmosphere. In other words, the pizza chains were trying to make their online presence on twitter more like an online community or a network of friends.

(5) Marketing tweets

Other than posting replies to customers' tweets, the three pizza chains also posted new tweets to advertise their promotions and deals, which accounted for nearly 40% of the total initial messages they posted. In addition, we found that Domino's and Papa John's also posted tweets that educate their audience about pizza knowledge in October, 2011. Based on our analysis and observation, these proactive efforts seemed effective strategies to engage the twitter audiences and made them the top twitter sites in the pizza industry.

Finally we examined the messages that were re-tweeted the most. They all were messages posted by Dominos. This is not a surprise as Domino's had the largest number of messages in October. Although all of the three pizza chains assigned specific staff members to engage users and monitor the content that users create in their twitter sites, we observed that Domino's staff members spent more efforts on their twitter sites and addressed customer issues and concerns more promptly than their competitors.

- Facebook results

We applied the same approach to mine all the wall posts from the three pizza chains during the period of October 2011. Six main themes were identified. A summary of the six main themes is listed in Table 4.

At last, we also noticed that the three pizza chains posted company introduction information, events, videos and photos to their Facebook sites. Their Facebook sites also have many photos and videos posted by the consumers and pizza chain employees. For example, at the end of our content analysis, Pizza Hut had 106 pictures and 42 videos on its Facebook site; Domino's had 367 pictures and 67 videos; Papa John's had 196 pictures and 40 videos; Both Pizza Hut and Papa John's provide a poll feature to collect opinions from consumers on questions such as "What would you put on your pizza" and "What is your favorite pizza topping?"

Table 4
A summary of the six main themes on Facebook sites.

Themes	Examples
Post pictures	*Halloween photos, specialty pizza photos, special event pictures*, etc.
Post questions to get input from consumers	*"what is my favorite part of Halloween?", "what is the best time for pizza", "what do you do for weekends?"*, etc.
Post contest and game information	*Game 2 of the World Series is tonight!*
Post company and community activity (e.g., social responsibility) information	*Store grand opening* *School Choice Fundraiser*
Post thank you and appreciation information	*We just want to say a big THANKS for liking Pizza Hut. You guys are awesome!* *THANK YOU to the best 4 MILLION fans on Facebook. We "LIKE" you too!!*
Post deal, promotion, reward and give-away information	*Monday-Wednesday deal: just $7.99.* *Free music download with your online pizza order.*

Different from the other two pizza chains, Papa John's also provides additional features such as purchasing gift cards, ordering pizza, joining birthday clubs and viewing special offers. It seems that Papa John's is integrating Facebook with their e-commerce system on their website to enable easy ordering of pizza and gift cards. Will these additional features on Facebook have an impact of customer perceptions and purchase behaviors? This could be a potential research question for further studies.

4. Discussion

Positive customer experience can encourage consumers to become an active brand advocate, increase brand loyalty and referrals and ultimately boost their revenues and profits (Sashi, 2011; Shen, Huang, Chu, & Liao, 2010). A recent survey by Empathica (2010) indicated that "one in three respondents followed through with a friend's recommendation received through a social media outlet like Facebook or Twitter". Thus, it is reasonable to say that customers become more powerful due to the introduction of social media (Constantinides & Fountain, 2008). Our case study provides firsthand evidence to support the claim of Rick (2010) and Rosenthal (2010) that social media are changing customer service landscape and are driving more firms like pizzerias to improve their services to their customers.

The results reveal that the three largest pizza chains are actively in social media and have committed substantial resources for their social media efforts. The data we examined show that they were committed to providing delightful experience for their customers. For example, if questions cannot be immediately answered, their customer representatives quickly apologized and directed customers to a toll-free telephone number or customer service for further assistance. On the other hand, we also found that the levels of engagement and commitment vary across pizza chains and social media applications. Domino's Pizza demonstrated a higher level of commitment and consumer engagement than the other two pizza chains through the number of posts and user comments on social media. Their social media efforts are more noticeable considering that their market share (7.60%) is smaller than the market share of Pizza Hut (11.65%). In particular, we noticed that Domino's Pizza responded to user comments more quickly during our review period, which reflects their strong efforts in monitoring and handling their social media activities.

In addition, we found that the user engagement level on Facebook is much higher than the engagement level on Twitter. There are many more Facebook fans than Twitter followers. The three pizza chains also offered more promotional and user engagement activities on Facebook than on Twitter. The main reason is caused by different characteristics of Facebook and Twitter. Facebook allows people to stay connected and supports more active user participation; Twitter is mainly used for submitting concise updates and noteworthy information.

The study demonstrates that the three largest pizza chains have made significant social media efforts to increase interaction with customers and build brands in the online communities. Specific staff members have been assigned to engage customers and monitor the content that customers created in their social media applications. They have used social media as an additional customer service and communication tool to gain insight into consumers' needs, wants, concerns and behaviors in order to serve them better. For example, they used social media to survey customers and listen to their feedback and opinions on matters such as price change, tastes, new recipes, new pizza ideas (Rosenthal, 2010). Some of the ideas and suggestions provided by their customers have been used to improve their pizza quality and tastes. Before social media were introduced, customers could call, email, fax, mail to or visit the local stores to convey their appreciations or complaints. Interactions only occurred between one customer and the seller. The messages received were private and seen only by the pizzeria (Culnan, McHugh, & Zubillaga, 2010) and the content and quality of customer service were not transparent to the public. Thus, customers had a limited ability to observe or influence other customers' relationships with a firm (Gallaugher & Ransbotham, 2010). Nowadays, customers can post their messages through social media applications publicly and the content of the messages is no longer private. The interactions between customers and pizzerias can draw the attention of other social media users, who may not necessarily be current customers of the pizzeria. Customers can also monitor what other customers are saying about a pizzeria through social media and can track a company's handling of customer complaints on social media (Gallaugher & Ransbotham, 2010). As a result, the customer service of a pizzeria becomes globally visible to a community of users instead of an individual customer. As social media tools enable customers to chat with one another, the content, timing, and frequency of the conversations among social media users are outside managers' direct control (Mangold & Faulds, 2009). The case study of the Big Three pizza chains further demonstrates the impact of social media on customer service. To some extent, social media applications such as Facebook and Twitter operate like "a giant word-of-mouth machine, catalyzing and accelerating the distribution of information" (Dellarocas, 2003; Godes & Mayzlin, 2004; Kumar, Petersen, & Leone, 2007). Therefore, it becomes necessary for pizzerias to actively monitoring social media to track customer conversations that involve them in order to address customer complaints and concerns in a timely manner and thus to proactively prevent and resolve potential public relation or brand crises.

5. Implications and recommendations

Social media competitive analysis allows a business to gain possible business advantage by analyzing the publicly available social media data of a business and its competitors. A business can compare its social media data to the social media data of their competitors to gain perspective on their performance. The comparison could help a business to identify weaknesses, find new opportunities and adjust their social media strategy. A main technique used in social media competitive analysis is text mining, which provides capabilities to analyze a large amount of complex textual data on social media. Traditionally text mining focuses on analyzing an organization's internal textual data. As Web applications and social media become increasingly prevalent, using text mining to analyze textual data from outside the organization becomes a critical business need and is expected to provide richer analysis and better

support for decision makers. The recent big data trend also demonstrates the importance for organizations to develop the capability of collecting, storing and analyzing both internal and external data for the purpose of harvesting information for decision making and strategic planning.

As more and more businesses established a social media presence, it becomes necessary for companies to monitor their own social media presence as well as that of their competitors. There is a need for companies to establish a social media monitoring and competitive analysis strategy to systematically gather, analyze and manage social media data about their competitors and the competitive environment. The social media monitoring and competitive analysis strategy not only helps a business to determine how its products or services are received by its customers, but also leads to a greater understanding of the competitors' products and services as well as increased market knowledge. Based on an extensive review of best practices in this area, we offer the following recommendations for companies who are interested in establishing social media monitoring and competitive analysis strategy:

- Constantly monitoring your own social media presence and your competitors' social media presence

  There are both free and commercial Internet tools and web services available that can help you monitor what is happening on social media by specifying keywords. Examples of such tools include Google Alerts, Social Mention, Quora, HootSuite, Advanced Twitter Search. Some of these tools can track real-time social media conversation and traffic, generate graphical reports and allow users to organize results by keywords, hashtags, sentiment and influencers (Robinson, 2011).
- Establishing Competitive Benchmarking

  A business should establish effective and realistic benchmarks to measure and monitor their social media efforts against competitors. Some examples of social media measurements and metrics include number of fans/followers, number of postings, comments, likes, tweets and retweets, frequency of posting, posting and response time. A business can use these measurements and metrics to compare their social media efforts against competitors' social media efforts and see what they can do to get ahead or make improvements. Some research questions include: do your fans and followers post more or less frequently than your competitors? Does your post receive more or less interactions than your competitor? Do you post more or less frequently than your competitors? Who are influential users? Do you respond to user comments more quickly or slowly than your competitors? (Mehlman, 2012). In addition to quantitative measurements, it is also necessary to establish qualitative metrics to assess what is being said in text such as sentiments or emotions.
- Mining the content of social media conversations

  As manual coding of social media data is too time-consuming, applying data mining and text mining techniques to analyze social media data has gained a lot of attention in recent years (Barbier & Liu, 2011). It is important for a business to collect their own social media data as well as that of their competitors and then mine the large amount of textual content in order to reveal hidden relationships, insights, patterns, and trends. A recent trend is to conduct opinion mining on social media data in order to identify consumer feelings, opinions, and sentiments on certain subjects/issues and to detect possible changes of opinion (Cheng, Ke, & Shiue, 2011; Pang & Lee, 2008).
- Analyzing the impact of social media findings and events on business

  To achieve real business advantage, organizations need to examine the impact of social media finings on business. Correlation between social media findings (consumer sentiments and opinions) and events (e.g., price changes, rival's promotional activities) and structured data like sales data need to be examined to understand how competition affects business and provide information for decision making (Dey, Haque, Khurdiya, & Shroff, 2011).

6. Conclusion and future research

As social media have become a topic of interest for many industries, it is important to understand how social media data can be harvested for decision making at the industry level. Currently, the majority of social media studies focus on individual companies or organizations. There are few studies performing social media competitive analysis on the leading companies in an industry in a systemic way. As an exploratory study, this case study made a contribution by using text mining to perform competitive analysis for the user-generated data on Twitter and Facebook in three major pizza chains. Results from the text mining and social media competitive analysis show that these pizza chains actively engaged their customers in social media such as Twitter and Facebook. They used the social media not only to promote their services, but also to bond with their customers. Findings from this study suggest that social media plays an important role in sustaining a positive relationship with customers.

Future research will focus on finding innovative ways to turn businesses' social media fans from "like" to "buy". For example, pizzerias will have to provide consumers easy ways to purchase pizzas inside social media from "selecting pizza, adding their selections to shopping carts, and completing purchases through payment with credit cards and points" (Anderson, Sims, Price, & Brusa, 2011). To reduce the gap from "like" to "buy", multiple types of customer-related data such as purchase, sales, behavioral, and demographic data need to be collected to form sociographic data. Businesses also need to track not only what consumers buy, but also what their friends buy (Anderson, Sims, Price, & Brusa, 2011). Thus, a future research area is to track real-time data and apply data mining and text mining to analyze all these data in order to acquire better competitive intelligence. Such efforts could lead to more personalized, differentiated and specific services to customers.

References

Abdous, M., He, W., & Yen, C. J. (2012). Using data mining for predicting relationships between online question theme and final grade. *Educational Technology & Society*, *15*(3), 77–88.

Abdous, M., & He, W. (2011). Using text mining to uncover students' technology-related problems in live video streaming. *British Journal of Educational Technology*, *40*(5), 40–49.

Aggarwal, R., Gopal, R., Sankaranarayanan, R., & Singh, P. V. (2012). Blog, blogger, and the firm: Can negative employee posts lead to positive outcomes? *Information Systems Research*, *23*(2), 306–322.

Akehurst, G. (2009). User generated content: The use of blogs for tourism organizations and tourism consumers. *Service Business*, *3*(1), 51–61.

Anderson, M., Sims, D., Price, J., & Brusa, J. (2011). Turning like to buy social media emerges as a commerce channel. Retrieved from www.booz.com/media/uploads/BaC-Turning_Like_to_Buy.pdf Accessed 07.06.2012.

Ananiadou, S. (2008). National centre for text mining: Introduction to tools for researchers. Retrieved from http://www.jisc.ac.uk/publications/publications/bpnationalcentrefortextminingv1.aspx Accessed 08.02.2009.

Barbier, G., & Liu, H. (2011). Data mining in social media. *Social Network Data Analytics*, *2011*, 327–352.

Barrett, L. (2010). 2010 pizza power report. Available from http://uspizzateam.com/index.php?option=com_zoo&task=item&item_id=350

Bender, J. L., Jimenez-Marroquin, M. C., & Jadad, A. R. (2011). Seeking support on Facebook: A content analysis of breast cancer groups. *Journal of Medical Internet Research*, *13*(1), e16. Available from http://www.jmir.org/2011/1/e16/

Brandau, M. (2010). Study: Consumers hungry for restaurants. Available from http://nrn.com/article/study-consumers-hungry-restaurants#ixzz1iB3TbprN

Bulik, B. S. (2008). Is your consumer using social media? *Advertising Age*, *79*, 12–13.

Cheng, L., Ke, Z., & Shiue, B. (2011). Detecting changes of opinion from customer reviews. In *Proceedings of 2011 eighth international conference on fuzzy systems and knowledge discovery* (pp. 1798–1802).

Chiang, D. M., Lin, C., & Chen, M. (2011). The adaptive approach for storage assignment by mining data of warehouse management system for distribution centres. *Enterprise Information Systems*, *5*(2), 219–234.
Chiasson, M. W., & Davidson, E. (2005). Taking industry seriously in is research. *MIS Quarterly*, *29*(4), 591–605, 2005
Constantinides, E., & Fountain, S. (2008). Web 2.0: Conceptual foundations and marketing issues. *Journal of Direct Data and Digital Marketing Practice*, *9*, 231–244.
Culnan, M., McHugh, P., & Zubillaga, J. (2010). How large U.S. companies can use twitter and other social media to gain business value. *MIS Quarterly Executive*, *9*(4), 243–259.
Dai, Y., Kakkonen, T., & Sutinen, E. (2011). MinEDec: A decision-support model that combines text-mining technologies with two competitive intelligence analysis methods. *International Journal of Computer Information Systems and Industrial Management Applications*, *3*, 165–173.
Dellarocas, C. (2003). The digitization of word of mouth: Promise and challenges of online feedback mechanisms. *Management Science*, *49*(10), 1407–1424.
Dey L., Haque S.M., Khurdiya A., & Shroff G. (2011). Acquiring competitive intelligence from social media. In *Proceedings of the 2011 joint workshop on multilingual OCR and analytics for noisy unstructured text data* Article 3.
Di Gangi, P. M., Wasko, M., & Hooker, R. E. (2010). Getting customers' ideas to work for you: Learning from Dell how to succeed with online user innovation communities. *MIS Quarterly Executive*, *9*(4), 163–178.
Duan, L., & Xu, L. (2012). Business intelligence for enterprise systems: A survey. *IEEE Transactions on Industrial Informatics*, *8*(3), 679–687.
Duan, L., Street, W. N., & Xu, E. (2011). Healthcare information systems: Data mining methods in the creation of a clinical recommender system. *Enterprise Information Systems*, *5*(2), 169–181.
Empathica. (2010). Empathica consumer insights panel: Consumer use of social media report. Retrieved from http://www.empathica.com/consumer-insights/market-specific-reports/social-media-report/ Accessed 07.06.2012.
Franchise Direct. (2011). Pizza franchise report 2010 (3) – New technology and business developments. Retrieved from http://www.franchisedirect.com/foodfranchises/pizzafranchises/newtechnologyandbusinessdevelopments/80/277 Accessed 07.06.2012.
Fuller, C., Biros, D., & Delen, D. (2011). An investigation of data and text mining methods for real world deception detection. *Expert Systems with Applications*, *38*(7), 8392–8398.
Gallaugher, J., & Ransbotham, S. (2010). Social media and customer dialog management at starbucks. *MIS Quarterly Executive*, *9*(4), 197–212.
Godes, D., & Mayzlin, D. (2004). Using online conversations to study word-of-mouth. *Marketing Science*, *23*(4), 545–560.
Governatori, G., & Iannella, R. (2011). A modeling and reasoning framework for social networks policies. *Enterprise Information Systems*, *5*(1), 145–167.
Guo, J., Xu, L., Xiao, G., & Gong, Z. (2012). Improving multilingual semantic interoperation in cross-organizational enterprise systems through concept disambiguation. *IEEE Transactions on Industrial Informatics*, *8*(3), 647–658.
He, W. (2013a). Examining students' online interaction in a live video streaming environment using data mining and text mining. *Computers in Human Behavior*, *29*(1), 90–102.
He, W. (2013b). Improving user experience with case-based reasoning systems using text mining and web 2.0. *Expert System with Applications*, *40*(2), 500–507.
He, W., Chee, T., Chong, D. Z., & Rasnick, E. (2012). Analyzing the trends of E-marketing from 2001 to 2010 with the use of bibliometrics and text mining. *International Journal of Online Marketing*, *2*(1), 16–24.
Hung, J. (2012). Trends of E-learning research from 2000 to 2008: Use of text mining and bibliometrics. *British Journal of Educational Technology*, *43*(1), 5–16.
Hung, J., & Zhang, K. (2008). Revealing online learning behaviors and activity patterns and making predictions with data mining techniques in online teaching. *MERLOT Journal of Online Learning and Teaching*, *4*(4). Retrieved from http://jolt.merlot.org/vol4no4/hung_1208.htm
Ingvaldsen, J. E., & Gulla, J. A. (2012). Industrial application of semantic process mining. *Enterprise Information Systems*, *6*(2), 139–163.
Kaplan, A., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, *53*, 59–68.
Katz, E., Blumler, J., & Gurevitch, M. (1973). Uses and gratifications research. *The Public Opinion Quarterly*, *37*(4th ser), 509–523 [1973–1974].
Keckley, P. H., & Hoffman, M. (2010). Social networks in health care: Communication, collaboration and insights. Deloitte. Available from http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/US_CHS_2010SocialNetworks_070710.pdf
Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, *54*(3), 241–251.
Kumar, V. J., Petersen, A., & Leone, R. (2007). How valuable is word of mouth? *Harvard Business Review*, *85*(10), 139–146.
Lanz, L., Fischhof, B., & Lee, R. (2010). *How are hotels embracing social media in 2010? Examples of how to start engaging*. New York: HVS Sales and Marketing Services.
Lau, K., Lee, K., & Ho, Y. (2005). Text Mining for the Hotel Industry. *Cornell Hotel and Restaurant Administration Quarterly*, *46*(3), 344–362.
Li, L., Ge, R., Zhou, S., & Valerdi, R. (2012). Guest editorial integrated healthcare information systems. *IEEE Transactions on Information Technology in Biomedicine*, *16*(4), 515–517.
Liu, B., Cao, S. G., & He, W. (2011). Distributed data mining for E-business. *Information Technology and Management*, *12*(2), 67–79.
Lin, F. R., Hsieh, L. S., & Chuang, F. T. (2009). Discovering genres of online discussion threads via text mining. *Computers & Education*, *52*(2), 481–495.
Lollis, B. D. (2011). Starwood exec: 36% of hotel social media fans buy more. Retrieve from http://travel.usatoday.com/hotels/post/2011/09/starwood-exec-36-facebook-twitter-social-media-fans-buy-more/546152/onNovember20, 2011.
Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix original. *Business Horizons*, *52*(4), 357–365.
McCorkindale, T. (2010). Can you see the writing on my wall?: A content analysis of the Fortune 50's Facebook social networking sites. *Public Relations Society of America*, *4*(3), 1–13.
Mehlman, J. (2012). How to stalk your competitors in social media. Available from http://blog.hubspot.com/blog/tabid/6307/bid/33347/How-to-Stalk-Your-Competitors-in-Social-Media-So-You-Can-Crush-Them.aspx
Müller, C. (2011). *The impact of the Internet and social media on the hotel industry*. Munich: GRIN Publishing.
Pang, B., & Lee, L. (2008). Opinion mining and sentiment analysis. *Foundations and Trends in Information Retrieval*, *2*(1–2), 1–135.
Park, N., Kee, K. F., & Valenzuela, S. (2009). Being immersed in social networking environment: Facebook groups, uses and gratifications, and social outcomes. *CyberPsychology & Behavior*, *12*(6), 729–733.
PMQ Pizza Magazine. (2010). Results of 2010 pizza industry census. Available from http://pmq.com/results2010/SurveySummary.html
PMQ Pizza Magazine. (2011). Results of 2011 pizza industry census. Available from http://pmq.com/results2011/SurveySummary.html
Qualman, E. (2009). *Socialnomics how social media transforms the way we live and do business*. Hoboken: Wiley John & Sons, Inc.
Raacke, J., & Bonds-Raacke, J. (2008). MySpace and Facebook: Applying the uses and gratifications theory to exploring friend-networking sites. *CyberPsychology & Behavior*, *11*(2), 169–174.
Rick, T. (2010). Social media changes customer service landscape. Available from http://www.torbenrick.eu/blog/customer-service/social-media-changes-customer-service-landscape/
Robinson, N. (2011). 4 free tools for social media competitive analysis. Available from http://blog.socialmediahq.com/4-free-tools-for-social-media-competitive-analysis/
Romero, C., & Ventura, S. (2010). Educational data mining: A review of the state of the art. *IEEE Transaction on Systems, Man, and Cybernetics, Part C: Applications and Reviews*, *40*(6), 601–618.
Romero, C., Ventura, S., & Garcia, E. (2008). Data mining in course management systems: Model case study and tutorial. *Computers & Education*, *51*(1), 368–384.
Rosenthal, B. (2010). How social media are changing the business landscape. Available from http://www.outsourcing-center.com/2010-06-how-social-media-are-changing-the-business-landscape-article-37300.html
Safko, L., & Brake, D. (2009). *The social media bible: Tactics, tools, and strategies for business success*. Hoboken: Wiley John & Sons, Inc.
Sashi, C. M. (2011). Customer engagement, buyer-seller relationships, and social media. *Management Decision*, *50*(2)
Shen, Y., Huang, C., Chu, C., & Liao, H. (2010). Virtual community loyalty: An interpersonal-interaction perspective. *International Journal of Electronic Commerce*, *15*(1), 49–74.
Shih, C. C. (2009). *The Facebook Era*. Boston: Prentice Hall.
Sinderen, M. V., & Almeida, J. P. A. (2011). Empowering enterprises through next-generation enterprise computing. *Enterprise Information Systems*, *5*(1), 1–8.
Tan, A. (1999). Text mining: Promises and challenges. In *Proceedings south east Asia research computer confederation (SEARCC99)* Singapore City, Singapore.
Tane, J., Schmitz, C., & Stumme, G. (2004). Semantic resource management for the web: An e-learning application. In *Proceedings of the WWW conference* New York, USA, 2004, (pp. 1–10).
Tsantis, L., & Castellani, J. (2001). Enhancing learning environments through solution-based knowledge discovery tools. *Journal of Special Education Technology*, *16*(4), 1–35.
Weber, L. (2009). *Marketing to the social web: How digital customer communities build your business* (2nd ed.). Hoboken, NJ: Wiley.
West, R. L., & Turner, L. H. (2010). *"Uses and gratifications theory". Introducing communication theory: Analysis and application*. Boston: McGraw-Hill., pp. 392–409.
Wetzstein, B., Leitner, P., Rosenberg, F., Dustdar, S., & Leymann, F. (2011). Identifying influential factors of business process performance using dependency analysis. *Enterprise Information Systems*, *5*(1), 79–98.
Witten, I., Don, K., Dewsnip, M., & Tablan, V. (2003). Text mining in a digital library. *International Journal of Digital Library*, *5*, 1–4.
Zafra, A., & Ventura, S. (2009). Predicting student grades in learning management systems with multiple instance programming. In *Proceedings of the 2nd international conference on educational data mining* Crodoba, Spain.
Zeng, L., Li, L., & Duan, L. (2012). Business intelligence in enterprise computing environment. *Information Technology & Management*, *13*(4), 297–310.
Zeng, L., Li, L., Duan, L., Lu, K., Shi, Z., Wang, M., Wu, W., & Luo, P. (2012). Distributed data mining: A survey. *Information Technology & Management*, *13*(4), 403–409.

Dr. Wu He is an Assistant Professor of Information Technology at Old Dominion University. He holds a PhD in Information Science (University of Missouri-Columbia, USA). He has been designing and developing information technology products and tools for more than ten years. His research interests include Data and Text Mining, Social Media, Enterprise Systems and Knowledge Management.

Dr. Shenghua Zha is an Instructional Technologist & & Assistant Professor at James Madison University. She holds a PhD in Information Science & Learning Technologies (University of Missouri-Columbia, USA). Her research interests include online learning, social media, and faculty development.

Dr. Ling Li is a Professor of Decision Sciences and an E.V. Williams Research Fellow in the College of Business and Public Administration (CBPA) at Old Dominion University. She has published numerous research articles and has received several research awards in the area of decision sciences. Professor Li's expertise includes theoretical and practical explanations of logistics and supply chain strategies, technology innovation for competitive advantage in a global market, production and operations management, and the impacts of emerging paradigms. Her published work focuses on a number of important issues such as supply chain management, operations planning and control, railway loading issues, knowledge management for problem solving, health care issues, and firm performance analysis.