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Building pharmaceutical relationship marketing and social media impact

An empirical analysis

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Abstract

Purpose – The purpose of this paper is to identify key social medial channels which pharmaceutical firms need to consider when desiring to understand consumer behavior, build, maintain and proactively manage relationships. Also, it proposes the application of analytic hierarchy process (AHP) sensitivity analysis algorithm to test the stability or robustness of the priority ranking. Specifically, this paper leverages performance sensitivity analysis to evaluate how small changes (perturbation) in the major objectives of the pharmaceutical relationship marketing (PRM) tactics within the social media environment will influence the ranking of the alternative course of actions.

Design/methodology/approach – This paper used AHP-based questionnaire survey to evaluate the relative importance of factors accounting for PRM and the impact of social media channels. The major objectives and the alternative strategies used were from literature reviewed. Interviews with senior managers were insightful and helpful in the wording, content and format of the questionnaire.

Findings – Customer engagement is the most important PRM tactic, followed by communication and trust. The performance sensitivity analysis carried out on the PRM tactics showed that the ranking associated with social media channel options remained robust or insensitive to small perturbations.

Research limitations/implications – The data procured for this paper were based on one focal pharmaceutical firm. Convincing the same to grant an interview and late responding to the questionnaire was a great challenge.

Practical implications – Social media impact on pharmaceutical marketing relationship is important for pharmaceutical marketers. PRM bodes well with the social media environment. Pharmaceutical industry can build and maintain relationships with consumers through social media. Firms that leverage social media to enhance their PRM tactics will be viewed favorably in terms of trust, transparency, openness and honesty. The results provide pharmaceutical marketing managers with insightful and valuable information with respect to the role or social media impact on the PRM. The AHP model, objectives and their relative importance provide valuable information for managers on how to monitor the values that matters to customers the most.

Originality/value – This paper is one of the very few on the PRM and perhaps the first that examines social impact leveraging the AHP model. In addition, this paper contributes to the relationship marketing literature by leveraging a multi-criteria decision-making algorithm to prioritize the most important factors accounting for the PRM strategies.

Keywords AHP, Social media, Relationship marketing, Sensitivity analysis, Pharmaceutical

Paper type Research paper

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Introduction

Pharmaceutical relationship marketing (PRM) tactics represent strategies pharmaceutical and health-care marketing firms use in establishing, maintaining and improving relationships with health consumers. Furthermore, PRM tactics focus on strengthening links with the existing health consumers with the view that retaining them is less expensive relative to acquiring new ones. Indeed, at a time of ruinous competition necessitated by social media and demanding consumers, pharmaceutical firms must consider the critical role of relationship marketing. Raskovic *et al.* (2013) assert that:

> If relationships and the ability to appropriately manage them lie at the core of [customer relationship], then managers need to pay particular attention to the quality of such relationships [. . .] to effectively and efficiently manage them.

For pharmaceutical firms to be successful in maintaining and developing relationship with health consumers and enhance superior performance, relationship marketing is necessary. Samaha *et al.* (2014) note that relationship marketing is increasingly important for business performance. Neff (2014) asserts that firms are proactively engaging with customers leveraging the new social media marketing strategies and tactics. According to Hudson *et al.* (2015):

> To leverage the interactive and engagement dimensions of social media, more and more marketers have changed their marketing objectives, focusing on building/maintaining a desirable consumer–brand relationship via social media interaction.

Social media networks represent a new relationship marketing channels for organizations to connect with their customers and to establish a social customer relationship (Costa *et al.*, 2017). A social media research reports that 86 per cent of marketers indicate social media channels are critical components of their strategies marketing initiatives (Stelzner, 2013). Ashley and Tuten (2015) suggest that social media may serve as a channel for strategic marketing activities such as customer relationship management, lead generation, sales promotion delivery channel, paid advertising channel, branding and buyer research. Social media such as Facebook, Twitter and YouTube have become a quintessential part of marketing communication strategies that enable a dialogue between marketers and consumers (Costa *et al.*, 2017. Arguably, in nowadays' health information seeking environment, social media is an important pharmaceutical and health-care marketing channels to reckon with. Health consumers of pharmaceuticals, health-care products and services are increasingly turning to social media channels for their health information. Thus, pharmaceutical firms are under intense pressure to engage and establish new relationship with their ultimate health consumers.

Like many other industries, the pharmaceutical industry has not escaped the onslaught of social media influence. Arguably, social media channels more than ever before are transforming today's pharmaceutical and health-care marketing landscape and the attendant marketing strategies. Social media channels are deployed in many industries around the globe to reach their target audience or customers (Bhaskaran *et al.*, 2017). Some of the past studies that have examined brands across a variety of industries relying on social media channels to listen and engage with customers. For example, food and beverage (Perumal *et al.*, 2017), alcohol (Winpenny *et al*, 2014), fashion (Chae and Ko, 2016; Mohr, 2013), cosmetics (Shen and Bissell, 2013; Hodge *et al.*, 2015), professional sport (Parganas and Anagnostopoulos, 2015; Parganas *et al.*, 2015), education/universities (Rutter *et al.*, 2016), tourism and hotels/hospitality (Hays *et al.*, 2013), travel (Tham *et al.*, 2013), health care (Moorhead *et al.*, 2013., Taggart *et al.*, 2015) and wellness (Lagrosen and Grunden, 2014).

Social media such as Facebook, Twitter and YouTube have become an important part of marketing communication strategies that support dialogue between consumers and marketers (Costa, 2014). Implementing social media in the pharmaceutical and health-care marketing is important for several reasons, such as to improve relationship marketing, to enhance customer engagement and to monitor brand. According to Shankar and Li (2014), the value of social media marketing for pharmaceutical firms includes the following: first, engaging customers in conversation about the firm, product and brand, build relationship with online influencers, hear feedbacks from customers who use their products and services and understand the customers and the market needs; second, allowing firms to speak more cost efficiently, to more customers and louder than the traditional media; third, offering a new channel for firms to reach new customers cannot be reached easily through the traditional media; fourth, driving sales and financial return; and fifth, providing word-of-mouth that can boost sales and return on investment. Traditionally, marketing managers spend millions of dollars on marketing research and promotions to understand and influence consumer behavior toward their brands. In today's environment, given that consumers are increasingly migrating to social media platforms to seek information and drive their decision-making offers pharmaceutical marketers new opportunity to sense and respond to changes in consumer purchasing behavior. Social media is a great influencer to consumer buying behavior and the attendant sales. Arguably, these days, a consumer who wishes to buy a cholesterol drug will likely consult with friends, colleagues, co-workers and relatives to acquire more information about its efficacy and competitive brands.

Social media is increasingly influencing how people search for health-related information (Cordos *et al.*, 2017). Thus, the propensity that a consumer will visit any social media channels and search for disease and treatment or drug-related information will significantly increase in the future. Consumers rely on social media for disease and treatment-related information (to support disease self-management), social and emotional support for those living with similar condition (Benetoli *et al.*, 2017; Newbold, 2015; Williams *et al.*, 2014; Ziebland and Wyke, 2012; Lim *et al.*, 2014; Househ *et al.*, 2014), to educate themselves on a disease process and to find hospital, physicians, and physician networks most capable of treating their condition (De Martino *et al.*, 2017). Similarly, patient communities can propagate closed-group communication behavior or the groupthink that can influence a consumer's buying behavior. To gain access to health consumer communities, pharmaceutical marketers have no other option but to get involved in the social media communities.

Social media channels are increasingly used to build relationships with patients and wide public audience (Aitken *et al.*, 2014). Social media can influence relationship-marketing variables and in turn boost the relational consumers (Clark and Melancon, 2013). Pharmaceutical marketers and researchers are increasingly interested in the impact of social media on pharmaceutical marketing and health-care relationship marketing. Social media channels are significantly transforming marketing strategies used by firms of all sizes to target and retain their customers. Markets and Markets (2010) contend that social media channels such as Facebook, YouTube, and Twitter will revolutionize the marketing strategies employed in the pharmaceuticals industry. Furthermore, Markets and Markets (2010) posit that an increasing number of pharmaceutical economic actors are leveraging these new channels to enhance consumer relationships and improve brand management, acquire market intelligence, monitor and analyze user-generated content. Today's health consumers are social media savvy and are increasingly participating in the management of their healthcare. Arguably, social media has helped to transfer power from pharmaceutical firms to the consumers as they have access to health information. Thus, pharmaceutical firms no longer have the leisure of one-way advertising that pushes health information to

consumers as opposed to the two-way conversation. The advent of social media has altered the balance of power in terms of both the control of a shared reality and the individual's ability to express a brand narrative (Felix *et al.*, 2017). This means pharmaceutical and health-care marketers must leverage social media to engage these savvy consumers, listen to their conversations, respond real-time to their health concerns, comments, inquiries, enhance superior relationship and ultimately extend their brand voice.

More than ever before, patients/consumers are turning to social media for their health information. Although social media has been touted to be an important source of information, Bhaskaran *et al.* (2017) argue that "it has to be carefully calibrated when used for sharing health information". Consumers rely social media to acquire health-related information such as medicines, health behavior change, disease and treatment-related information (to support disease self-management), social and emotional support for those living with similar condition (Bhaskaran *et al.*, 2017; Lu *et al.*, 2017; Benetoli *et al.*, 2017., Laranjo *et al.*, 2015), to educate themselves on a disease process and to find hospital, physicians and physician networks most capable of treating their condition (De Martino *et al.*, 2017). Griffiths *et al.* (2015) opines that social media enables sharing or exchanging of health-related information such as symptoms, diagnosis and treatment, adverse effects experienced and medical evidence. According to Griffiths *et al.* (2015), in addition, according to Griffiths *et al.* (2015):

> Information from social networks is already used to support diagnosis, self-management and monitoring of treatment for individuals as well as the planning and provision of health care for a community.

Moorhead *et al.* (2013) assert that social media plays an important role in health care, as it provides a new channel for the public, patients and health professionals to communicate about health issues with the likelihood of improving health outcomes. For some public health professionals, they use social media to acquire data on patients and to communicate with them (Moorhead *et al.*, 2013). Newbold (2015) asserts that social media can be used to disseminate information on health-related issues such as flu clinic locations and operating hours and weather advisories.

> This real-time delivery allows weather advisories [and]. . .public health officials to take advantage of social media for transmitting seasonal messages such as heat alerts or humidex warnings, promote current events such as open houses or free clinics and communicate with the public in times of crisis (Newbold, 2015).

Grajales *et al.* (2014) indicate that social media channels are leveraged as communication strategies to maintain or improve peer-to-peer and clinician-to-patient communication, promote institutional branding and enhance the speed of interaction between and across different health-care stakeholders.

Anscombe *et al.* (2015) state that pharmaceutical firms' customers more than ever before are live, interact and engage in a digital world. According to Anscombe *et al.* (2015), "each month 19 million people search the information health website WebMD, and one-quarter of patients with chronic disease visit peer sites to "meet" fellow sufferers and discuss their health". Jackson *et al.* (2015) report that the top 20 pharmaceutical firms used in their study were present in varying degrees on Twitter (90 per cent), YouTube (70 per cent) and Facebook (50 per cent). Antheunis *et al.* (2013) in their study reported that patients mainly used Twitter (59.9 per cent), particularly for increasing knowledge and exchanging advice, and Facebook (52.3 per cent) for *social support* and exchanging health advice, whereas professionals mainly relied on LinkedIn (70.7 per cent) and Twitter (51.2 per cent), for communication with their colleagues and marketing activities. A report by Statista (2017)

states that in 2017, there are 208.91 million social network users in the USA or 64.18 per cent of the population in the USA is using social network. It is estimated to increase by 64.77 per cent in 2019. Pew (2017) reports that percentage of US adults who use each social media channel can be broken down as follows: Facebook (68 per cent), Instagram (28 per cent), Pinterest (26 per cent), LinkedIn (25 per cent) and Twitter (21 per cent).

Mack (2005) attests that relationship marketing should be a natural for the pharmaceutical firms. Relationship marketing concept, first introduced by Berry (1983), is based on developing a mutually beneficial exchange between business actors (Sorce, 2002). Morgan and Hunt (1994, p. 22) describe relationship marketing as encompassing "all marketing activities directed towards establishing, developing, and maintaining successful relational exchanges". Relationship marketing demands personal communication with the consumer that can help improve marketing productivity (Sheth and Parvatiyar, 1995; Sorce, 2002). Andrews (2012) contends that one of the hallmarks of effective relationship marketing is to listen to consumers by encouraging dialogue through patient advisory board and social media, engaging the consumers in the process and gaining deeper understanding of their needs, patient feedback and market research. Relationship marketing focuses on developing a valuable relationship between a firm and a customer that bodes well with social media engagement. Social networks are valuable new reservoirs of consumer intelligence for firms that can access and harvest the data (Peppers and Rogers Group, 2009). Clark and Melancon (2013) report that social media tend influence key relationship marketing variables that help build and enhance relationships with their customers. According to Clark and Melancon (2013):

> Loyal consumers following an organization on social media [. . .] are open and desirous of content and information from an organization; the organization must not fail them in this respect or miss out on the opportunity to ask users to contribute their thoughts, opinions, compliments and concerns on a regular basis if social media is to be used as a relationship marketing tool.

Trainor (2012) contends that social media is one of the capabilities-based approach firms can deploy to build or enhance relationship marketing. Mershon (2012) attests that the two social media benefits reported by marketers were increased brand awareness and the ability to engage in dialogue with consumers. Indeed, because of social media, power is increasingly shifting from the pharmaceutical marketers as well as physicians to health-care consumers. Essentially, the previous situations where pharmaceutical marketers controlled their messages are rapidly eroding. This means that to thrive and prosper in today's networked environment, pharmaceutical and health-care marketers must transform their old marketing model or be made to transform by the ever growing and demanding patient or health communities.

Social media is a less expensive investment that pharmaceutical firms can use to improve proximity to consumers and enhance customer relationship management program. Geiger and Martin (1999) note that ". . .theoretically, the internet offers a unique opportunity for marketers to build up and maintain relationships with their clients". With the advent of information technology, Deighton (1997) asserts that the practice of the traditional marketing game will be transformed. Schlegelmilch and Sinkovics (1998) contend that for marketing to survive and prosper in the information age, marketing managers need to break with established rules. With an online platform, Geller (1998) contends that firms can afford to interact with customers on a one-to-one manner that is crucial for building relationship marketing. Geiger and Martin (1999) opine that the internet is a medium that lends itself in various aspects to use as a tool for relationship marketing. Successful relationship marketing campaigns depend heavily upon marketing databases and interactive media like the internet (Mack, 2005). Lerer (2002) contends that the internet is an important paradigm for a personalized interaction between a pharmaceutical firm and individual customer.

Anscombe *et al.* (2015) argue that firms have learned to segment their audience based on digital interactions as well as providing forums where users can share opinions and experiences-and drawing on user-generated content to refine their offer. The growing imperative of social media will no doubt change the way pharmaceutical firms connect and interact with consumers and other health-care providers. Thus, to survive in today's relationship marketing ecosystem, the pharmaceutical industry must consider embracing social media network tools. For pharmaceutical firms to earn the attention and loyalty of health consumers, it is important to invest in a new relationship quality with the growing health consumers who are becoming social media savvy. There is no doubt that acquiring new customers is costly than retaining the existing customers. Furthermore, one of the roles of relationship marketing is getting closer to customers and keeping them. This relationship with health consumers can be achieved efficiently and effectively through the social media.

Purpose of the study

Prior to the advent of social media, pharmaceutical firms primarily marketed their products through pharmaceutical sales force, physicians and other health-care providers, rather than through consumers. Essentially, pharmaceutical firms focused their brands on what they wanted consumers to hear. This type of pharmaceutical marketing strategy is referred to as push marketing strategy. Push marketing is strategy pharmaceutical firms' sales representatives or detailers use to promote their pharmaceuticals to the intermediaries such as doctors who then prescribe the same to their patient-consumers (Dadhich and Dixit, 2015; Goldberg, 2013; Gorstin, 2012). Gandolf (2014) describes push marketing strategy as that which pushes messages to consumers who are not actively seeking the information. However, in today's social media era, there is an increasing shift from the push to pull marketing strategy. Kotler and Keller (2007) indicate manufacturers use pull marketing strategy to generate demand by advertising direct to the ultimate end-consumer.) Hospitals or pharmaceutical firms leverage pull marketing strategy to expose advertising to consumers who are actively seeking information due to a current need, want or problem (Dadhich and Dixit, 2015; Gandolf, 2014). According to Gandolf (2014), "pull ad response will likely be stronger than from social media push ads". There is no doubt that as the number of consumers who rely on social media platforms for their health information continues to grow, pharmaceutical firms have no other choice but to leverage social media to enhance their healthcare decisions.

By leveraging social media platforms, pharmaceutical firms can easily find ways to engage consumers on their level and provide them with actionable information they need. Essentially, health consumers trust peer generated social media content than information generated by pharmaceutical firms. This means that the pharmaceutical organizations must be "willing and able to change [their behavior] toward an individual customer based on what the customer tells [them] and what else [they] know about that customer" (Peppers *et al.*, 1999). Likewise, because consumers increasingly obtain their brand messages from other consumers, peers, circle of co-workers, colleagues, friends, family members in online communities, it behooves pharmaceutical firms to embrace the social media culture that has come to stay if they desire to thrive and survive. Regrettably, however, a good number of pharmaceutical firms are missing the consumer engagement opportunities because the FDA is yet to provide guidance on how to monitor pharmaceutical and health-care marketing in the new social media environment. This is not surprising given that the pharmaceutical industry is among the most regulated industry in the world (Gandolf, 2014).

The purpose of this study is to use Saaty and Thomas (1980) analytic hierarchy process (AHP) model to conduct the sensitivity analysis (SA) of the impact of social media channels on PRM in which the goal has multiple, often conflicting attributes. AHP is a multi-attribute

decision-making process, which enables decision makers to set priorities and deliver the best decision when both quantitative and qualitative decisions are considered. AHP encompasses three basic functions: structuring complexity, measuring on a ration scale and synthesizing. It is a powerful operational research methodology useful in structuring complex multi-criterion problems or decisions in many fields such as pharmaceutical supply chain management, pharmaceutical marketing, marketing, engineering, education, and economics. Merits associated with AHP include its reliance on easily derived expert judgment data, ability to reconcile differences (inconsistencies) in expert judgments and perceptions, and the existence of Expert Choice Software that implements the AHP.

The remainder of this paper is organized as follows. First, we briefly discuss the challenges associated with social media in pharmaceutical and health-care marketing challenges. We next review relevant literature on relationship marketing, PRM and SA. Next, we present research methodology and the data collection. We then discuss the empirical results, with focus on the SA results. Finally, we offer conclusions and the managerial implications.

Issues and challenges of using social media in pharmaceutical and health-care marketing

Pharmaceutical and device firms can use social media channels to educate, market, listen and connect with customers, patients and doctors (Belbey, 2016a, 2016b). The internet and social media channels are increasingly enabling pharmaceutical and device firms to more actively engage with consumers and health-care professionals (FDA, 2014). Physicians and health-care consumers are the primary targets of pharmaceutical firms' relationship marketing efforts (Clark *et al.*, 2011). Despite the acknowledged benefits associated with social media, the pharmaceutical industry has been slow to embrace social media channels because of the uncertainty regarding the necessary parameters for marketing and promoting pharmaceutical products (Boston and Andalia, 2016). Liu and Fraser (2012) note that "having a presence on social media sites does not necessarily mean using social media". Liu and Fraser (2012) argue that because pharmaceutical industry is a highly regulated industry, pharmaceutical firms intending to engage in social media must get it right, as there are inherent risks when they get it wrong. However, the Food and Drug Administration's (FDA) strict regulations limit the pharmaceutical firms from full adoption or implementation of social media in the pharmaceutical industry (Ruskin and Middlebrook, 2014). Greene and Kesselheim (2010) attest that the pharmaceutical and medical-device industries have been reluctant and/or slow to establish a social media presence. Aitken *et al.* (2014) opine that pharmaceutical firms face higher hurdles in adopting social media in part because of regulatory requirements and constraints outside the USA to reach patients directly. Similarly, the FDA has been slow in instituting regulations that will govern the pharmaceutical industry's use of social media for pharmaceutical/health-care marketing and health information services (Relle, 2012).

Literature review

Relationship marketing

Relationship marketing is a strategy used to achieve sustained customer loyalty through cultivation of long-term engagement, building and enhancing strong mutual relationships. Abeza *et al.* (2013) define relationship marketing as the process of retaining customers via the attainment of long-term mutual satisfaction by firms and their customers. Relationship marketing is a strategy that is deeply rooted in establishing, maintaining, building strong bond and customer loyalty, long-term engagement, customer retention, satisfaction and customer lifetime value (Mahmoud *et al.*, 2017, Ciotti, 2016, Abtin and Pouramiri, 2016). Sheth and Sisodia (2012) contend that the purpose of relationship marketing is to improve

marketing productivity by attaining efficiency and effectiveness. Shani and Chalasani (1991) defined relationship marketing as a process to identify, determine and build up a network with individual consumers and to continuously strengthen the network for the mutual benefits of both sides, through interactive, individualized and value-added contacts over a long time. Relationship marketing is a strategic platform on which marketers can build connections between the pharmacist, physician, patient, family, caregiver and other health-care providers (Andrews, 2012). Some notable studies have enriched our understanding of relationship marketing including channel relationships (Ganesan, 1994), services marketing (Berry, 1983), sales management and buyer–seller partnerships. Gronroos (1996) points out that the success of relationship marketing depends on direct contact with customers and other stakeholders, a database to store customer information and a customer-oriented service system. Parvatiyar and Sheth (2000) contend that relationship marketing is strategic driven as opposed to customer relationship manipulation. Sheth and Parvatiyar (2000) assert that relationship marketing tends to focus on customer retention and customer commitment as well as share of the customer business rather than the market share.

Factors important in enhancing relationship marketing have been reported in marketing literature. For example, relationship quality is important in improving relationship marketing (e.g. Storbacka *et al.*, 1994). For Gummession (2000), relationships are part of customer perceived quality. Relationship quality attests to the degree of a firm's long-term customer relationships. Ng *et al.* (2017) note that "customer's perceptions of the quality of the Relationship they have with their service providers are built over time". Ramayah and Leen (2017) assert that trust and satisfaction (e.g. personal interaction, reliability) are the key ingredients of relationship marketing. Pantouvakisa and Bouranta (2017) suggest that building quality relationships with customers require firms having the ability to be agile and/or to continually adjust their internal structures and systems to respond to change. Li *et al.* (2012) argue that relationship quality by way of customer satisfaction can affect customer loyalty. According to Lian (2017), focusing relationship quality on increasing customer satisfaction and trust through improvement of service delivery and innovativeness of new services can lead to long-term relationship success. Prince *et al.* (2016) describe relationship quality as important fact that can be used to gain customer loyalty and achieve successful relationship marketing. Relationship quality can be improved through mutual trust and in turn facilitates effective exchange between the business partners (Cerri, 2012). Communication between firms and customers has positive impact on relationship quality (Ruswanti and Lestari, 2016). Berry (2000) recommends that relationship marketing strategies marketers can consider in the development of a relationship marketing plan, including core service strategy, relationship customization, service augmentation, relationship pricing and internal marketing. Overall, relationship marketing encompasses trust, commitment, a long-term orientation and cooperation (Bagozzi, 1995; Gronroos, 1994; Morgan and Hunt, 1994; Christopher *et al.*, 1991).

Impact of social media on pharmaceutical marketing relationship

The prevalence of social media continues to have transformational influence on our daily lives including the pharmaceutical and health care. According to Al-rahimi *et al.* (2013), because of the convenience, flexibility and functionalities attached to social media, it is used by millions of people around the world for various tasks on a regular basis. Anscombe *et al.* (2015) state that pharmaceutical firms' customers more than ever before are live, interact and engage in a digital world. According to Anscombe *et al.* (2015), "each month 19 million people search the information health website WebMD, and one-quarter of patients with chronic disease visit peer sites to "meet" fellow sufferers and discuss their health". Jackson *et al.* (2015) report that the top

20 pharmaceutical firms used in their study were present in varying degrees on Twitter (90 per cent), YouTube (70 per cent) and Facebook (50 per cent). Antheunis *et al.* (2013) in their study reported that patients mainly used Twitter (59.9 per cent), particularly for increasing knowledge and exchanging advice, and Facebook (52.3 per cent) for *social support* and exchanging health advice, whereas professionals mainly relied on LinkedIn (70.7 per cent) and Twitter (51.2 per cent), for communication with their colleagues and marketing activities. A report by Statista (2017) states that in 2017 there are 208.91 million social network users in the USA or 64.18 per cent of the population in the USA is using social network. Moreover, it is estimated to rise by 64.77 per cent in 2019. Pew (2017) reports that per cent of USA adults who use each social media channel can be broken down as follows: Facebook (68 per cent), Instagram (28 per cent), Pinterest (26 per cent), LinkedIn (25 per cent) and Twitter (21 per cent). Bhaskaran *et al.* (2017) study that examined the use of social media for seeking health-related information in India report that WhatsApp is the preferred channel followed by Facebook, YouTube, Twitter, blogs and LinkedIn, respectively. Benetoli *et al.* (2017) summarized the imperative of social media role in the health care as follows: blogs are used to learn from other people's experiences with similar health condition; Facebook enables consumers to follow health-related pages and to participate in disease-specific group discussions; Wikipedia is used to learn about information regarding diseases and treatments; YouTube is used to gain knowledge of medical procedures such as surgery; and Twitter is rarely used to learn about health-related information.

Pharmaceutical firms can use social media to engage with health professionals and consumers providing valuable health information as well as securing feedback and referrals for online communities (Costa et al, 2017). Arguably, social media is transforming today's market dynamic) and has become an important strategic marketing channel for listening (or monitoring) and understanding physician and patient-consumer behavior, developing, maintaining and proactively managing customer relationships (Agrawal and Kaur, 2015). Increasingly, marketers are leveraging social media channels to enhance a set of marketing communication activities, including sales, advertising, public relations, internal communication and, most importantly, relationship marketing goals (Trainor *et al.*, 2014; Vernuccio, 2014; Schultz and Peltier, 2013; Hennig-Thurau *et al.*, 2010; Kotler *et al.*, 2010; Williams and Chinn, 2010). The physician is the primary target of most pharmaceutical firms' relationship marketing activities (Clark *et al.*, 2011). Pharmaceutical marketing is different from most consumer marketing because the physician serves as an intermediary between the pharmaceutical firm and the patient-consumer; in some pharmaceutical categories, the physician is often influenced by the patient-consumer's request of a product or the insurance company's willingness to pay for a drug (Clark *et al.*, 2011).

Clark and Melancon (2013) assert that social media influences key relationship marketing attributes such as building and maintaining relationships with consumers. Agrawal and Kaur (2015) note that social media marketing offers doctors and patients the best source of awareness, perception, attitudes, responses and expectations; provide information on new pharmaceuticals, educating patients about their health-related issues and deepening relationships with their patients and health-care professionals (Agrawal and Kaur, 2015). Anscombe *et al.* (2015) note that the pharmaceutical or health-care industry is a reluctant digital covert because regulations have been ambiguous, and there is a lack of universal standards and level of perceived risk in social media. However, from marketing point of view, Anscombe *et al.* (2015) declare, "even partial adoption of digital can reduce promotional costs between 20 and 50 per cent". FDA (2014) warned that although the internet/social media platforms are allowing patients the opportunity to share experiences and disseminate information about drugs and devices, user-generated content might not always be accurate and may be dangerous or harmful to the public health.

Pharmaceutical marketing is different from most consumer marketing because the physician serves as an intermediary between the pharmaceutical firm and the patient-consumer; in some pharmaceutical categories, the physician is often influenced by the patient-consumer's request of a product or the insurance company's willingness to pay for a drug (Clark *et al.*, 2011). Agrawal and Kaur (2015) contend that social media has become important for pharmaceutical firms for listening and learning about consumer behavior, market perceptions and new opportunities. Because of social media, consumers are no longer passive recipients in the marketing exchange process (Hanna *et al.*, 2011) but have also become more active market players (Hennig-Thurau *et al.*, 2010) in co-creating marketing content with firms and their respective brands (Hanna *et al.*, 2011). By adopting social media, pharmaceutical firms can provide a wealth of customer-generated content such that when retrieved and analyzed, offers valuable input to their sales and marketing strategies (Liu and Fraser, 2012). Leveraging social media in pharmaceutical and health-care marketing helps pharmaceutical firms to expand their customer base, strengthen customer relationship and enhance brand performance (Pharmanews, 2016). The social media provides many opportunities for pharmaceutical firms to promote prescription drugs directly to consumers (Kim, 2015), thus building long-lasting bond or relationship with them. With respect to social media marketing channels, Liang and Mackey (2011) and Gibson (2014) assert that they allow marketers to reach a larger number of consumers, help target-specific patients and are more cost-effective than traditional forms of media.

Social media makes it easier and more convenient than ever to access and act on those opinions. This development is putting a nail in the coffin of companies that build their business on a single unique proposition and then throw it out there to see how many people will bite on it. Flexible relationship marketing programs represent table stakes to participate in the environment. Social media can be leveraged "to educate, market, listen to and connect with customers, patients, and physicians, all while complying with industry regulations" (Belbey, 2016a, 2016b) and by extension build sustainable relationship marketing.

Social media is a suitable environment for engaging consumers and building brand. Indeed, conventional marketers as well as pharmaceutical and health-care marketers are increasingly leveraging social media to engage consumers around experiences they value most and in turn build superior brand. According to Littleton (2016):

> He most successful pharma brands on social are the ones that focus on sharing content around the values of the company and its customers. They know what's important to their followers and they post content that connects.

The combination of mobile technology, patient demand and the growing influence of digital native generation has encouraged the role of social media in healthcare and corresponding effect on patient engagement (Aitken *et al.*, 2014). Indeed, in the social media era, customer engagement is increasingly becoming more important than ever before (Acar and Puntoni, 2016). According to Acar and Puntoni (2016):

> [. . .] more and more brands are using social-media platforms to connect with their Customers by creating engaging content so that consumers can interact (e.g. sharing an interesting and current Tweet) and/or by initiating dialog with them (e.g. responding to a customer comment or complaint).

Social media channels enable consumers to engage in brands-related activities/products and enter relationships (Schivinski *et al.*, 2016; Hollebeek and Brodie, 2016; Baldus *et al.*, 2015; Dessart, Veloutsou, and Morgan-Thomas, 2015; Vivek *et al.*, 2012, 2014; Hollebeek *et al.*, 2014; Tsai and Men, 2014; Jaakkola and Alexander, 2014).

According to Hollebeek *et al.* (2014), "a consumer's positively valenced brand-related cognitive, emotional and behavioral activity during or related to focal customer/brand interactions". Hollebeek *et al.* (2014) proposed the three dimensions to use in measuring consumer brand engagement (CBE) in social media:

(1) Cognitive processing (i.e. cognitive CBE dimension) is "a consumer's level of brand-related thought processing and elaboration in a particular consumer/brand interaction".

(2) Affection (i.e. emotional CBE dimension) is "a consumer's degree of positive brand related affect in a particular consumer/brand interaction".

(3) Activation (i.e. behavioral CBE dimension) is "a consumer's level of energy, effort and time spent on a brand in a particular consumer/brand interaction".

Siu (n.d.) suggested ten ways of social media engagement could be measured, namely, tracking the number of likes and shares of posts. Tracking provides a firm the opportunity to get an idea of how its post is doing and to widen reach exponentially; audience growth/rate of followers; flowers vs following ratio; active fans; organic vs paid results; clicks per post; lead generation; audience demographics; audience mentions; and count the money. Aitken *et al.* (2014) measured social media (Facebook, Twitter and YouTube) engagement of top ten pharmaceutical firms in terms of reach index, relevance index and relationship index. They defined each as follows:

- Reach is the measure of listeners, and the index as the number of people reached by each social media channel through likes, shares and re-tweets.
- Relevance measures how people found posts or content relevant, while the index is the degree to which content is being shared and forwarded across social networks.
- Relationship measures the interaction of a firm and patient-consumer integration.

Essentially, relationship index measures the degree of interaction between a firm and those people post, reply and in turn interact with the firm's posting. According to Aitken *et al.* (2014), IMS health social media engagement index for top ten pharmaceutical firms are Johnson & Johnson (70); GlaxoSmithKline (25); Novo Nordisk (23); Pfizer (20); Novartis (18); Boehringer Ingelheim (18); Bayer (16); Merck & Co (13); AstraZeneca (10); and UCB (9).

Social media is transforming pharmaceutical and health-care marketing relationships in a variety of ways. Pharmaceutical marketers can use social media to sense and shape effective relationship marketing, target, define and engage consumers on a more personal level. With social media, marketers can have visibility on how a product is perceived, the demographics of consumers and the interest in the product attributes. However, pharmaceutical marketers have been very slow in adopting social media to enhance their relationship marketing. Pharmaceutical marketing must urgently consider adopting social media, as it has become more than ever the premier destination for consumers' health questions and answers. Social media as part of an integrated marketing program has been embraced by less regulated industries than the more regulated pharmaceutical industry to enhance their relationship marketing strategies. Because of an operating environment that is characterized by strict regulatory compliance, and privacy issues, the pharmaceutical industry has been reluctant in embracing social media platforms to enhance its relationship marketing strategies. However, despite these issues, a growing number of pharmaceutical firms are slowly embracing social medial channels to ameliorate their relationship marketing and brand management agenda that are based on the market intelligence acquired through listening, monitoring and analyzing the end-user generated content.

Pharmaceutical Marketing (2017) study reports that the most popular social media channels in the pharmaceutical industry for 2017 and 2018 are Facebook (73 per cent), YouTube (64 per cent), LinkedIn (55 per cent), and Twitter (45 per cent). Statista (2017) reports that the most popular networks worldwide as of September 2017 by number of active accounts including Facebook at 2.06 billion monthly active users, YouTube at 1.5 billion, WhatsApp at 1.3 billion and Facebook Messenger at 1.3 billion.

Although pharmaceutical firms, health-care professionals and patients are increasingly adopting social media channels, there is public concerns regarding the risks that such online data-sharing platforms pose to the privacy and security of personal health data, usability, the manipulation of identity and misinformation (Azer, 2017; Househ *et al.*, 2014; Li, 2013; Taitsman *et al.*, 2013). To safeguard against abuse of patient privacy in the USA:

> Health Insurance Portability and Accountability Act (HIPAA) and state privacy laws limit healthcare providers' ability to interact with patients through social media [. . .] and prohibit healthcare providers from disclosing patient information without proper patient authorization. A healthcare provider discloses patient information without patient authorization in violation of HIPAA and/or state privacy laws can be subject in fines and other penalties (Odenheimer, 2017).

Indeed, the actionable information mined from the social media environment can assist pharmaceutical and health-care marketing firms to develop new products, increase pharmaceutical products sales such as the over-the-counter (OTC) pharmaceuticals in the long term, mitigate risk and manage crisis. For example, Novartis is leveraging Facebook and YouTube to improve the sales of its OTC drugs, including Comtrax, Orofar and Bufferin. In addition, Johnson & Johnson, the first-mover to the social media environment used the networking platforms for crisis management when it recalled its Tylenol and Benadryl tablets and to apologize to consumers for irregularities discovered in its manufacturing plant during FDA inspection (Markets and Markets.com, 2010). Additional benefits that can accrue from implementing social media include sustainment of customer loyalty, new leads, increased sales, improved brand awareness, improved customer service, enhanced operational efficiencies and efficient sharing of real-time information within and across enterprises.

Sensitivity analysis

Sensitivity analysis (SA) has been applied in different fields, including the pharmaceuticals, medicine, civil engineering, political science and computer science (Ferretti *et al.*, 2016; Imai and Yamamoto, 2013; Jakhrani *et al.*, 2013; Chen and Kocaoglu, 2008; Serra, 2004; Steenland and Greenland, 2004; Blake *et al.*, 1988; Castillo *et al.*, 2006). SA is a means of investigating the impact of reasonable changes in base-case assumptions (Eschenbach, 1992) or an approach which allows decision makers to explore the impact on the optimal decision(s) of potential changes in any of the problem variables (Trueman, 1974). Some of the uses of SA include determining the impact on the ranking of alternatives of changes in various model assumptions, making better decisions, deciding which data estimates should be refined before decision-making and enabling management to focus attention on the most critical elements during decision implementation. Rappaport (1967) assert that in the face of risk and uncertainty, the recurring questions to be answered by organizations are of the form, "what if"? "What if" analysis or the SA is a technique used to assess how possible changes in parameter values affect model outputs and helps to facilitate a better understanding of risk (Rappaport, 1967).

Essentially, SA checks the responsiveness of model results to possible variations in parameter values, and thus offers valuable and insightful information for evaluating the relative risk among alternative courses of action. Pannell (1997) notes that SA is the examination of potential changes and errors and their effects on conclusions to be derived

from the model. In discussing the imperatives of subjecting models to SA, Arnoff and Netzorg (1965) emphasized:

> The use of operations research is especially important and advantageous in that [. . .] one can assess the sensitivity (response) of the system to a wide variety of conditions – without requiring either the time, expense, or risks associated with experimenting with system itself. [Thus,] hidden relationship can be brought to light and brought to bear upon decisions and control of activity.

Samson (1988) suggests that SA is an important part of decision-making process thinking in real time and generally entails checking the effects of the model assumptions on the model solution. Wallace (1998) contends that SA can be used to facilitate decision-making under uncertainty by way of parametric linear programming.

Research methodology

Structuring pharmaceutical relationship marketing problem for analytic hierarchy process model

PRM represents a typical multi-criteria decision-making, also known as MCDM, is essential in decision-making processes that can be both qualitative and quantitative. AHP is one of the most commonly used MCDM methods as a management tool in several industry sectors (Tramarico, *et al.*, 2015). We leveraged AHP to model social media impact on PRM because it enables decision makers to model a complex problem in a hierarchical structure showing the relationships of the overall goal, objectives and alternatives. Although the positive attributes associated with AHP has been widely reported in the literature, there has been a small number of dissenting opinions (Belton and Gear, 1983; Dyer and Wendel, 1985).

Developed in the 1970s and originally applied to the marketing area by Wind and Saaty and Thomas (1980), Dolan (1989) was the first to apply this method to health economics research. Since then, it has been embraced slowly as a method in the field of multi-criteria decision-making in health care. Liberatore and Nydick (2008) described the importance of applying the AHP as follows: "Health care and medical decision making has been an early and on-going application area for the AHP". With its growing usefulness, AHP is now widely used in a variety of research in the health-care industry. For example, it has been used in pharmaceutical supply chain, pharmaceutical marketing and management (Adebanjo *et al.*, 2014). The hierarchy structure for improving relationship marketing in a pharmaceutical firm is composed of three levels as depicted in Figure 1. The top level contains the overall goal of the problem, the middle level contains the multiple criteria that define the decision alternatives and the lower level contains competing alternative cause of actions.

Analytic hierarchy process steps

Steps 1-2: Define an unstructured problem and determine the overall goal. According to Simon (1977), the methodology of decision-making process encompasses identifying the problem, generating and evaluating alternatives, designing and obtaining actionable intelligence. The hierarchy structure of impact of social media on PRM tactics is schematically presented in Figure 1. Level 1 (goal) is to assess the impact of social media channels on the focal firm's PRM tactics. The attributes, which are the major PRM tactics are contained in, Level 2. Finally, the alternative social media channels in the last level, including Facebook, YouTube, Twitter, Linkedln and online communities. These social media channels are ones used by the focal firm.

Step 3: Construction of the pair-wise comparison metrics. The third step in using AHP is to construct a set of pair-wise comparison matrices for each of the lower levels. The pairwise comparison is made such that the attribute in row i ($i = 1, 2, 3, 4 \ldots n$) is ranked relative to each

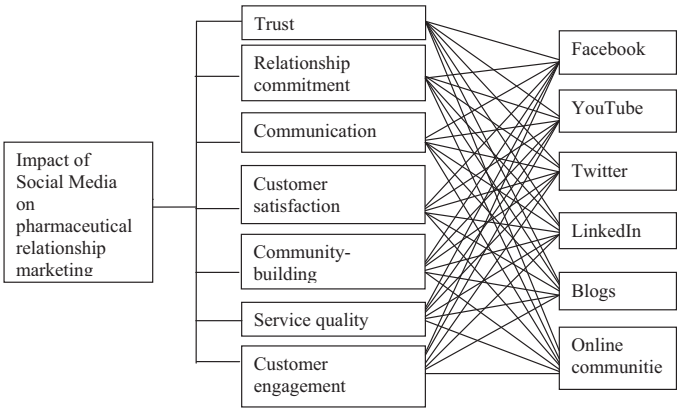

Figure 1. Hierarchy structure of impact of social media on PRM tactics

of the attribute represented by n columns. The pair-wise comparisons are done in terms of which element dominates another (i.e. based on relative importance of elements). Senior marketing and social media marketing managers who are familiar with the firm's pharmaceutical marketing operations were asked to perform the pair-wise comparisons and referred to as judges. Their judgments were then expressed as integer values 1 to 9 in which $a_{ij} = 1$ means that i and j are equally important; $a_{ij} = 3$ signifies that i is moderately more important than j; $a_{ij} = 5$ suggests that i is strongly more important than j; $a_{ij} = 7$ indicates that i is very strongly more important than j; $a_{ij} = 9$ signifies that i is extremely more important than j.

Assuming C_1, C_2, C_3, ... C_n to be the set of elements and a_{ij} representing a quantified opinion or judgment on a pair of elements C_i, C_j. The relative importance of two elements C_i, C_j is assessed using a preference scale on an integer-valued 1-9 developed by Saaty (2000) for pair-wise comparisons. According to Saaty (2000), a value of 1 between two attributes indicates that both equally influence the affected node, while a value of 9 indicates that the influence of one attribute is extremely more important than the other. It allows the transformation of qualitative judgments and/or intangible attributes into preference weights (level of importance) or numerical values. The pair-wise comparisons are accomplished in terms of which element dominates or influences the order. AHP is then used to quantify these opinions that can be represented in n-by-n matrix shown in equation (1).

Establishment of pairwise comparison matrix a

Assuming C_1, C_2, C_3, ... C_n to be the set of elements and a_{ij} representing a quantified opinion or judgment on a pair of elements C_i, C_j. The relative importance of two elements C_i, C_j is assessed using a preference scale on an integer-valued 1-9 developed by Saaty (2000) for pairwise comparisons. Table II lists the definition of a nine-point scale. Larger number assigned to the pair-wise comparisons means larger differences between criteria levels. According to Saaty and Thomas (1980), a value of 1 between two criteria indicates that both equally influence the affected node, while a value of 9 indicates that the influence of one criterion is extremely more important than the other. It allows the transformation of qualitative judgments and/or intangible attributes into preference weights (level of importance) or numerical values. The pair-wise comparisons are accomplished in terms of which element dominates or influences the order.

AHP is then used to quantify these opinions that can be represented in n-by-n matrix as follows:

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \ldots & a_{in} \\ 1/a_{12} & 1 & \ldots & a_{2n} \\ . & . & . & . \\ . & . & . & . \\ . & . & . & . \\ 1/a_{1n} & 1/a_{2n} & \ldots & 1 \end{bmatrix} = w_i/w_j = \begin{bmatrix} w_1/w_2 & w_1/w_2 & \ldots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \ldots & w_2/w_n \\ . & . & . & . \\ . & . & . & . \\ . & . & . & . \\ w_n/w_1 & w_n/w_2 & \ldots & w_n/w_n \end{bmatrix} \quad (1)$$

If c_i, is judged to be of equal importance as c_j, then $(a_{ij}) = 1$.
If c_i, is judged to be more important than c_j, then $(a_{ij}) > 1$.
If c_i, is judged to be less important than c_j, then $(a_{ij}) < 1$.
$(a_{ij}) = 1/a_{ji}, (i, j = 1, 2, 3, \ldots, n), a_{ij} \neq 0$.

Where matrix A represents a reciprocal matrix, a_{ij} is the inverse of the entry a_{kj} which indicates the relative importance of C_i compared with attribute C_j. As an example, $a_{12} = 3$ indicates that C_1 is 3 times as important as C_2. In matrix A, it becomes the case of assigning the n elements C_1, C_2, C_3, ... C_n a set of numerical weights W_1, W_2, W_3, ...W_n, that represents the recorded experts' judgments. If A is a consistency matrix, the links between weights W_i and judgments a_{ij} are given by $W_i/W_j = a_{ij}$ (for $i, j = 1, 2, 3, \ldots, n$).

Eigenvalue and eigenvector

Saaty (1990) recommended that the maximum eigenvalue, λ_{max}, can be determined as:

$$\lambda_{max} = \sum_{j=1}^{n} a_{ij} W_j / W_i. \quad (2)$$

where λ_{max} is the principal or maximum eigenvalue of positive real values in judgment matrix, W_j is the weight of j^{th} factor, and W_i is the weight of i^{th} factor.

If A represents consistency matrix, eigenvector X can be determined as:

$$(A - \lambda_{max} I)X = 0 \quad (3)$$

Consistency test

Both AHP and Expert Choice Software do not impose on the pharmaceutical firm to be perfectly consistent, rather a consistency test is performed to examine the extent of consistency as well as each judgment once the priorities are determined. Saaty (1990) recommended using consistency index (CI) and consistency ration (CR) to check for the consistency associated with the comparison matrix. A matrix is assumed to be consistent if and only if $a_{ij} * a_{jk} = a_{jk} \forall_{ijk}$ (for all *i, j, and k.*) When a positive reciprocal matrix of order n is consistent, the principal eigenvalue possesses the value n. Conversely, when it is inconsistent, the principal eigenvalue is greater than n and its difference will serve as a measure of CI. Therefore, to ascertain that the priority of elements is consistent, the maximum eigenvector or relative weights/λ_{max} can be determined. Specifically, CI for each matrix order n is determined by using (3):

$$CI = (\lambda_{max} - n)/n - 1 \quad (4)$$

where n is the matrix size or the number of items to be compared in the matrix. Based on equation (4), the consistency ratio (CR) can be determined as:

$$\mathrm{CR} = \mathrm{CI}/\mathrm{RI} = [(\lambda_{max} - \mathrm{n})/\mathrm{n} - 1]\mathrm{RI}. \quad (5)$$

where RI represents average consistency index over a number of random entries of same order reciprocal matrices shown in Table I. CR is acceptable, if its value is less than or equal to 0.10. If it is greater than 0.10, the judgment matrix will be considered inconsistent. To rectify the judgment matrix that is inconsistent, decision makers' judgments should be reviewed and improved.

Overall or composite priority

The composite priority score of the alternatives is determined by multiplying the relative priorities of an alternative by the relative priorities of the corresponding criteria and added over all criteria. Specifically:

$$S_i = \sum_{j=1}^{n} w_j p_{ij} \quad \text{for } i = 1, 2, \ldots n \quad (6)$$

where S_i is the composite score for the ith alternative social media channels, p_{ij} is the score of the ith alternative social media channels with respect to the jth PRM criterion, and w_j is the priority weight of the jth PRM criterion in the second level.

Data collection and analysis

To examine the impact of social media on PRM tactics and the associated SA, we used a case study methodology that was popularized by Yin (1994). Indeed, a case study is a relevant approach to investigate a phenomenon in its own natural environment where complex links and underlying meanings can help the researcher. Oke and Gopalakrishnan (2009) argue that a case study is relevant "where existing knowledge is limited because it generates in-depth contextual information which may result in a superior level of understanding".

We conducted a thorough literature review to identify the relationship marketing tactics and social media channels. Based on the identified relationship marketing tactics and social media channels, a survey questionnaire was developed and disseminated to a group of five subject matter experts, i.e. pharmaceutical senior managers, for their opinions. Using the AHP-based decision-making approach, the group brainstormed and reached a consensus on the relevant relationship marketing tactics and social media channels adopted in this paper. Brainstorming and sharing ideas and insights using a combination of the AHP and Expert Choice in a group setting often results in a more complete representation and understanding

Intensity of importance	Definition
1	Equal importance
3	Moderate importance one element over another
5	Essential or strong importance one element over another
7	Very strong importance one element over another
9	Extreme/absolute importance one element over another
2, 4, 6, 8	Intermediate values between two adjacent judgments

Source: Saaty and Thomas (1980)

Table I.
The pair-wise comparison scale

of the problems (Al-Harbi, 2001). Thus, a group decision-making model supports subject matter expert opinions to be combined so that a group decision can be successfully achieved. Because it was a group decision-making by senior managers, the number of response obtained for the analyses is one. Al-Harbi (2001) asserts that:

> The AHP allows group decision making, where group members can use their experience, values and knowledge to break down a problem into a hierarchy and solve it by the AHP steps.

Hunt (1992) emphasized that the main attributes in three areas, including member, group and task must exist for group work to be successful. The approved and most important relationship marketing tactics and social medial channels relevant in the pharmaceutical industry were then used to develop the final survey questionnaire. Thus, the relational data were obtained with the aid of questionnaire administered on a group of pharmaceutical senior managers to determine the order of importance of the relationship-marketing tactic and social media channel criteria. Based on the hierarchy tree or structure, a questionnaire was finally developed to support pairwise comparisons between all the criteria at each level in the hierarchy.

From the developed hierarchy tree in Figure 1, we developed a questionnaire to enable pair-wise comparisons between all the criteria at each level in the hierarchy. The pair-wise comparison process elicits qualitative judgments that indicate the strength of pharmaceutical marketing managers' preference in a specific comparison using Saaty's 1-9 scale. We then administered the questionnaire to a group of pharmaceutical marketing managers within a pharmaceutical firm in the USA to determine the order of importance of relationship marketing criteria. The PRM scores were obtained based on the major criteria, including customer engagement, relationship commitment, trust, customer satisfaction, communication, service quality and community building. The social media scores obtained were based on the alternative criteria, including Facebook, Twitter, LinkedIn, YouTube, Blogs and online communities. The experts responded to several pair-wise comparisons where two categories at a time were compared with respect to the goal as well as the major criteria. We used the result of the survey as input for the AHP.

It took 21 judgments (i.e. 7(7-1)/2) to complete the pair-wise comparisons shown in Table III. The other entries are ones along the diagonal as well as the reciprocals of the 21 judgments. We used the data shown in the matrix to derive estimates of the criteria priorities. The priorities provide a measure of the relative importance of each criterion. The final matrix of pair-wise comparisons of the criteria provided by the case pharmaceutical firm is shown in Table III. We analyzed the data collected with the aid of AHP using Expert Choice Software 11.5. The following steps can be determined either manually or automatically:

- total the elements in each column in (Table III) and then divide each element of the matrix by its column total in (Table III);
- synthesize the pair-wise comparison matrix in (Table III);
- determine the priority vector for each supply chain risk factor;
- determine the consistency ratio;
- determine λ_{max};
- determine the consistency index (CI);
- choose an appropriate value of the random consistency ratio from (Table II); and
- evaluate the consistency of the pair-wise comparison matrix to check whether the comparisons are consistent.

Synthesizing the results

Figures 2 and 3 depict the normalized pair-wise rating of PRM tactics and the social media channel options, respectively. AHP-based expert choice software offers two primary means of synthesizing the local priorities of the alternative course of actions employing the global priorities of their parent objectives, including ideal mode and distributive mode. In the ideal mode, the priority of an objective indicates the importance the decision maker or a group of decision makers associate with the dominance of each social media channel relative to other social media channels under the corresponding objective. The priorities of major attributes or criteria with respect to the goal are shown in Figure 2. For major relationship marketing tactics, customers considered customer engagement the most important followed by communication and trust. Specifically, customer engagement > communication > trust > service quality > customer satisfaction > relationship commitment > community building. The consistency ratio (CR) of 0.06 is less than 0.10 recommended by Saaty and Thomas (1980). Based on Saaty and Thomas (1980) recommendation that a CR of 0.10 or less is acceptable, the foregoing pair-wise comparisons to derive criterion weights are therefore

Table II.
The reference values of RI for different numbers of *n*

N	2	3	4	5	6	7	8	9	10
RI	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

Table III.
Pair-wise comparison matrix for the PRM objectives

	Trust	RC	Com	CS	CB	SQ	CE
Trust	1	3	1	3	5	1	3
Relationship commitment (RC)	1/3	1	3	1	3	1	3
Communication (Com)	1	1/3	1	3	3	1	1
Customer satisfaction (CS)	1	1	1/3	1	3	1	1
Community building (CB)	1/5	1/3	1/3	1/3	1	3	5
Service quality (SQ)	1	1	1	1	1/3	1	3
Customer engagement (CE)	1/3	1/3	1	1	1/5	1/3	1

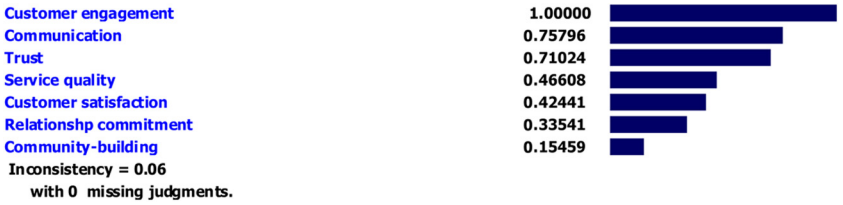

Figure 2.
Normalized pair-wise rating of PRM tactics (objectives or criteria)

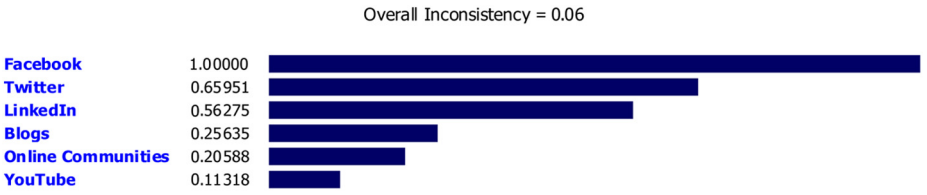

Figure 3.
Normalized pair-wise rating of social media channel alternatives

consistent. As shown in Figure 4, Facebook happens to be the most preferable social media channel among the six options or alternatives, with an overall priority score of 0.357. Their corresponding CR is acceptable. Each CR value is less than or equal to 0.10.

Table IV depicts the detailed synthesis of PRM tactics and the associated social media channels. Facebook is shown to be more important for each of the PRM tactics, followed by Twitter. Figure 5 reports on the priority scores associated with the major PRM decision attributes (shown on the top panel). Customer engagement (0.2598) is the most important pharmaceutical relationship-marketing tactic, followed by communication (0.1969), trust (0.1845), service quality (0.1211), customer satisfaction (0.1103), relationship commitment (0.0872) and community-building (0.0402), respectively. Also, Figure 2 reports on the priority scores of social media alternatives (shown on the bottom panel). With respect to the overall priority scores of social media alternatives, Facebook (0.3615) is the most preferred relationship marketing improvement strategy followed by Twitter (0.2344), LinkedIn (0.1989), Blogs (0.0911), online community (0.0732) and (0.0410), respectively.

Sensitivity analysis results and discussion

SA can provide decision makers with information regarding the robustness of the ranking of the alternative course of action. Per Fiacco (1983), SA determines the effect of local perturbation over results and stability analysis as the effect of finite perturbation over results behavior. Min (1993) argues that "the sensitivity analyses are necessary because changing the importance of criteria requires different levels of resource commitment, [. . .]" If a decision maker or a group of decision makers believe that a criterion maybe more or less important than originally indicated, that criterion's bar can be dragged to the right (increase) or left (decrease) to observe the impact on the ranking of the alternatives. Thus, the objective of SA of the social media impact on PRM tactics is to determine how small changes (perturbation) in input parameters, such as the three most important PRM tactics (customer engagement, communication and trust) will influence the ranking of the social media channel alternatives. Figure 7 show the performance SA of the social media alternatives' priorities with respect to the three most important objectives, including customer engagement, communication and trust, one at a time. The left vertical axis or line indicates the major objective's priority with respect to goal, while the right vertical axis shows the priorities of the social media alternatives. A series of SAs were performed using AHP-based Expert Choice Software to investigate the impact of changing the priority of the major objectives or criteria on the ranking of the social media channel options.

The original performance and dynamic SA are reported in Figures 6 and 7, respectively. Although both have the original ranking of social media channel options (Facebook > Twitter > Linkedln > Blogs > Online communities > Youtube), performance SA is considered. Figures 8 and 9 report on the performance SA of customer engagement. Increasing the customer engagement priority from 26 to 36 per cent in Figure 8 and conversely decreasing same from 26 to 16.4 per cent in Figure 9 did not change the choice or

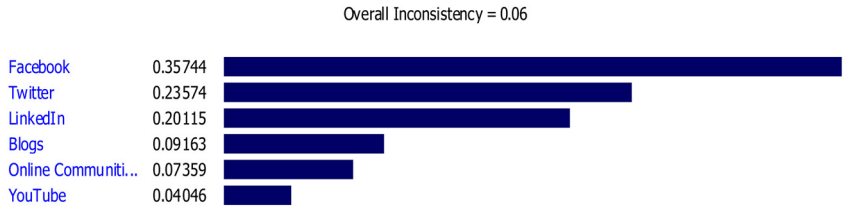

Figure 4.
Synthesis of social media channels with respect to goal

Level 1	Alts	Prty
Trust (L: 0.18454)	Facebook	0.06596
	YouTube	0.00683
	Twitter	0.05588
	LinkedIn	0.05114
	Blogs	0.01636
	Online Co	0.01452
Relationship commitment (L: 0.08715)	Facebook	0.03115
	YouTube	0.00244
	Twitter	0.02147
	LinkedIn	0.01875
	Blogs	0.00572
	Online Co	0.00404
Communication (L: 0.19694)	Facebook	0.07039
	YouTube	0.00836
	Twitter	0.03991
	LinkedIn	0.03150
	Blogs	0.01476
	Online Co	0.01196
Customer satisfaction (L: 0.11027)	Facebook	0.03942
	YouTube	0.00491
	Twitter	0.02110
	LinkedIn	0.01433
	Blogs	0.00763
	Online Co	0.00607
Community building (L: 0.04017)	Facebook	0.01436
	YouTube	0.00149
	Twitter	0.00594
	LinkedIn	0.00642
	Blogs	0.00253
	Online Co	0.00266
Service quality (L: 0.12110)	Facebook	0.04329
	YouTube	0.00531
	Twitter	0.02534
	LinkedIn	0.02261
	Blogs	0.01554
	Online Co	0.01301
Customer engagement (L: 0.25983)	Facebook	0.09287
	YouTube	0.01112
	Twitter	0.06610
	LinkedIn	0.05641
	Blogs	0.02909
	Online Co	0.02132

Table IV.
Detailed synthesis of PRM tactics and social media channels

ranking of the social media channel options. Thus, the original ranking after the small changes remained stable (Facebook > Twitter > Linkedln > Blogs > Online communities > Youtube). For Figures 10 and 11 that report on the performance SA of communication, whether increasing the priority of communication from 19.7 to 29.8 per cent (Figure 10) or decreasing it from 19.7 to 9.7 per cent (Figure 11), the rankings remained stable or robust (Facebook > Twitter > Linkedln > Blogs > Online communities > Youtube), respectively.

With respect to trust reported in Figures 12 and 13, increasing the priority of trust from 18.5 to 28.6 or decreasing it from 18.5 to 8.5 per cent, the ranking remained insensitive to the perturbations (Facebook > Twitter > Linkedln > Blogs > Online communities > Youtube).

Based on the entire performance SAs, the overall priority of social media channel alternatives is robust or stable to changes in the importance of all the attributes. However, if the ranking becomes highly sensitive to small perturbation in the priorities of the objectives, a review of the priorities will be recommended for a review. This means "[. . .] additional decision criteria should be included as a highly sensitive ranking point to a weak discrimination potential of the present set of [objectives]".

Conclusion, managerial implications and recommendations for future studies

The rise in social media presents enormous challenges and opportunities for both pharmaceutical and health-care professionals. Social media has the capacity to potentially transform PRM in terms of consumer engagement, monitoring and analysis of consumer generated-content, building and changing brand perception. However, the industry is yet to fully grasp the breadth and depth of these relationships. Given the fact that consumers are increasingly empowered to probe into the activities in the industry, and increasing loss of trust in the health-care systems, one of the best ways to reach or connect to them is to deploy relationship marketing-based social media. Arguably, "nowhere in marketing is trust more important than in [pharmaceutical] and healthcare" (Andrews, 2012). Embracing the new social media culture will help firms to cut costs and enable faster and more efficient response to consumers/patients' changing demands. For years, C-level executives in marketing and communications have been using the internet to

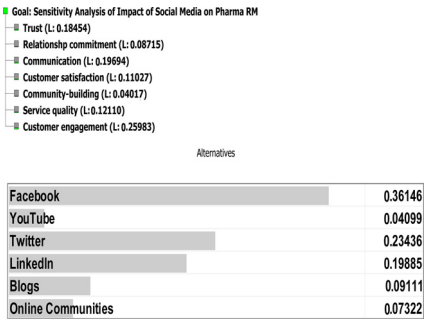

Figure 5.
Priorities with respect to PRM and social media channels

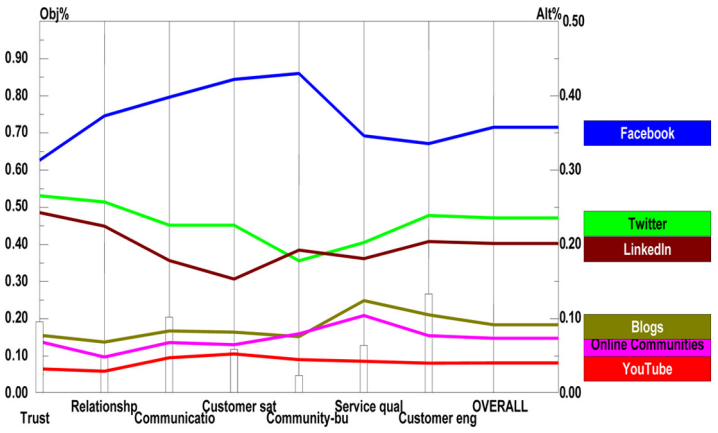

Figure 6.
Original of performance SA

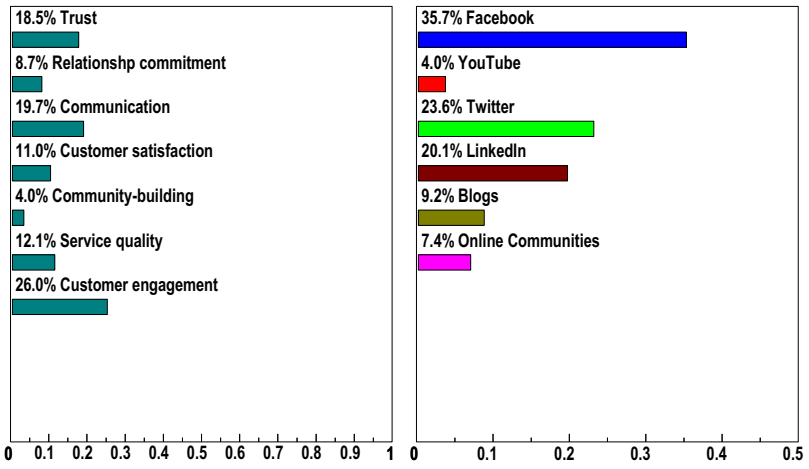

Figure 7.
Original of dynamic SA

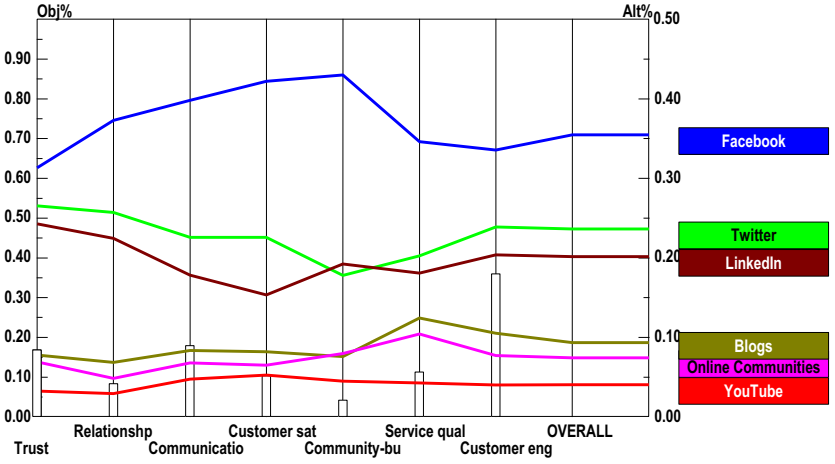

Figure 8.
Performance SA of customer engagement- increase from 26 to 36%

attract and retain customers. More recently, C-level executives in the pharmaceutical marketing arena are slowly embracing social media platforms. Social media can be used as a tool to listen and engage customers. It can also be used to share content and establish a firm as a thought leader in a specific market. Like any marketing tool, social media can drive sales and build brand awareness. Customers and potential patients/consumers associate an organization they see as active on the internet with specific services and contact that firm when there is a need. Consumers in a market for a new pharmaceutical product can ask questions and seek recommendations online. By listening to the voice of consumers in the social media environment, potential patients/consumers can identify themselves.

A number of implications were raised based on the findings of this study. Leveraging social media can help pharmaceutical and health-care marketers to target, define and engage consumers better on a more personal level. In addition, pharmaceutical and health-care marketers must consider implementing social media platforms as they have become key source

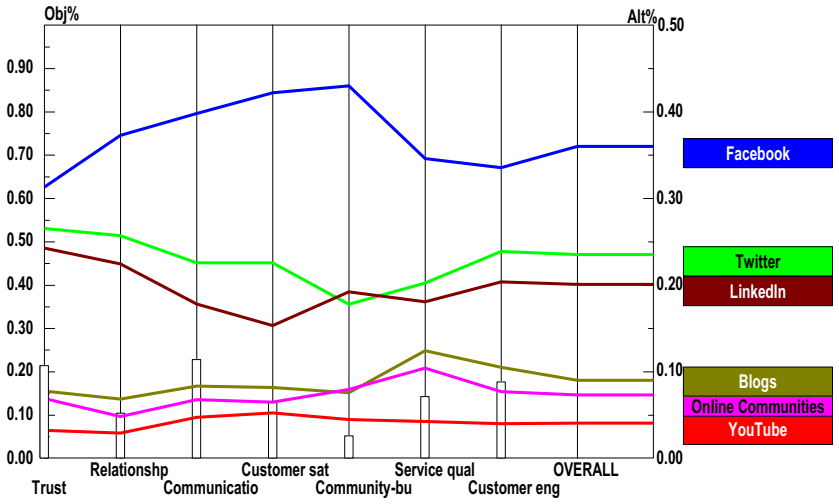

Figure 9.
Performance SA of customer engagement-decrease from 26 to 16.4%

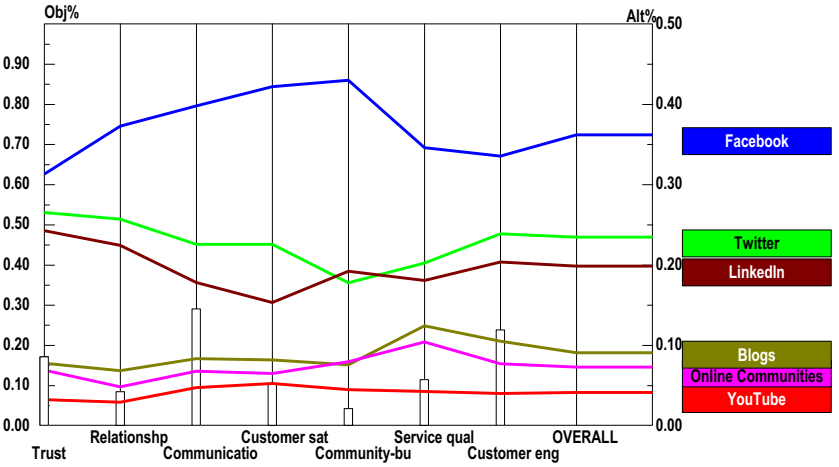

Figure 10.
Performance SA of communication-increase from 19.7 to 29.8%

for consumers and professionals regarding health-care information. Evidence suggests health-care consumers are widely using social media to research health-care providers, procure information on treatments and diseases and support each other. For example:

> 60 million consumers now use new media to share their health experiences online, 216 US hospitals use social media, 142 US hospitals have You Tube channels, 132 US hospitals maintain Twitter accounts, 83 US hospitals have Facebook pages, approximately 1,200 Facebook communities advocate for cures for chronic illnesses, 72% of e-patients search for medical information right before or after a doctor's visit, and 93% of e-patients say the Internet has made it possible to get the medical information they need (www.healthcareos.com/250/health-care-consumer-social-media-statistics/).

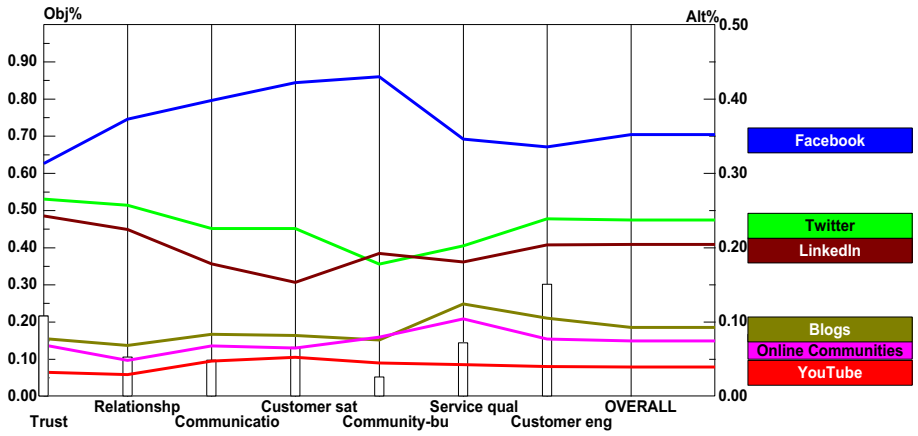

Figure 11.
Performance SA of communication- decrease from 19.7 to 9.7%

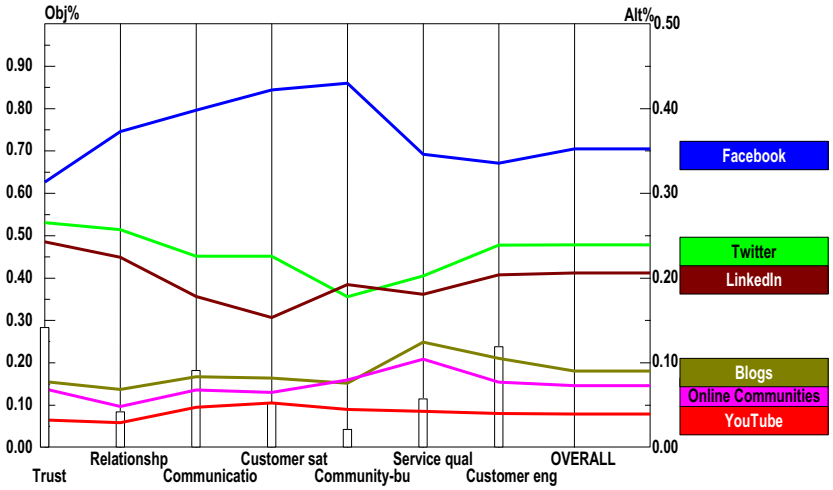

Figure 12.
Performance SA of trust- increase from 18.5 to 28.6%

An analysis approach using the AHP reveals customer engagement as the most important relationship marketing factors relative to other relationship marketing criteria.

Despite our findings, a number of precautions are worth noting regarding social media use. First, a major limitation of social media is that health information domiciled on social media platforms often unreliable. The frequent anonymity of authors of health-care information on social media sites present accountability issues. Another risk associated with the use of social media is the posting of unprofessional content that can reflect unfavorably on pharmaceutical firms and health-care providers. Other concerns regarding the use of social media by health-care industry professionals center on the potential for negative repercussions resulting from the breach of patient confidentiality. Such violations may expose health-care entities to liability under federal and state privacy laws. Finally, the

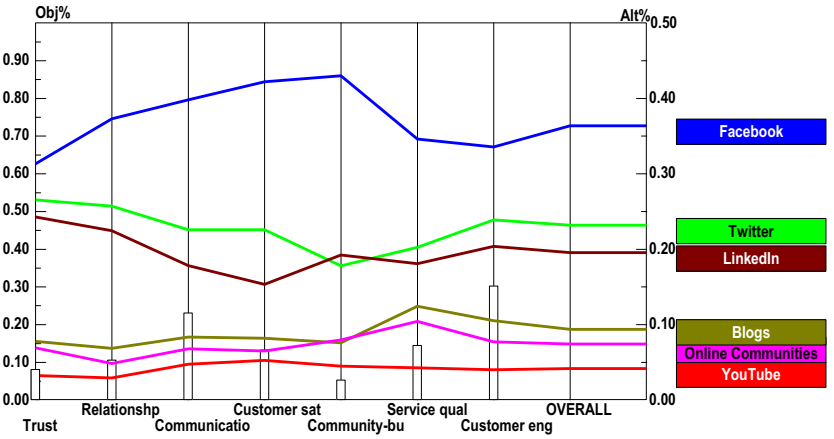

Figure 13.
Performance SA of trust- decrease from 18.5 to 8.5%

widespread use of social media has introduced new legal complexities with no precedents. While social media use can be defended under a number of constitutional rights, such as freedom of speech, freedom from search and seizure and the right to privacy, increasingly, these rights have been successfully challenged.

Our systematic review of the literature shows a kaleidoscopic picture for application of the AHP in health-care research. Our study adds to this growing body of work in health-care research using the AHP method. It is likely that interest in the AHP will rise in the future, particularly in its application to health economic evaluations, the assessment of therapy outcomes, benefit assessments and micro issues in the pharmaceutical industry supply chain system. In this context, the AHP method could support decision-making regarding reimbursement of pharmaceuticals. This ability derives from its ability to translate complex questions into stepwise comparisons at different hierarchical levels. Future studies are needed in which such hierarchies with both quantitative and qualitative criteria can be compared to achieve more accurate representation of real-world health-care issues.

References

Abeza, G., O'Reilly, N. and Reid, I. (2013), "Relationship marketing and social media in sport", *International Journal of Sport Communication*, Vol. 6 No. 2, pp. 120-142.

Abtin, A. and Pouramiri, M. (2016), "The impact of relationship marketing on customer loyalty enhancement (case study: Kerman Iran insurance company)", *Kuwait Chapter of Arabian Journal of Business and Management Review*, Vol. 6 No. 1, pp. 3, pp. 41-49.

Acar, O. and Puntoni, S. (2016), "Customer empowerment in the digital age", *Journal of Advertising Research*, Vol. 56 No. 1, pp. 4-8, doi: 10.2501/JAR-2016-007.

Adebanjo, D., Laosirihongthong, T. and Samaranayake, P. (2014), "Prioritizing lean supply chain management initiatives in healthcare service operations: a Fuzzy AHP approach", *Production Planning and Control: The Management of Operations*, Vol. 27 No. 12, pp. 953-966.

Agrawal, S. and Kaur, N. (2015), "Influence of social media marketing in Indian pharmaceutical industry", *International Journal of Advance Research and Innovation*, Vol. 3 No. 4, pp. 735-738.

Aitken, M., Altmann, T. and Rosen, D. (2014), "Engaging patients through social media: is healthcare ready for empowered and digitally demanding patients?", IMS Institute for Healthcare Informatics, pp. 1-47.

Al-Harbi, K.M. (2001), "Application of the AHP in project management", *International Journal of Project Management*, Vol. 19, pp. 19-27.

Al-rahimi, W.M., Othman, M.S. and Musa, M.A. (2013), "Using tam model to measure the use of social media for collaborative learning", International Journal of Engineering Trends Technology, Vol. 5 No. 2, pp. 90-95.

Andrews, K. (2012), "Relationship marketing: the Rx for DTC", available at: www.dtcperspectives.com/wp-content/uploads/2011/02/RelationshipMarketing.pdf (accessed December 2016).

Anscombe, J., Paddison, C., Plimely, J., Thomas, M. and Lostaglio, K. (2015), *Time for Pharma to Dive into Digital*, AT Kearney, Chicago, pp. 1-8.

Antheunis, M.L., Tates, K. and Nieboer, T.E. (2013), "Patients' and health professionals' use of social media in health care: motives, barriers and expectations", *Patience Education and Counseling*, Vol. 92 No. 3, pp. 426-431.

Arnoff, E.L. and Netzorg, M.J. (1965), "Operations research – the basics", *Management Services*, Vol. 46.

Ashley, C. and Tuten, T. (2015), "Creative strategies in social media marketing: an exploratory study of branded social content and consumer engagement", *Psychology and Marketing*, Vol. 32 No. 1, pp. 15-27.

Azer, S.A. (2017), "Social media channels in health care research and rising ethical issues", *AMA Journal of Ethics*, Vol. 19 No. 11, pp. 1061-1069.

Bagozzi, R.P. (1995), "Reflections on relationship marketing in consumer markets", *Journal of the Academy of Marketing Science*, Vol. 23 No. 4, pp. 272-277.

Baldus, B.J., Voorhees, C. and Calantone, R. (2015), "Online brand community engagement: scale development and validation", *Journal of Business Research*, Vol. 68 No. 5, pp. 978-985.

Belbey, J. (2016a), "FDA readies social media rules for big pharma", available at: www.forbes.com/sites/joannabelbey/2014/08/06/fda-readies-social-media-rules-for-big-pharma/#44f4b5e336cb (accessed 8 October 2017).

Belbey, J. (2016b), "6 Ways Pharma May Use Social Media", available at: www.forbes.com/sites/joannabelbey/2016/03/09/6-ways-pharma-may-use-social-media/#279d74c426de

Belton, V. and Gear, T. (1983), "On a shortcoming of Saaty's method of analytic hierarchy", *Omega*, Vol. 11 No. 3, pp. 228-230.

Benetoli, A., Chen, T.F., Aslani, P. (2017), "Consumer health-related activities on social media: exploratory study", *Journal of Medical Internet Research*, Vol. 19 No. 10, p. e352.

Berry, L.L. (1983), "Relationship marketing", in Berry, L.L., Shostack, G.L. and Upah, G. (Eds), *Emerging Perspectives on Services Marketing*, American Marketing Association, Chicago, IL, pp. 25-28.

Berry, L.L. (2000), "Relationship of marketing services-perspective from 1983-2000", *Journal of Relationship Marketing*, Vol. 1 No. 1, pp. 59-70.

Bhaskaran, N., Kumar, M. and Janodia, M.D. (2017), "Use of social media for seeking health related information – an explanatory study", *Journal of Young Pharmacists*, Vol. 9 No. 2, pp. 267-271.

Blake, J.T., Reibman, A.L. and Trivedi, K.S. (1988), "Sensitivity analysis of reliability and performability measures for multiprocessor systems", *ACM SIGMETRICS conference on Measurement and modeling of computer systems Santa Fe, New Mexico*.

Boston, S. and Andalia, C. (2016), "Social media trends in the promotion of pharmaceuticals, biologics and medical devices", available at: www.apks.com/en/perspectives/publications/2016/01/20160114social_media_trends_in_the_prom_12594 (accessed 12 October 2017).

Castillo, E., Mínguez, R. and Castillo, C. (2006), "Sensitivity analysis in optimization and reliability problems", in ESREL.

Cerri, S. (2012), "Exploring factors affecting trust and relationship quality in a supply chain context", *Journal of Business Quarterly*, Vol. 4 No, No. 1, pp. 74-90.

Chae, H. and Ko, E. (2016), "Customer social participation in the social networking services and its impact upon the customer equity of global fashion brands", *Journal of Business Research*, Vol. 69 No. 9, pp. 3804-3812.

Chen, H. and Kocaoglu, D.F. (2008), "A sensitivity analysis algorithm for hierarchical decision models", *European Journal of Operational Research*, Vol. 185 No. 1, pp. 266-288.

Christopher, M., Payne, A. and Ballantyne, D. (1991), *Relationship Marketing*, Heinemann, London.

Ciotti, G. (2016), "The business case for building real relationships with customers", available at: www.helpscout.net/blog/relationship-marketing/ (accessed 12 October 2017).

Clark, M. and Melancon, J. (2013), "The influence of social media investment on relational outcomes: a relationship marketing perspective", *International Journal of Marketing Studies*, Vol. 5 No. 4, pp. 132-142.

Clark, M., Vorhies, D. and Bentley, J. (2011), "Relationship quality in the pharmaceutical industry: an empirical analysis", *Journal of Medical Marketing*, Vol. 11 No. 2, pp. 144-155.

Cordos, A.A., Bolboaca, S.D. and Drugan, C. (2017), "Social media usage for patients and healthcare consumers: a literature review", *MDPI*, Vol. 5 No. 2, doi: 10.3390/publications5020009.

Costa, T.F.T. (2014), "Pharmaceutical marketing and social media: a Facebook, Twitter, and Youtube analysis", available at: file:///C:/Users/Sampson/Downloads/DissertMestradoTiagoFilipeTavaresCosta2014%20(2).pdf (accessed 2017).

Costa, T., Tiago, T., Tiago, F., Faria, S. and Couto, J. (2017), "Pharmaceutical Marketing Star", in Kavoura, A., Sakas, D. and Tomaras, P. (des), *Strategic Innovative Marketing, Springer Proceedings in Business and Economics*, Springer, Cham.

Dadhich, A. and Dixit, K. (2015), "Trends in OTC drug marketing strategies by Indian pharmaceutical companies", *World Journal of Pharmaceutical Research*, Vol. 4 No. 10, pp. 2899-2909.

De Martino, I., D'Apolito, R., McLawnhorn, A.S., Fehring, K.A., Sculco, P.K., Gasparini, G. (2017), "Social media for patients: benefits and drawbacks", *Current Reviews in Musculoskeletal Medicine*, Vol. 10 No. 1, pp. 141-145.

Deighton, J. (1997), "Commentary on exploring the implications of the internet for consumer marketing", *Journal of the Academy of Marketing Science*, Vol. 25 No. 4, pp. 347-351.

Dessart, L., Veloutsou, C. and Morgan-Thomas, A. (2015), "Consumer engagement in online Brand communities: a social media perspective", *Journal of Product & Brand Management*, Vol. 24 No. 1, pp. 28-42.

Dolan, J.G. (1989), "Medical decision-making using the analytic hierarchy process: Choice of initial antimicrobial therapy for acute pyelonephritis", *Medical Decision Making*, Vol. 9 No. 1, pp. 51-56.

Dyer, J.S. and Wendel, R.R. (1985), "A critique of the analytical hierarchy process", Working Paper 84/85-4-24, Department of Management, the University of Texas, Austin.

Eschenbach, T.G. (1992), "Spiderplots versus tornado diagrams for sensitivity analysis", *Interfaces*, Vol. 22 No. 6, pp. 40-46.

FDA (2014), "Guidance for industry-internet/social media platforms: correcting independent third-party misinformation about prescription drugs and medical devices", available at: www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/UCM401079.pdf (accessed 10 October 2017).

Felix, R., Rauschnabel, P.A. and Hinsch, C. (2017), "Elements of strategic social media marketing: a holistic framework", *Journal of Business Research*, Vol. 70, pp. 118-126.

Ferretti, F., Saltelli, A. and Tarantola, S. (2016), "Trends in sensitivity analysis practice in the last decade", Science of the Total Environment, available at: http://dx.doi.org/10.1016/j.scitotenv (accessed 13 February 2016).

Gandolf, S. (2014), "The push and pull of a winning hospital ad strategy", available at: www.healthcaresuccess.com/blog/hospital-marketing/the-push-and-pull-of-a-winning-hospital-advertising-strategy.html (accessed 10 October 2017).

Ganesan, S. (1994), "Determinants of long term orientation in buyer-seller relationships", *Journal of Marketing*, Vol. 58 No. 2, pp. 1-19.

Geiger, S. and Martin, S. (1999), "The internet as a relationship marketing tool: some evidence from Irish companies", *Irish Marketing Review*, Vol. 12 No. 2, pp. 24-35.

Geller, L.K. (1998), "The internet: the ultimate relationship", *Direct Marketing*, Vol. 61 No. 5, pp. 36-38.

Gibson, S. (2014), "Regulating direct-to-consumer advertising of prescription drugs in the digital age", *Laws*, Vol. 3 No. 3, pp. 410-438.

Goldberg, S. (2013), "Advertising to the end consumers by pharmaceutical companies: blessing or curse?", *International Journal of Research in Business and Social Science (2147-4478)*, Vol. 2 No. 4, pp. 2147-4478.

Gorstin, L.O. (2012), "Marketing pharmaceuticals; a constitutional right to sell prescriber identified data?", *JAMA*, Vol. 307 No. 8, pp. 787-788.

Grajales, F.J., Sheps, S., Ho, K., Novak-Lauscher, H.P. and Eysenbach, G. (2014), "Social media: a review and tutorial of applications in medicine and healthcare", *Journal of Medical Internet Research*, Vol. 16 No. 2.

Greene, J.A. and Kesselheim, A.S. (2010), "Pharmaceutical marketing and the new social", *New England Journal of Medicine*, Vol. 363 No. 22, pp. 2088-2089.

Griffiths, F., Dobermann, T., Cave, J.A.K., Thorogood, M., Johnson, S., Salamatian, K., Gomez Olive, F.X. and Goudge, J. (2015), "The impact of online social networks on health and health systems: a scoping review and case studies", *Policy and Internet*, Vol. 7 No. 4, pp. 473-496.

Gronroos, C. (1994), "From marketing mix to relationship marketing", *Management Decision*, Vol. 32 No. 2, pp. 4-20.

Gronroos, C. (1996), "Relationship marketing: strategic and tactical implications", *Management Decision*, Vol. 34 No. 3, pp. 5-15.

Gummession, E. (2000), "Relationship marketing in the economy", *Journal of Relationship Marketing*, Vol. 1 No. 1, pp. 37-57.

Hanna, R., Rohm, A. and Crittenden, V.L. (2011), "We're all connected: the power of the social media ecosystem", *Business Horizons*, Vol. 54 Issue No. 3, pp. 265-273.

Hays, S., Page, S.J. and Buhalis, D. (2013), "Social media as a destination marketing tool: its use by national tourism organizations", *Current Issues in Tourism*, Vol. 16 No. 3, pp. 211-239.

Hennig-Thurau, T., Malthouse, E.C., Friege, C., Gensler, S., Lobschat, L., Rangaswamy, A. and Skiera, B. (2010), "The impact of new media on customer relationships", *Journal of Service Research*, Vol. 13 No. 3, pp. 311-330.

Hodge, A.C., Romo, Z.G., Medina, I.G. and Fionda-Douglas, A. (2015), "Consumer-Brand relationships within the luxury cosmetic domain", *Journal of Brand Management*, Vol. 22 No. 8, pp. 631-657.

Hollebeek, L. and Brodie, R. (2016), "Non-monetary social and network value: Understanding the effects of non-paying customers in new media", *Journal of Strategic Marketing*, Vol. 24 Nos 3/4, pp. 169-174.

Hollebeek, L.D., Glynn, M.S. and Brodie, R.J. (2014), "Consumer brand engagement in social media: conceptualization, scale development and validation", *Journal of Interactive Marketing*, Vol. 28 No. 10, pp. 149-165.

Househ, M., Borycki, E. and Kushniruk, A. (2014), "Empowering patients through social media: the benefits and challenges", *Health Informatics Journal*, Vol. 20 No. 1, pp. 50-58.

Hudson, S., Huang, L., Roth, M.S. and Madden, T.J. (2015), "The influence of social media interactions on consumer–Brand relationships: a three-country study of Brand perceptions and marketing

behaviors", *International Journal of Research in Marketing*, available at: https://pdfs.semanticscholar.org/28a4/22c954c5b81d1c1b358b4cbe26f10811c949.pdf (accessed 10 October 2017).

Imai, K. and Yamamoto, T. (2013), "Identification and sensitivity analysis for multiple causal mechanisms: revisiting evidence from framing experiments", *Political Analysis*, Vol. 21 No. 2, pp. 141-171.

Jaakkola, E. and Alexander, M. (2014), "The role of customer engagement behavior in value co-creation: a service system perspective", *Journal of Service Research*, Vol. 17 No. 3, pp. 247-261.

Jackson, W., Park, B., Toscani, M. and Hermes-DeSantis, E. (2015), "Analysis of social media interactions between pharmaceutical companies and consumers", *Therapeutic Innovation & Regulatory Science*, Vol. 49 No. 3, pp. 387-391.

Jakhrani, A.Q., Othman, A., Rigit, A.R.H., Samo, S.R. and Kamboh, S.A. (2013), "Sensitivity of analysis of standalone photovoltaic system models parameter", *Journal of Applied Sciences*, Vol. 13 No. 2, pp. 220-231.

Kim, H. (2015), "Trouble spots in online direct-to-consumer prescription drug promotion: a content analysis of FDA warning letters", *International Journal of Health Policy and Management*, Vol. 4 No. 12, pp. 813-821.

Kotler, P. and Keller, K.L. (2007), *A Framework for Marketing*, 3rd ed., Prentice Hall, Upper Saddle River.

Kotler, P., Kartajaya, H. and Setiawan, I. (2010), *Marketing 3.0: From Products to Customers to the Human Spirit*, Wiley, Hoboken, NJ.

Lagrosen, S.O. and Grunden, K. (2014), "Social media marketing in the wellness industry", *The TQM Journal*, Vol. 26 No. 3, pp. 253-260. Issue.

Laranjo, L., Arguel, A., Neves, A.L., Gallagher, A.M., Kaplan, R., Mortimer, N., Mendes, G.A., Annie, Y.S. and Lau, A.Y.S. (2015), "The influence of social networking sites on health behavior change: a systematic review and Meta-analysis", *Journal of the American Medical Informatics Association*, Vol. 22 No. 1, pp. 243-256.

Lerer, L. (2002), "Pharmaceutical marketing segmentation in the age of the internet", *Journal of Medical Marketing*, Vol. 2 No. 2, pp. 159-166.

Li, J. (2013), "Privacy policies for health social networking sites", *Journal of the American Medical Informatics Association*, Vol. 20 No. 4, pp. 704-707.

Li, M.L., Green, R.D., Farazmand, F.A. and Grodzki, E. (2012), "Customer loyalty: influences on three types of retail stores' shoppers", *International Journal of Management and Marketing Research*, Vol. 5 No. 1, pp. 1-19.

Lian, S.B. (2017), "The role of relationship quality on customer loyalty: the effectiveness of strategic relationship", *Proceedings of 112th The IIER International Conference, Tokyo*, 29-30 July, available at: www.worldresearchlibrary.org/up_proc/pdf/956-150303321521-24.pdf (accessed 15 October 2017).

Liang, B.A. and Mackey, T.K. (2011), "Prevalence and global health implications of social media in direct-to-consumer drug advertising", *Journal of Medical Internet Research*, Vol. 13 No. 3, p. 64.

Liberatore, M.J. and Nydick, R.L. (2008), "The analytic hieracrchy process in medical and healthcare decision-making: a literature review", *European Journal of Operations Research*, Vol. 189 No. 1, pp. 194-207.

Lim, M.S.C., Vella, A., Sacks-Davis, R. and Hellard, M.E. (2014), "Young people's comfort receiving sexual health information via social media and other sources", *International Journal of STD & Aids*, Vol. 25 No. 14, pp. 1003-1008.

Littleton, T. (2016), "Why pharmaceutical marketers are increasingly turning to social media", available at: https://econsultancy.com/blog/67993-why-pharma-marketers-are-increasingly-turning-to-social-media (accessed 15 November 2017).

Liu, D. and Fraser, H. (2012), *Benchmark Data Reveals Pharmaceutical Industry Not Connecting Social Media Data with Marketing Strategies*, IBM Institute for Business Value, New Delhi.

Lu, Y., Wu, Y., Liu, J., Li, J. and Zhang, P. (2017), "Understanding health care social media use from different stakeholder perspectives: a content analysis of an online health community", *Journal of Medical Internet Research*, Vol. 19 No. 4, p. e109.

Mack, J., (2005), "Relationship marketing program management for pharmaceutical marketers", *Pharma Marketing News*, Vol. 4. No. 2, p. 5.

Mahmoud, M.A., Kastner, A.N.A. and Lartey, J.O. (2017), "Internet-based relationship marketing: a Sub-saharan african perspective", *Journal of Relationship Marketing*, Vol. 16 No. 3, pp. 179-196.

Markets and Markets (2010), "Pharma & healthcare social media marketing strategies", available at: www.marketsandmarkets.com/Market-Reports/Pharma-Social-Media-245.html (accessed December 2016).

Mershon, P. (2012), "Social media Marketing Trends: New Research", Social Media Examiner, available at: www.socialmediaexaminer.com/5-social-media-marketing-trends-new-research-2/ (accessed 10 October 2017).

Min, H. (1993), "International supplier selection: a multi-attribute utility approach", *International Journal of Physical Distribution & Logistics Management*, Vol. 24 No. 5, pp. 24-33.

Mohr, I. (2013), "The impact of social media on the fashion industry", *Journal of Applied Business and Economics*, Vol. 15 No. 6, pp. 17-22.

Moorhead, S.A., Hazlett, D.E., Harrison, L., Carroll, J.K., Irwin, A. and Hoving, C. (2013), "A new dimension of health care: systematic review of the uses, benefits, and limitations of social media for health communication", *Journal of Medical Internet Research*, Vol. 15 No. 4, p. e85.

Morgan, R.M. and Hunt, S.D. (1994), "The commitment–trust theory of relationship marketing", *Journal of Marketing*, Vol. 58 No. 3, pp. 20-38.

Neff, J. (2014), "Digital is selling more soap that it gets credit for: Nielsen study", Advertising Age, available at: http://adage.com/article/digital/study-digital-return-investment-undervalued/291772/ (accessed 12 October 2017).

Ng, S., David, M.T. and Dagger, T.S. (2017), "Examining customer perceptions of relationship quality over time", in Campell, C.L. (Ed), *The Customer Is Not Always Right? Marketing Orientations in a Dynamic Business World" Developments in Marketing Science Proceedings of the Academy of Marketing Science*, Springer, Cham.

Newbold, B. (2015), *Social Media in Public Health*, National Collaborating Centre for Healthy Public Policy, Montréal, Québec.

Odenheimer, M. (2017), "6 Legal issues when healthcare uses social media", available at: www.actiance.com/blog/healthcare-gets-social-media-ga/ (accessed 20 November 2017).

Oke, A. and Gopalakrishnan, M. (2009), "Managing disruptions in supply chains: a case study of a retail supply chain", *International Journal of Production Economics*, Vol. 118 No. 1, pp. 168-174.

Pannell, D.J. (1997), "Sensitivity analysis of normative economic models: theoretical framework and practical strategies", *Agricultural Economics*, Vol. 16 No. 2, pp. 139-152.

Pantouvakisa, A. and Bouranta, N. (2017), "Agility, organizational learning culture and relationship quality in port sector", *Total Quality Management*, Vol. 28 Nos 3/4, pp. 366-378.

Parganas, P. and Anagnostopoulos, C. (2015), "Social media strategy in professional football: the case of liverpool FC", *CHOREGIA*, Vol. 11 No. 2, pp. 62-75.

Parganas, P., Anagnostopoulos, C. and Chadwick, S. (2015), "You'll never tweet alone: Managing sports brands through social media", *Journal of Brand Management*, Vol. 22 No. 7, pp. 551-558.

Parvatiyar, A. and Sheth, J.N. (2000), "The domain and conceptual foundations of relationship marketing", in Parvatiyar, A. and Sheth, J.N. (Eds), *Handbook of Relationship Marketing*, Sage Publications, New York.

Perumal, I., Krisnan, U.D. and Abdul Halim, N.S.B. (2017), "Social media in food and beverages industry: case of Klang Valley, Malaysia", *International Journal of Business and Management*, Vol. 12 No. 6, p. 121.

Pew (2017), *Social Media Fact Sheet*, Pew Research Center, Washington.

Peppers and Rogers Group (2009), "Relationship marketing: thriving in marketing's new ecosystem", available at: www.1to1media.com/DocumentDownload.aspx?Doc_ID=31889 (accessed November 2016).

Peppers, D., Rogers, M. and Dorf, B. (1999), "Is your company ready for one-to-one marketing?", *Harvard Business Review*, Vol. 77 No. 1, pp. 151-160.

Pharmanews (2016), "Pharma and Healthcare Social Media Market: Great Trends in Near Future, 2025", available at: www.pharmanewsonline.com/pharma-and-healthcare-social-media-market-great-trends-in-near-future-2025/ (accessed 31 January 2017).

Pharmaceutical Marketing (2017), "Pharmaceutical marketing: reevaluate digital trends and metrics for social media and mobile success", available at: www.cuttingedgeinfo.com/preview/pharmaceutical-marketing/ (accessed 20 November 2017).

Prince, M., Palihawadana, D., Davies, M.A.P. and Winsor, R.D. (2016), "An integrative framework of buyer–supplier negative relationship quality and dysfunctional interfirm conflict", *Journal of Business-to-Business Marketing*, Vol. 23, No. 3, pp. 221-234.

Ramayah, T. and Leen, J.Y.A. (2017), "What drives relationship marketing? A study of two retail clothing stores", *Journal of the Asian Academy of Applied Business*, Vol. 2, pp. 41-52.

Rappaport, A. (1967), "Sensitivity analysis in decision making", *The Accounting Review*, pp. 441-456.

Raskovic, M., Makovec Brencic, M., Ferliogi, A. and Fransoo, J.C. (2013), "Relationship learning as a dimension of relationship quality: tentative evidence from transnational buyer-supplier relationships", *Theory and Practice*, Vol. 25 Issue No. 1, pp. 37-50.

Relle, K. (2012), "A prescription for pharma: Social media reality check", *Human Digital*, August, pp. 1-11.

Ruskin, W.A. and Middlebrook, B.E. (2014), "Opportunities and challenges: social media marketing and pharmaceuticals", For the Defense, November, pp. 14-20.

Ruswanti, E. and Lestari, W.P. (2016), "The effect of relationship marketing towards customers' loyalty mediated by relationship quality (case study in priority bank in niaga)", *DeReMa (Development Research of Management): Jurnal Manajemen*, Vol. 11 No. 2, pp. 191-211.

Rutter, R., Roper, S. and Lettice, F. (2016), "Social Media Interaction, The University Brand and Recruitment Performance", *Journal of Business Research*, available at: www.researchgate.net/publication/292680421_Social_media_interaction_the_university_brand_and_recruitment_performance (accessed 10 October 2017).

Saaty, T.L. (1990), *The Analytic Hierarchy Process*, RWS Publications, Shallowater, TX.

Saaty, T.L. (2000), *Fundamentals of Decision Making and Priority Theory*, 2nd ed., RWS Publications, Pittsburgh, PA.

Saaty, L. and Thomas, L. (1980), *The Analytic Hierarchy Process*, McGraw-Hall, New York.

Samaha, S.A., Beck, J.T. and Palmatier, R.W. (2014), "The role of culture in international relationship marketing", *Journal of Marketing*, Vol. 78 No. 5, pp. 78-98.

Samson, D. (1988), *Managerial Decision Analysis*, Homewood, Irwin.

Schivinski, B., Christodoulides, G. and Dabrowski, D. (2016), "Measuring consumers' engagement with Brand-related social-media content - development and validation of a scale that identifies levels of social-media engagement with brands", *Journal of Advertising Research*, Vol. 56 No. 1, pp. 1-18, doi: 10.2501/JAR-2016-004.

Schlegelmilch, B.B. and Sinkovics, R. (1998), "Viewpoint, marketing in the information age – can we play for an unpredictable future?", *International Marketing Review*, Vol. 15 No. 3, pp. 162-170.

Schultz, D.E. and Peltier, J.J. (2013), "Social media's slippery slope: challenges, opportunities and future research directions", *Journal of Research in Interactive Marketing*, Vol. 7 No. 2, pp. 86-99.

Serra, D. (2004), "Empirical determinants of corruption: a sensitivity analysis", GPRG-WPS-012.

Shani, D. and Chalasani, S. (1991), "Exploiting niches using relationship marketing", *The Journal of Consumer Marketing*, Vol. 9 No. 3, pp. 33-42.

Shankar, V. and Li, J. (2014), "Leveraging social media in the pharmaceutical industry", in Eliashberg, J., Ding, M., Eliashberg, J. and Stremersch, S. (Eds), *International Series in Quantitative Marketing: Innovation and Marketing in the Pharmaceutical Industry*, Springer, New York, Vol. 20, pp. 477-505.

Shen, B. and Bissell, K. (2013), "Social media, social me: a content analysis of beauty companies' use of FACEBOOK in marketing and branding", *Journal of Promotion Management*, Vol. 19 No. 5, pp. 629-651.

Sheth, J.N. and Parvatiyar, A. (1995), "Relationship marketing in consumer markets: antecedents and consequences", *Journal of the Academy of Marketing Science*, Vol. 23 No. 4, pp. 255-271.

Sheth, J.N. and Parvatiyar, A. (2000), "Evolving relationship marketing into a discipline", *Journal of Relationship Marketing*, Vol. 1 No. 1, pp. 5-11.

Sheth, J. and Sisodia, R. (2012), "Improving marketing productivity", available at: www.jagsheth.net/docs/Improving%20Marketing%20Productivity.pdf (accessed November 2016).

Simon, H. (1977), *The New Science of Management Decisions*, Prentice-Hall, Englewood Cliffs, NJ.

Sorce, P. (2002), "Relationship marketing strategy", available at: http://print.rit.edu/pubs/0204_Sorce.pdf (accessed 15 January 2016).

Statista (2017), *Statistics Portal*, Statista Inc.

Steenland, K. and Greenland, A. (2004), "Monte carlo sensitivity analysis and bayesian analysis of smoking as an unmeasured confounder in a study of silica and lung cancer", *American Journal of Epidemiology*, Vol. 160 No. 4, pp. 384-392.

Stelzner, M. (2013), "The 2013 social media marketing industry report: social media examiner", available at: www.socialmediaexaminer.com/SocialMediaMarketingIndustryReport2013.pdf (accessed 15 October 2017).

Storbacka, K., Strandvik, T. and Grönroos, C. (1994), "Managing customer relationships for profit: the dynamics of relationship quality", *International Journal of Service Industry Management*, Vol. 5 No. 5, pp. 21-38.

Taggart, T., Grewe, M.E., Conserve, D.F., Gliwa, C. and Roman, I.M. (2015), "Social media and HIV: a systematic review of uses of social media in HIV communication", *Journal of Medical Internet Research*, Vol. 17 No. 11, p. e248.

Taitsman, J.K., Grimm, C.M. and Agrawal, S. (2013), "Protecting patient privacy and data security", *The New England Journal of Medicine*, Vol. 368 No. 11, pp. 977-979.

Tham, A., Croy, G. and Mair, J. (2013), "Social media in destination choice: distinctive electronic word of mouth dimensions", *Journal of Travel & Tourism Marketing*, Vol. 30 Nos 1/2, pp. 144-155.

Tsai, W. and Men, L. (2014), "Consumer engagement with brands on social network sites: a cross-cultural comparison of China and the USA", *Journal of Marketing Communication*, Vol. 23 No. 1, pp. 2-21.

Trainor, K.J. (2012), "Relating social media technologies to performance: a capabilities-based perspective", *Journal of Personal Selling and Sales Management*, Vol. 32 No. 3, pp. 317-331.

Trainor, K.J., Andzulis, J.M., Rapp, A. and Agnihotri, R. (2014), "Social media technology usage and customer relationship performance: a capabilities-based examination of social CRM", *Journal of Business Research*, Vol. 67 No. 6, pp. 1201-1208.

Tramarico, C.L., Mizuno, D., Salomon, V.A. and Marins, F.A. (2015), "Analytic hierarchy process and supply chain management: a bibliometric stuudy", *Procedia Computer Science*, Vol. 55, pp. 441-450.

Trueman, R.E. (1974), *An Introduction to Quantitative Methods for Decision Making*, Holt, Rinehart and Winston, New York.

Vernuccio, M. (2014), "Communicating corporate brands through social media: an exploratory study", *International Journal of Business Communication*, Vol. 51 No. 3, pp. 211-233.

Vivek, S.D., Beatty, S.E. and Morgan, R.M. (2012), "Customer engagement: exploring customer relationships beyond purchase", *Journal of Marketing Theory and Practice*, Vol. 20 No. 2, pp. 122-146.

Vivek, S.D., Beatty, S.E., Dalela, V. and Morgan, R.M. (2014), "A generalized scale for measuring customer engagement", *Journal of Marketing Theory and Practice*, Vol. 22 Issue No. 4, pp. 401-420.

Wallace, S.W. (1998), "Decision making under uncertainty: is sensitivity analysis of any use?", *Operation Research*, Vol. 48 No. 1, pp. 20-25.

Williams, J. and Chinn, S.J. (2010), "Meeting relationship-marketing goals through social media: a conceptual model for sport marketers", *International Journal of Sport Communication*, Vol. 3 No. 4, pp. 422-437.

Williams, G., Hamm, M.P., Shulhan, J., Vandermeer, B. and Hartling, L. (2014), "Social media interventions for diet and exercise behaviors: a systematic review and Meta-analysis of randomized controlled trials", *BMJ Open*, Vol. 4 No. 2, p. e003926.

Winpenny, E.M., Marteau, T.M. and Nolte, E. (2014), "Exposure of children and adolescents to alcohol marketing on social media websites", *Alcohol and Alcoholism (Oxford, Oxfordshire)*, Vol. 49 No. 2, pp. 154-159.

Yin, R.K. (1994), *Case Study Research: Design and Methods*, 2nd ed., Sage, Thousand Oaks, CA.

Ziebland, S. and Wyke, S. (2012), "Health and illness in a connected world: how might sharing experiences on the internet affect people's health?", *The Milbank Quarterly*, Vol. 90 No. 2, pp. 219 -249.

Further reading

Fiacco, A.V. (2003), "*Introduction to Sensitivity and Stability Analysis*", *Nonlinear Programming*, Academic Press, New York.

Fox, S. and Jones, S. (2009). *The Social Life of Health Information*, The Pew Research Center, Washington, DC.

Pewinternet (2016), "Washington, DC: Pew Internet & American Life Project", available at: www.pewinternet.org/Reports/2009/8-The-Social-Life-of-Health-Information.aspx (accessed December 2016).

Itskhoki, A. (2011), "Social media influence: foundational learning for pharmaceutical firms", available at: www.knowledgenetworks.com/business-solutions/docs/DTC_SoMeItskhoki.pdf (accessed 2017).

Liao, W.H. and Qiu, W.L. (2016), "Applying analytic hierarchy process to assess healthcare-oriented cloud computing service systems", *SpringerPlus*, Vol. 5 No. 1, p. 1030.

Tang, J. and Liu, L. (2015), "Trust in social media", *Synthesis Lectures on Information Security, Privacy, and Trust*, Vol. 10 No. 1, pp. 1-129.

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