

ANALYTIC HIERARCHY PROCESS AND SENSITIVITY ANALYSIS APPROACH FOR SOCIAL MEDIA IMPACT ON PHARMACEUTICAL RELATIONSHIP MARKETING TACTICS

Chris I. Enyinda, Canadian University of Dubai, UAE
christian@tud.ac.ae, 97143219090

Alphonso O. Ogbuehi, Clayton State University
alphonsoogbuehi@clayton.edu

Suhair Hamouri, Canadian University of Dubai, UAE
suhair@tud.ac.ae

ABSTRACT

Pharmaceutical relationship marketing (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. This paper explores the sensitivity analysis (SA) of PRM tactics within the social media environment using analytic hierarchy process (AHP) approach. Results revealed customer engagement as the most important PRM tactic, followed by communication, and trust. The performance SA carried out on the PRM tactics showed that the ranking associated with social media channel options remained robust or insensitive to small perturbations.

Keywords: Relationship Marketing Tactics, AHP, Sensitivity Analysis, Social Media

INTRODUCTION

Pharmaceutical marketers and researchers are increasingly interested in the impact of social media on pharmaceutical marketing and relationship marketing in particular. Social media channels are significantly transforming marketing strategies used by a number of industries 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, based on the market intelligence acquired by monitoring and analyzing user-generated content.

More than ever before, patients/consumers are turning to social media for their health information. A survey reports that “61% of American adults look online for health information” (Fox and Jones, 2009). According to Mack (2005), “relationship marketing should be a natural for the pharmaceutical industry.” 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 requires personal communication with the consumer that can help improve marketing productivity (Sheth and Parvatiyar, 1995; (Sorice, 2002). Andrews (n. d) notes “because of its consumer-centric focus and reliance on listening, [pharmaceutical] relationship marketing is a perfect antidote to the layers of distrust that often accompany DTC.” Andrews (n. d) further points out 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). Indeed, because of social media, power is increasingly shifting from the pharmaceutical marketers as well as physicians to health care consumers. Essentially, the old ways in which the pharmaceutical marketers controlled their messages are rapidly eroding. This means to thrive and prosper in a networked environment, pharmaceutical marketers may need to transform their old marketing model or be made to transform by the ever growing and demanding patient communities.

For pharmaceutical firms to earn the attention and loyalty of health consumers, it is now important to urgently begin to invest in new relationship quality with the growing health consumers who are increasingly becoming digital media savvy. Acquiring new customers is increasingly more costly than the retaining existing customers. Furthermore, one of the roles of relationship marketing is getting closer to customers and keeping them. This can be achieved efficiently and effectively through social media. Social media is a less expensive investment that pharmaceutical firms can use to improve proximity to consumers and enhance customer relationship management program. According to Geiger and Martin (1999), “...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 can 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) asserts that firms can afford to interact with customers on a one-to-one manner that is crucial for building relationship marketing. According to Geiger and Martin (1999), the internet is a medium that lends itself in various aspects to use as a tool for relationship marketing. Also, according to Mack (2005), successful relationship marketing campaigns depend heavily upon marketing databases and interactive media like the internet. Lerer (2001) contends that the internet is an important paradigm for a personalized interaction between a pharmaceutical firm and individual customer. The growing imperative of social media will no doubt change the way pharmaceutical firms connect and interact with consumers and other healthcare providers. To survive in today’s relationship marketing ecosystem, the pharmaceutical industry must consider embracing social media network tools.

Traditionally, pharmaceutical firms primarily marketed their products through pharmaceutical sales force, physicians, and other healthcare providers, rather than through consumers. Essentially, brands tend to focus on what they want consumers to hear, rather than what they want. However, as the number of consumers relying on the 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. Today's consumers often obtain their brand messages from other consumers and peers as opposed to mainly from the brand itself. In essence, health consumers trust peer generated social media content than information generated by pharmaceutical firms. Hoffman and Novak (1996) note the importance of developing a new medium-as-market in which all parties can interact with each other. Thus, pharmaceutical relation marketing-social media base can increase the consumers/patients base. 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 and/or patients 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. However, a number of pharmaceutical firms are missing the consumer engagement opportunities because the FDA is yet to provide guidance on how to monitor marketing in the social media environment.

We used Saaty's (1980) analytic hierarchy process (AHP) model to conduct the sensitivity analysis of the impact of social media channels on pharmaceutical relationship marketing 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 review relevant literature on relationship marketing, pharmaceutical relationship marketing, and sensitivity analysis. Next, we present research methodology and the data collection. We then discuss the empirical results, with particular focus on the sensitivity analysis results. Finally, we offer conclusions and the managerial implications.

LITERATURE REVIEW

Some Relationship Marketing Studies

Sheth and Sisodia (2012) contend that the purpose of relationship marketing is to improve marketing productivity by attaining efficiency and effectiveness. Shani and Chashani (1992) defined relationship marketing as a means 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 period of time. Physicians and end-consumers are the primary targets of pharmaceutical firms' relationship marketing efforts (Clark et al., 2011). Relationship marketing is a strategic platform on which marketers can build connections between the pharmacist, physician, patient, family, caregiver and other healthcare providers (Andrews, 2012). Some notable studies that have enriched our understanding of relationship marketing including channel relationships (Ganesan, 1994; Boyle et al. 1992), 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. Parvatityar et al (2000) contend that relationship marketing is strategic driven as opposed to customer relationship manipulation. Sheth and Parvatityar (2000) assert that relationship marketing tends to focus on customer retention and customer commitment as well as on 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). According to Gummesson (2000), relationships are part of customer perceived quality and Berry (2000) recommends that relationship marketing strategies marketers can consider in the development of a relationship marketing plan include core service strategy, relationship customization, service augmentation, relationship pricing, and internal marketing. Thus, 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 Tactics

Implementing social media in the pharmaceutical industry is important for several reasons: improve relationship marketing, enhance customer engagement, monitor brand, among others. Traditionally, marketing managers spend millions of dollars on marketing research and promotions to understand and influence consumer behavior towards their brands. Given that more consumers are migrating to the social media platforms to seek information and drive their decision-making, marketers have an opportunity to sense and respond to changes in consumer purchasing behavior. Social media can become a great influencer to consumer buying behavior and the attendant sales. 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. The propensity that a consumer will visit a social media platform and search for a cholesterol drug/brand has become significantly higher. Patient communities can propagate closed-group communication behavior or the group-think that

influences a consumer's buying behavior. Health consumers are the ultimate end-users of pharmaceutical and healthcare products and services. In order to have access to these fast growing patient communities, pharmaceutical marketers have to eventually get involved in the social media communities because consumers trust each other much better than they trust a firm's self-proclaimed brand benefits. Peppers and Rogers Group (2009) puts it this way, "people's friends and colleagues have always played a role in shaping their opinions. However, social media makes it easier and more convenient than it ever was 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 is transforming pharmaceutical and healthcare 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. Social media marketing strategies can help firms generate market exposure, market research data, relationship building, and improve sales in the long term (<http://socialmediajam.com/effective-social-media-marketing-strategies-for-pharmaceutical-market/>). 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. Because of an operating environment 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, in spite of the pharmaceutical industry's concern with the social media platforms (e.g., Facebook, Twitter, LinkedIn, YouTube, and Blogs), a number of pharmaceutical firms are slowly embracing these platforms to ameliorate their relationship marketing and brand management agenda based on the market intelligence acquired by listening, monitoring and analyzing the end-user generated content. Indeed, the actionable information mined from the social media environment can assist pharmaceutical 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, Orofam, and Bufferin. Also, 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 (<http://www.marketsandmarkets.com/Market-Reports/Pharma-Social-Media-245.html>). Some of the benefits that can accrue from 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) 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 making a decision, and enabling management to focus attention on the most critical elements during decision implementation. SA has been applied in a number of fields, including the pharmaceuticals, medicine, civil engineering, political science and computer science (Steenland and Greenland, 2004; Blake et al., 1988; Castillo et al., 2006). Rappaport (1967) assert that in the face of risk and uncertainty, the most 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 impact 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. According to Pannell (1997), SA is “the investigation of potential changes and errors and their impacts on conclusions to be drawn 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 (2000) contends that SA can be used to facilitate decision making under uncertainty by way of parametric linear programming.

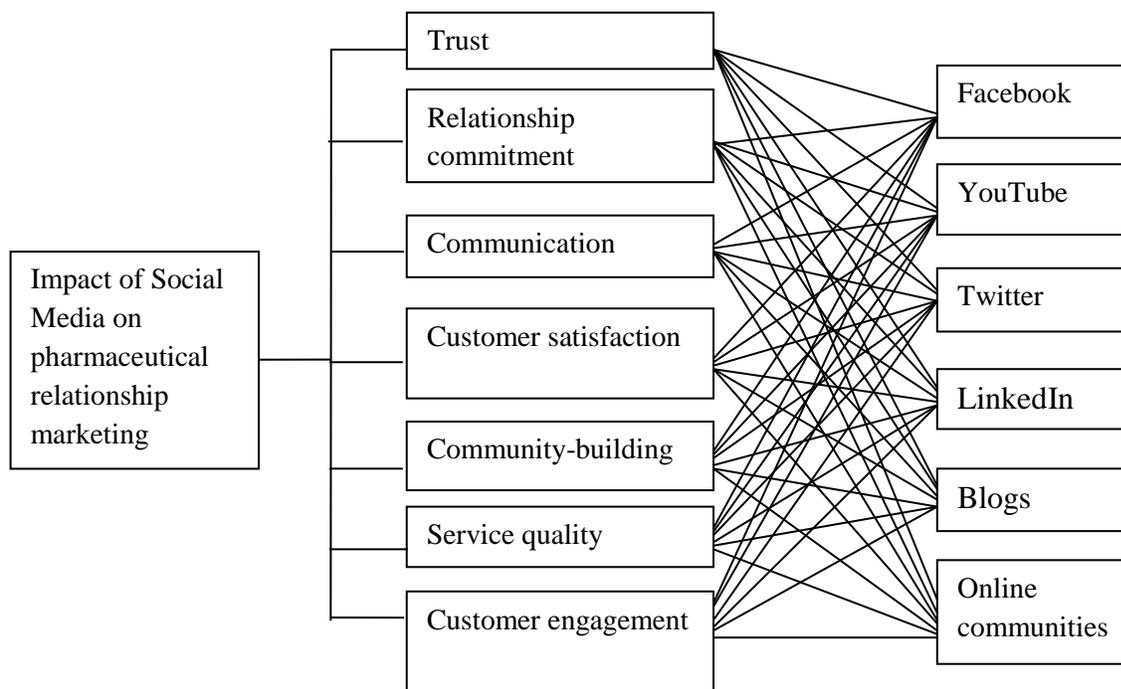
RESEARCH METHODOLOGY

Pharmaceutical relationship marketing represents a typical multi-criteria decision-making that entails multiple criteria that can be both qualitative and quantitative. We leveraged AHP to model social media impact on pharmaceutical relationship marketing. We selected AHP because it enables a group of 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 (e.g., Belton and Gear, 1986; Dyer and Wendel, 1985). However, because of its usefulness, AHP has been widely used in research world-wide. For example, it has been used in pharmaceutical supply chain, and pharmaceutical marketing and management. 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.

AHP Steps

1. Define an unstructured problem and determine the overall goal. According to Simon (1960), the methodology of decision-making process encompasses identifying the problem, generating and evaluating alternatives, designing, and obtaining actionable intelligence. The overall goal of the focal pharmaceutical firm is at the first level of the hierarchy, shown in Figure 1.
2. Build the hierarchy from the top through the intermediate levels (criteria on which subsequent levels depend on) to the lowest level that usually contains the list of alternatives.
3. Construct a set of pair-wise comparison matrices for each of the lower levels. The pair-wise comparison is made such that the attribute in row i ($i = 1, 2, 3, 4 \dots n$) is ranked relative to each of the attributes represented by n columns. The pair-wise comparisons are done in terms of which element dominates another (i.e. based on the relative importance of each elements). These judgments are 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 .

Figure 1. Hierarchy Structure of Impact of Social Media on PRM Tactics



Establishment of Pairwise Comparison Matrix A

Assuming $C_1, C_2, C_3, \dots C_n$ 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 2 lists the definition of 9-point scale. Larger number assigned to the pairwise comparisons means larger differences between criteria levels. According to Saaty, 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 pairwise comparisons are accomplished in terms of which element dominates or influences the order.

Table 1. The Pair-wise Comparison Scale (Saaty, 1980)

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

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

$$A=[a_{ij}] = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{bmatrix} = w_i/w_j = \begin{bmatrix} w_1/w_2 & w_1/w_2 & \dots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \dots & w_2/w_n \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ w_n/w_1 & w_n/w_2 & \dots & w_n/w_n \end{bmatrix} \tag{1}$$

- 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 $(a_{ij}) < 1$
- $(a_{ij}) = 1/a_{ji}, \quad (i, j = 1, 2, 3, \dots, n), a_{ij} \neq 0.$

Where matrix *A* represents a reciprocal matrix, a_{ij} is the inverse of the entry a_{ji} 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 $C_1, C_2, C_3, \dots, C_n$ a set of numerical weights $W_1, W_2, W_3, \dots, W_n$, 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 $i, j = 1, 2, 3, \dots, n$).

Eigenvalue and Eigenvector

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

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

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

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

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 $a_{ij} * a_{jk} = a_{ik} \forall_{i,j,k}$ (for all $i, j, \text{ and } k$). 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):

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

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

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

Where RI represents average consistency index over a number of random entries of same order reciprocal matrices shown in Table 1. 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.

Table 2. 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

Calculation of Overall Priorities of Alternatives

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,

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

Where S_i is the composite score for the i^{th} alternative social media channels, p_{ij} is the score of the i^{th} alternative social media channels with respect to the j^{th} pharmaceutical relationship marketing criterion, and w_j is the priority weight of the j^{th} pharmaceutical relationship marketing criterion in the second level.

THE CASE STUDY, 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. According to Oke and Gopalakrishnan (2009), a case study is also relevant “where existing knowledge is limited because it generates in-depth contextual information which may result in a superior level of understanding.”

The data collection was between September 2010 and February 2011. A survey questionnaire consistent with literature and the research objectives were developed and pretested. Essentially, we used a survey questionnaire to gather relational data to assess the order of importance of the pharmaceutical relationship marketing tactics and social media channels. 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 according to Saaty’s 1-9 scale. We then administered the questionnaire to a group of pharmaceutical marketing managers within a pharmaceutical firm in the U.S to determine the order of importance of relationship marketing criteria. The pharmaceutical relationship marketing 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 2. 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 3. 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. 1. Total the elements in each column in (Table 3) and then divide each element of the matrix by its column total in (Table 3). 2. Synthesize the pair-wise comparison matrix in (Table 3). 3. Determine the priority vector for each supply chain risk factor. 4. Determine the consistency ratio. 5. Determine λ_{max} . 6. Determine the consistency index (CI). 7. Choose an appropriate value of the random consistency ratio from

(Table 2). 8. Evaluate the consistency of the pair-wise comparison matrix to check whether the comparisons are consistent or not.

Table 3. 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

Synthesizing the Results

Figures 2a and 2b 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 channel under the corresponding objective. As depicted in Figure 3, 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.

Figure 2a. Normalized Pair-wise Rating of PRM Tactics (Objectives or Criteria)

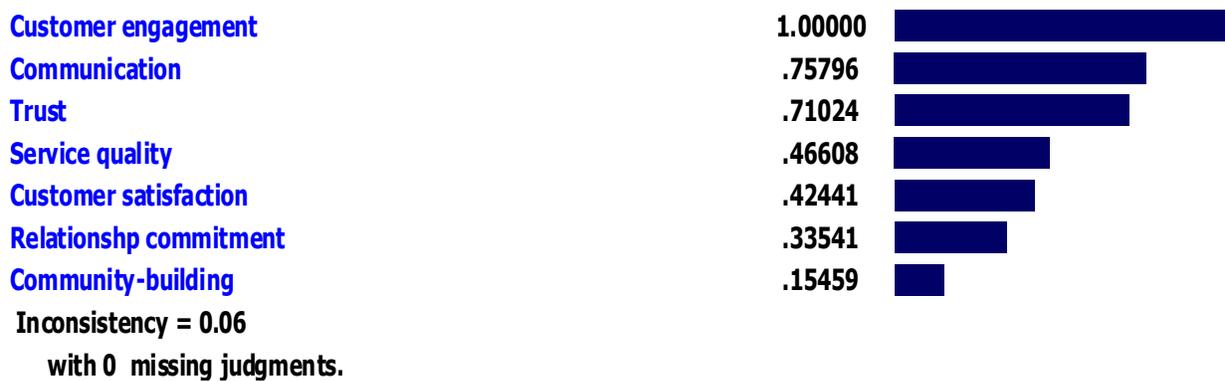


Figure 2b. Normalized Pair-wise Rating of social media channel alternatives

Overall Inconsistency = .06

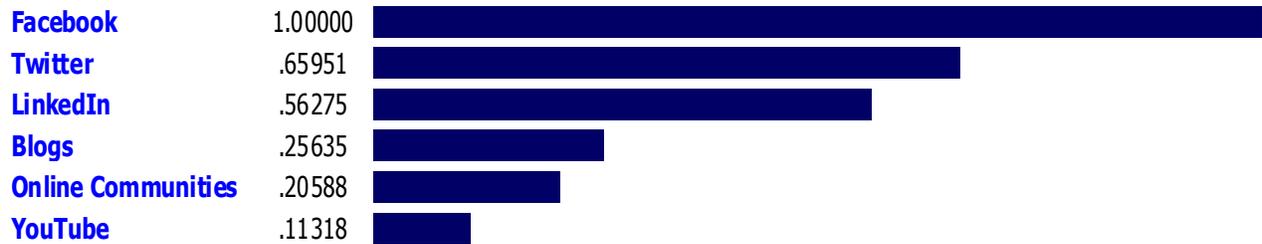


Figure 3. Synthesis of Social Media Channels with respect to Goal

Overall Inconsistency = .06

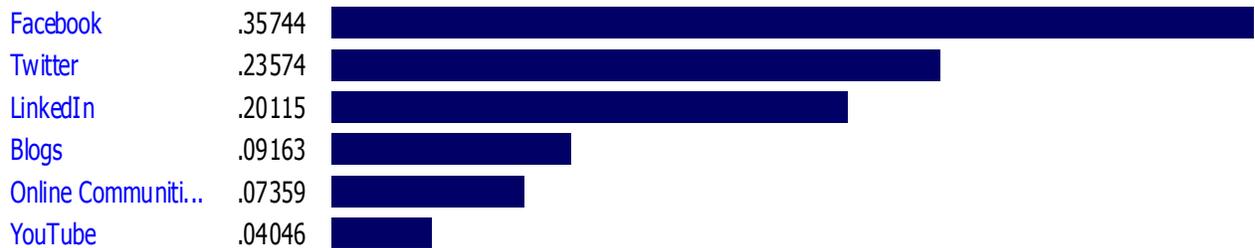


Table 3 depicts the detailed synthesis of PRM tactics and the associated social media channels. Facebook is shown to be more important for each of the PRM tactics, followed by Twitter.

Figure 4 reports on the priority scores associated with the major pharmaceutical relationship marketing 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.

Table 3. Detailed Synthesis of PRM Tactics and Social Media Channels

Level 1	Alts	Prt
Trust (L: .18454)	Facebook	.06596
	YouTube	.00683
	Twitter	.05588
	Lin kedIn	.05114
	Blogs	.01636
	Online Co...	.01452
Relationship commitment (L: .08715)	Facebook	.03115
	YouTube	.00244
	Twitter	.02147
	Lin kedIn	.01875
	Blogs	.00572
	Online Co...	.00404
Communication (L: .19694)	Facebook	.07039
	YouTube	.00836
	Twitter	.03991
	Lin kedIn	.03150
	Blogs	.01476
	Online Co...	.01196
Customer satisfaction (L: .11027)	Facebook	.03942
	YouTube	.00491
	Twitter	.02110
	Lin kedIn	.01433
	Blogs	.00763
	Online Co...	.00607
Community-building (L: .04017)	Facebook	.01436
	YouTube	.00149
	Twitter	.00594
	Lin kedIn	.00642
	Blogs	.00253
	Online Co...	.00266
Service quality (L: .12110)	Facebook	.04329
	YouTube	.00531
	Twitter	.02534
	Lin kedIn	.02261
	Blogs	.01554
	Online Co...	.01301
Customer engagement (L: .25983)	Facebook	.09287
	YouTube	.01112
	Twitter	.06610
	Lin kedIn	.05641
	Blogs	.02909
	Online Co...	.02132

Figure 4. Priorities with respect to PRM and Social Media Channels

- Goal: Sensitivity Analysis of Impact of Social Media on Pharma RM
- Trust (L: .18454)
- Relationship commitment (L: .08715)
- Communication (L: .19694)
- Customer satisfaction (L: .11027)
- Community-building (L: .04017)
- Service quality (L: .12110)
- Customer engagement (L: .25983)

Alternatives

Facebook	.36146
YouTube	.04099
Twitter	.23436
LinkedIn	.19885
Blogs	.09111
Online Communities	.07322

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 (1994) 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 might be 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 pharmaceutical relationship marketing 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 5 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. Chang et al (2007) posit that "... sensitivity analysis can be performed based on scenarios that reflect alternative future developments or different views on the relative importance of the criteria."

The original performance and dynamic sensitivity analysis are reported in Figures 5 and 6, respectively. Although both have the original ranking of social media channel options (Facebook > Twitter > LinkedIn > Blogs > Online communities > Youtube), performance SA is considered. Figures 7- 8 report on the performance SA of customer engagement. Increasing the customer engagement priority from 26% to 36% in Figure 7 and conversely decreasing same from 26% to 16.4% in figure 8 did not change the choice or ranking of the social media channel options. Thus, the original ranking after the small changes remained stable (Facebook > Twitter > LinkedIn > Blogs > Online communities > Youtube). For Figures 9-10 that report on the performance SA of communication, whether increasing the priority of communication from 19.7% to 29.8% (Figure 9) or decreasing it from 19.7% to 9.7% (Figure 10) the rankings remained stable or robust (Facebook > Twitter > LinkedIn > Blogs > Online communities > Youtube), respectively.

With respect to trust reported in Figures 11-12, increasing the priority of trust from 18.5 to 28.6 or decreasing it from 18.5% to 8.5%, the ranking remained insensitive to the perturbations (Facebook > Twitter > LinkedIn > 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]."

Figure 5. Original of Performance SA

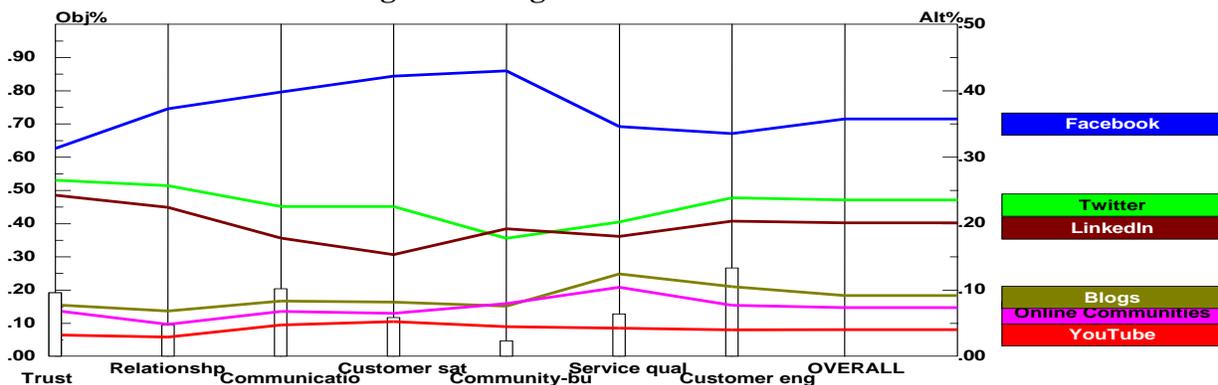


Figure 6. Original of Dynamic SA

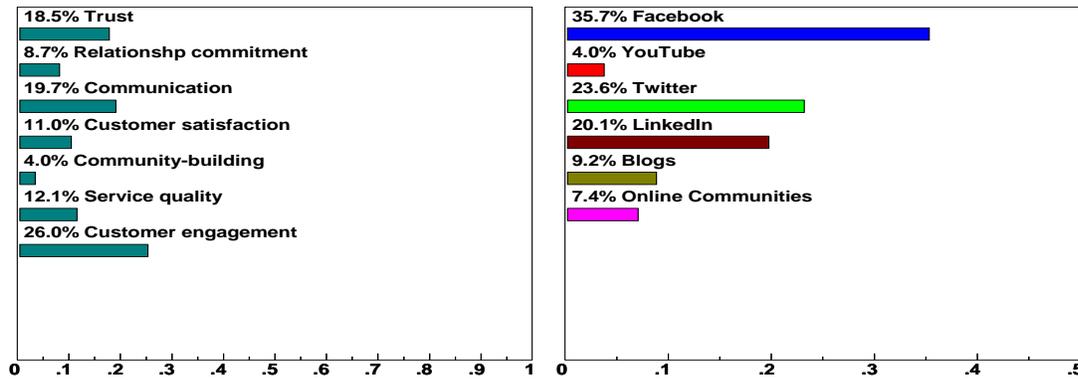


Figure 7. Performance SA of Customer Engagement- Increase from 26% to 36%

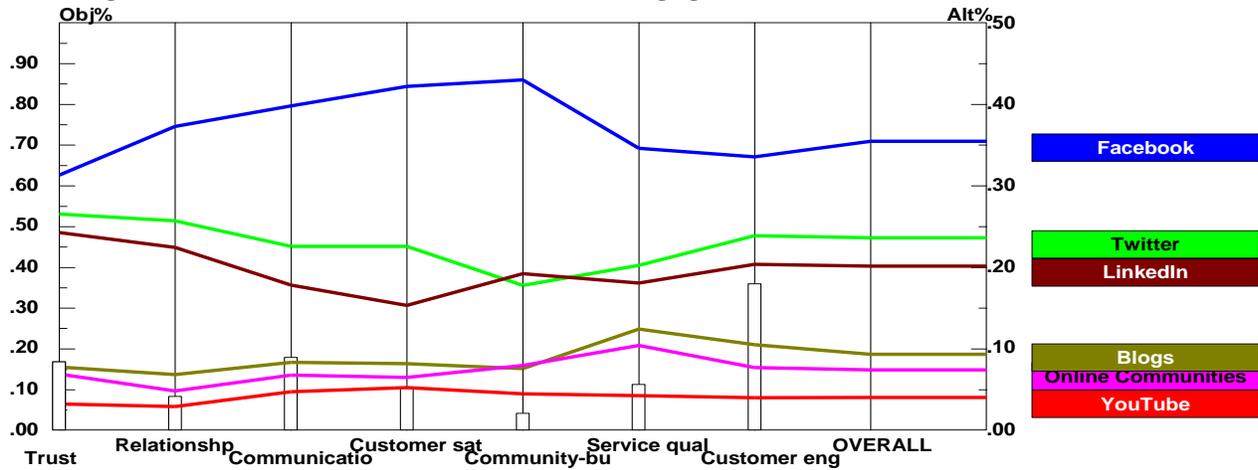


Figure 8. Performance SA of Customer Engagement- Decrease from 26% to 16.4%

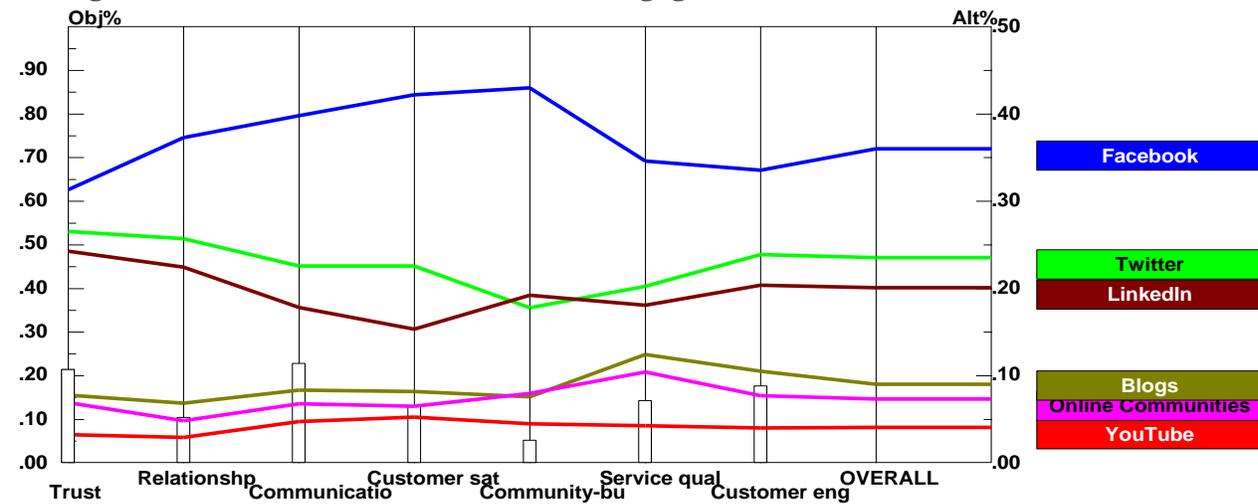


Figure 9. Performance SA of Communication- Increase from 19.7% to 29.8%

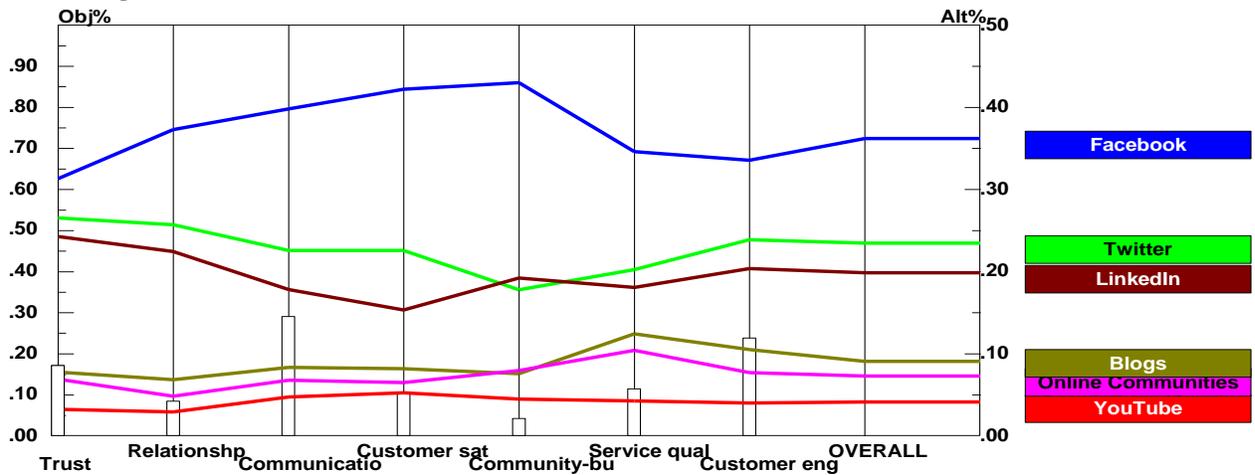


Figure 10. Performance SA of Communication- Decrease from 19.7% to 9.7%

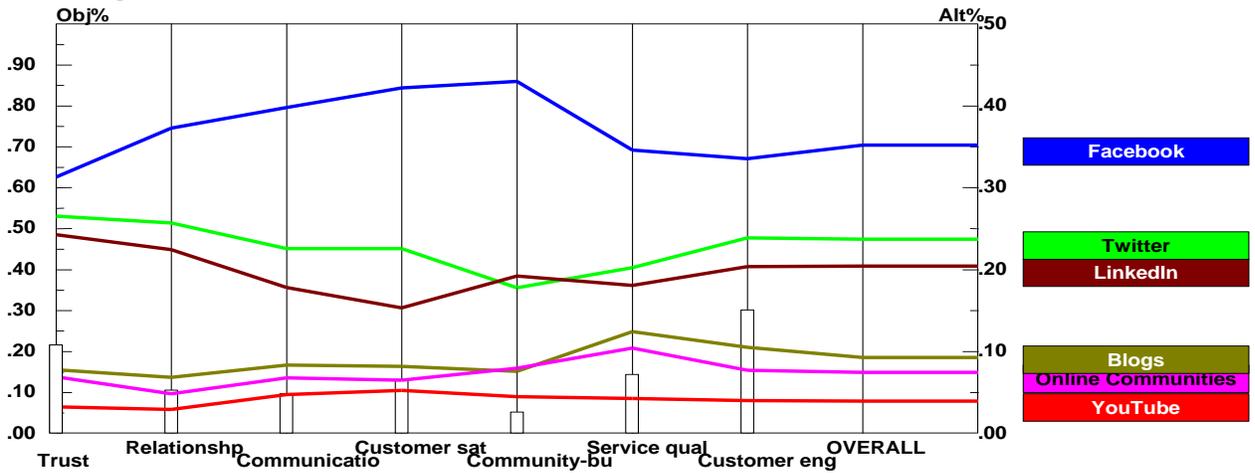


Figure 11. Performance SA of Trust- Increase from 18.5% to 28.6%

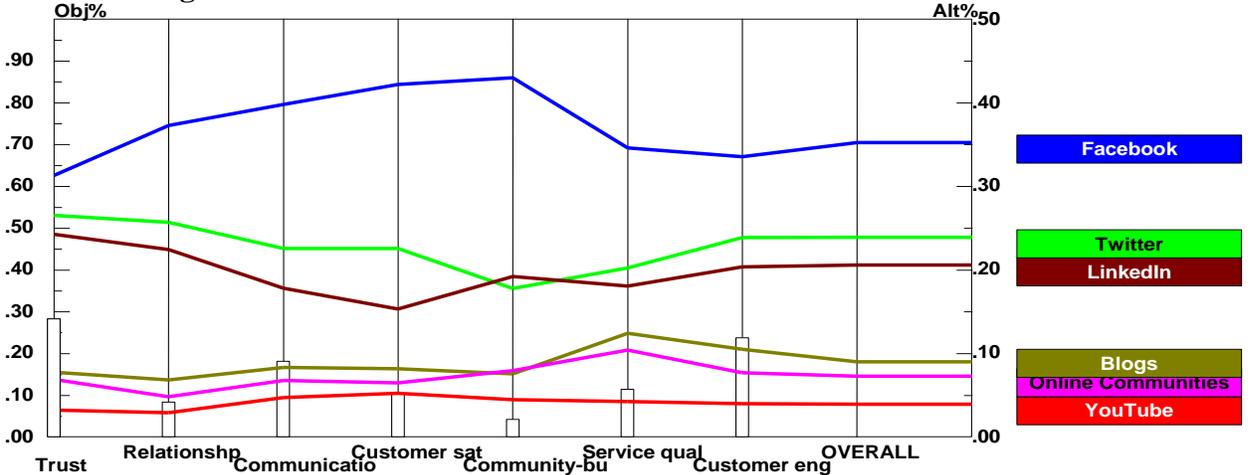
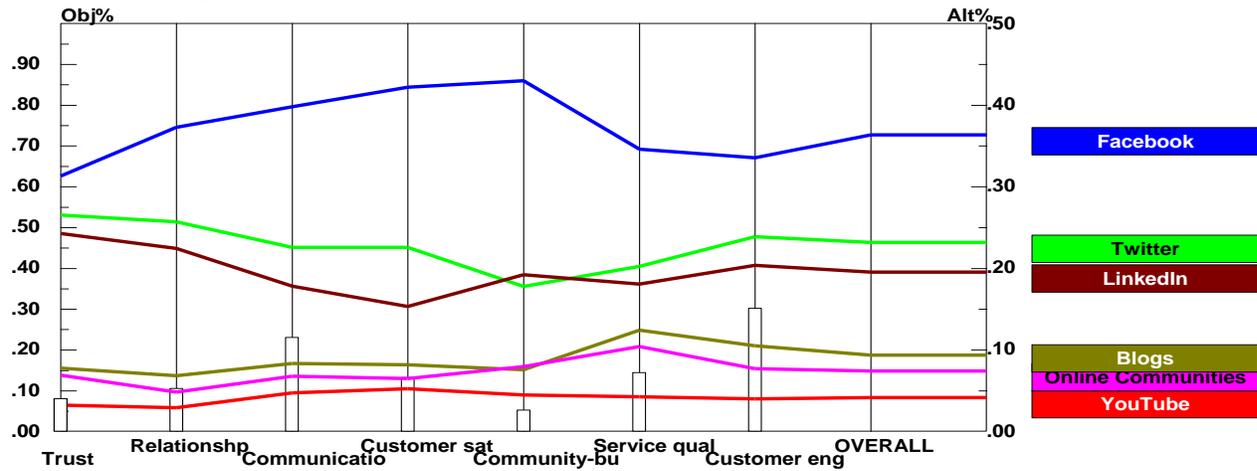


Figure 12. Performance SA of Trust- Decrease from 18.5% to 8.5%



CONCLUSIONS AND MANAGERIAL IMPLICATIONS

The rise in social media presents enormous challenges and opportunities for the pharmaceutical industry marketers. Social media is poised to transform pharmaceutical relationship marketing and information sharing. Social media can be an important tool for pharmaceutical relationship marketing in terms of consumer engagement, monitoring and analyzing consumer generated-content, building and changing brand perception. Given the fact that consumers are increasingly being empowered and losing trust in the healthcare systems, one of the best ways to reach or connect to them is to deploy relationship marketing-based social media. There is “nowhere in marketing is trust more important than in [pharmaceutical] and healthcare” (Andrews, n. d). Social media platform tools will ultimately reshape how the pharmaceutical industry conducts its business. 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 attract and retain customers. More recently, social media platforms are slowly and/or consciously been embraced by C-level executives in the pharmaceutical marketing arena. Social media can be used as a tool to listen to, and engage customers. It can also be used as a way 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 is active on the internet with specific services and contact that firm when there is a need. Consumers in the 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 identify themselves.

Leveraging social media can enable pharmaceutical marketers to target, define and engage consumers better on a more personal level. Also, pharmaceutical marketers must consider implementing social media platforms as they have become key source for consumers and professionals regarding healthcare information. Evidence suggests healthcare consumers are widely using social media to research healthcare 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 YouTube 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” (<http://www.healthcareos.com/250/health-care-consumer-social-media-statistics/>). An analysis approach using the AHP reveals customer engagement as the most important relationship marketing factors relative to other relationship marketing criteria. We performed a sensitivity analysis to assess the impact of social media channels on pharmaceutical relationship marketing.

References available upon request from Chris I. Enyinda at christian@cuu.ac.ae