The impact of Social Media on Healthcare

Completed Research Paper

Hee-Sook Yoo
Sungkyunkwan University
School of Business, 25-2
Sungkyunkwan-ro, Jongno-gu Seoul
110-745, Republic of Korea
hisookyoo@gmail.com

Gee-Woo Bock
Sungkyunkwan University
School of Business, 25-2
Sungkyunkwan-ro, Jongno-gu Seoul
110-745, Republic of Korea
gwbock@skku.edu

Abstract

In recent years, with appearance of social media era, the social media have been used in various ways in healthcare areas. Some use them as a tool for disease treatments others use them as a health information source. The more people get information and psychological supports from social media, the more healthcare service organizations provide health information on the social media. In such trends, little empirical research has systematically examined the causal relationship between the social media environment and the impact of social media on health outcome. To fill this gap, this study investigated how social media influence individual user's health outcome using the SPO framework, especially focusing on their self-management outcome. The result shows that Health Information Social Media (HISM) significantly influences one's psychological and behavioral health outcome.

Keywords: Health Information Social Media, Hospital Social Media, SPO Framework

Introduction

With advances in medical science and technology, a considerable amount of diseases that are preventable and treatable have become chronic and moreover, the population is aging. Continuous health management becomes every day and everyone's work. In this vein, in recent year, people have a great interest in a healthy long life. And many of them are using the Internet to find health information on a regular basis (e.g., WebMD) (Fox et al. 2012; Lefebvre et al. 2013), and try to self-manage their health. Apparently, the appearance of social media such as Twitter, Facebook and blog, has also changed the way of doctor-patient communication, and made a new healthcare experience (Hawn 2009; Lefebvre et al. 2013). According to research on online healthcare, people get psychological support as well as information from the social media (Ryan 2010). In such trends, some leading healthcare service providers, such as Mayo Clinic and Cleveland Clinic in the US, and Samsung Medical Center in Korea, are deploying all the available means in the social media to provide various types of health information and to manage their customer relationships. In fact, people prefer the healthcare services by "academic medical centers/teaching hospitals" and "doctor/physician group" on the Internet due to high credibility to them (Anderson 2012; Keckley 2012).

Therefore, the intersection of healthcare and social media represents a promising space for future IS research with increasing importance for the public, and prior research suggests that conditions and effective design rules for healthcare service through the social media should be studied further (Fichman et al. 2011). Christensen et al. (2009) who wrote "Disruptive Innovation" in the healthcare service also argued that online community such as "Patientlikeme.com" would be one of the effective business models to the healthcare services which are dealing diseases needed continuous prevention and management.
Despite this growing importance and criticality of the topic, the scope of research in this field so far is very limited. On the one hand, researchers in the social media area just apply existing findings in the social media research to the healthcare context (Berkman 2000; Fichman et al. 2011), on the other hand, in recent medical research, most of studies are examining fragmentarily the impact of popular social media such as Facebook and Twitter, as a medical intervention, focused on the treatment of chronic diseases such as obesity and diabetes, which need continuous attention (Cavallo et al. 2012; Napolitano et al. 2013; Shaw et al. 2011). Hence, it is urgent to investigate the impact of the social media, especially the social media which provides health information - as a mean of managing a person’s health with a more solid framework and the integrated view taking more comprehensive set of factors into consideration: the capability of the social media itself, the resources in it, and those who offering the resources in the social media environment.

To obtain a comprehensive understanding of this issue, this study aims to examine how social media, which provide health information (referred to as a health information social media (HISM) in this study), affects the processes and the results of care for self-management based on the SPO (Structure-Process-Outcome) framework. This is a concept that has been widely adopted in medical research when the quality of healthcare is evaluated. Specifically, this study analyzes the social media being operated by general hospitals, which are representative and credible healthcare service organizations in common. In order to identify the influence of HISM on one’s health management based on a concept of self-management and SPO framework, this study develops a research model along with the research hypotheses and conducts the survey. In addition, this study also probes what kinds of service resources HISM offers to users by applying the content analysis on the messages in HISM.

To accomplish the above mentioned objectives, this study proposes the following research questions:

- What kind of factors, which influence on one’s health management, does HISM have??
- How does occurs the HISM influence on one’s health management?

**Literature Review and Theoretical Framework**

**S-P-O (Structure-Process-Outcome) Framework**

Donabedian (1966, 1987) first proposed a framework that can measure the quality of healthcare by evaluating its structure, process and outcome. Such concept has been most widely used as a basis of defining quality in many studies (Campbell et al. 2000; James 1989; Legido-Quigley 2008; Salzer et al. 1997; Shaw and Kalo 2002). To measure healthcare quality, the SPO Framework evaluates the healthcare service environment (termed ‘structure’), service execution (termed ‘process’) and service outcome (termed ‘outcome’). Donabedian (1987) argued that “good structure increases the likelihood of good process, and good process increases the likelihood of good outcome.” He has also stated that care quality is assessed by parts of s-p-o in order to capture the given aspect of the quality; however, the combined strategy can be of help to obtain a more comprehensive assessment (Donabedian 2002). For this reason, the SPO (Structure-Process-Outcome) framework will be used to understand a comprehensive impact on self-management among HISM users. However, because the SPO framework has been used for healthcare in the physical environment, it is necessary to tailor it to the context of this study, which is the healthcare service in the social media environment. The adjustments made are explained in detail as follows.

**Outcome**

Outcome in healthcare refers to the result of care, which is a change in health status and an antecedent of future health status. Although typical outcomes in healthcare are morbidity, recovery and restoration of physical functions (Donabedian, 2005), they are not limited concepts regarding the bio-medical health status. It includes intermediate outcomes, such as changes in one’s attitudes, knowledge and behaviors related to health. In prior research, self-management outcomes are mostly evaluated by performing behaviors related to self-management and the predictor of self-management behaviors, such as PAM (Patient Activation Measure). In many studies, PAM is the measure of psychometric properties for self-management outcomes, such as knowledge, skills and confidence for the self-management of one’s health.
or chronic condition (Fowles et al. 2009; Lorig et al. 2014; Lorig et al. 2009). In PAM, “Activation” refers to having the capability and the willingness to take on the role of managing one’s own health (Hibbard et al. 2008). Having a sense of control over one’s health as well as the knowledge, skills, beliefs and behaviors that a patient needs in order to manage one’s health are critical elements for better health conditions. Several studies indicated that being engaged and activated to one’s own care – carrying out the needed behaviors - is linked to better health outcomes (Bodenheimer et al. 2002; Fischer et al. 1999; Von Korff et al. 1997; Von Korff et al. 1998). Thus, to assess the self-management outcome comprehensively, this study adopts both PAM and self-management behaviors as the dependent variables.

**Process**

Process in healthcare refers to what is done between the healthcare provider and a healthcare recipient. It is defined as the actual delivery and receipt of care (Campbell et al. 2000), that is, care itself. Prior literature suggested two aspects in the process of care: (1) technical process of care and (2) interpersonal process of care.

The technical process of care, sometimes simply referred to as “clinical care,” refers to the medical knowledge execution. When a healthcare provider makes an appropriate decision regarding the care and skillfully executes the plan (Blumenthal 1996), it constitutes high technical care quality. In contrast, interpersonal care has been viewed as the social and psychological interactions between the healthcare provider and the healthcare recipient. This has been operationalized as communication (Angst et al. 2012; Blumenthal 1996), sympathy (Blumenthal 1996) and responsiveness (Carmel and Glick 1996). Sherbourne and Stewart (1991) indicated that the interpersonal social relationship associated with care refers to social support.

If we apply this to the context of HIM, the process can be defined as activities in the social media among users, which has two aspects – technical (clinical) and inter-personal (social) support. The technical support primarily focus on the specialized advices on one’s health condition, such as prognosis and exercise/diet plan for one’s health status. In this study, we use the term “condition-specific support” for such a technical process, and define it as “the degree to which a user perceive that (s)he has received the potential treatment options specialized on his (or her) personal health condition – such as prognosis and health management action plan - in the HISM.” With regard to the interpersonal (social) support, users in the HISM can build a relationship by sharing the emotion they have through comments and postings. Sherbourne et al. (1991) assessed social support in a medical study as measuring the degree to which interpersonal relationships serve particular functions, such as emotional support, appraisal support, informational support and social companionship. In line with this context, this research uses the term “inter-personal support” for social supports in HISM, and defines it as “the degree to which a user perceive that (s)he has received social support in the HISM.

**Structure**

In the healthcare context, the structure refers to the setting in which the processes and the outcomes occur (Donabedian 1987). Prior literature considered three resources as the structure in common: (1) Human resources related to the healthcare service provider (Campbell et al. 2000; Donabedian 1980; Donabedian 2002; Legido-Quigley 2008), (2) Intellectual resources related to knowledge for care (Campbell et al. 2000; Donabedian 1980; Donabedian 2002; Legido-Quigley 2008), and (3) Material resources related to healthcare service facilities to which the knowledge is delivered (Campbell et al. 2000; Donabedian 1980; Donabedian 2002; Legido-Quigley 2008; Mainz 2003).

In the physical environment, the healthcare service, medical knowledge execution, is delivered by healthcare professionals using medical facilities. From the HISM view, the structure can be defined as the social media conditions under which activities of exchanging information occur. In this vein, in the HISM, the service, offering information, is delivered by the information provider using social media. In this context, corresponding to these three resources of structure in healthcare service, this study draws three resources – (1) Information provider (human resource), (2) Information (intellectual resource) and (3) Facilities to deliver information (material resource) as components of the structure in a HISM. Subsequently, this study draws variables in accordance with each resource of structure.
First, with respect to human resources in a HISM, source credibility is considered. Source credibility refers to the attributes of the communicator, including expertise, trustworthiness, attractiveness and power (Belch and Belch 1987). Eysenbach et al. (2002) and Hu and Sundar (2010) identified that one of the major elements of health information quality on the Internet is source credibility, and the credibility is the precedence over processing the information. Thus, this study defines “source credibility” as “the extent to which the user perceived that the information provider has the expertise and the trustworthiness to fulfill his (or her) needs,” and adopts it as one of the variables for measuring the attributes of human resources in the HISM.

Second, with respect to intellectual resources in HISM, the content type of message in HISM is considered. In the physical healthcare setting, the methods of care are driven by knowledge, know-how and attitudes, which the care providers have. In the social media setting, the methods of providing information are driven by messages, such as postings and comments. According to prior research, there are two types of health information – information based on experiential knowledge and that based on medical knowledge – and Emotional Appeals in the online environment (Bradbury 2007; Hartzler and Pratt 2011). However, in the preliminary observation on HISM, we found that many postings and comments did not fall into one of these types. For this reason, to make it clear, this study conducted a content analysis on messages in HISM. As a result of the content analysis, this study identifies that messages (postings and comments) in HISM provide four types of content – Knowledge-Based Health Information (KBHI), Experience-Based Health Information (EBHI), Emotional Appeals (EA) and Non-Health Topic (NHT). Accordingly, this study adopts these four types of message content as variables for measuring an attribute of information in the HISM; each variable is defined as below

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge-Based Health Information</td>
<td>The degree to which a user perceived that (s)he can get the posting/comment dealing with health-related information based upon existing medical knowledge or facts in the HISM.</td>
</tr>
<tr>
<td>Experience-Based Health Information</td>
<td>The degree to which a user perceived that (s)he can get the posting/comment dealing with health-related information based upon one’s personal experience in the HISM.</td>
</tr>
<tr>
<td>Emotional Appeals</td>
<td>The degree to which a user perceived that (s)he can get the posting/comment showing one’s emotional status in the HISM.</td>
</tr>
<tr>
<td>Non-Health Topic</td>
<td>The degree to which a user perceived that (s)he can get the posting/comment dealing with non-health-related topic information in the HISM.</td>
</tr>
</tbody>
</table>

Table1. Intellectual Resource in HISM

Third, with respect to the material resources in HISM, the media capability, which supports both information processing and transmission, is considered. Media capability is referred as the potential structures provided by a medium that influences the manner in which individuals can transmit and process information (Dennis et al. 2008; Rice 1987; Rice and Steinfeld 1994). Prior research (Dennis et al. 2008) suggested five primary media capabilities to support information transmission and information

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1 To identify an intellectual resource in HISM, this study collected data from two Facebook accounts that are officially managed by two large corporate hospitals in Korea (Samsung Medical Center and Asan Medical Center), and investigated the content type of the messages (postings and comments). Using NVivo 10 software program, all postings and individual comments responding to them in the two accounts were collected on July 25, 2013. The overlapped period of intense activity among the two accounts was from November 2012 to July 2013. During the nine months, 562 postings and 7,156 comments were uploaded. Among them, we randomly selected 30 percent of the uploaded 562 postings as a sample. Finally, 186 postings and 629 comments (total 815 cases) responding to the 186 postings were selected as a sample for the content analysis in this research. The content analysis of messages in HISM was executed considering the main steps for human coding, as suggested by Neuendorf (2002). To characterize the type of message content in the HISM, this study used a grounded approach in order to thematize as well as code a sample of 186 postings and 629 comments downloaded from the two Facebook accounts. First, the selected postings and comments were categorized as “Health-related” or “Non-health related.” Then, we proceeded to analyze the affinity of the emerging themes from each posting and comment in order to create a set of coding categories. Subsequently, this study drew four content categories and its twelve sub categories in order to analyze the content of messages in the HISM. Krippendorff’s alpha was used to determine the inter-reliability, which can be used regardless of the number of observers, levels of measurement, sample sizes and presence or absence of the missing data in general (Hayes and Krippendorff 2007; Neuendorf 2002). The coding result of intercoder reliability was calculated using the software ReCal (Freelon 2010); krippendorff's alpha for the analysis in this study is 0.8099. If necessary, details of the content analysis can be submitted additionally.
processing. Transmission velocity (the speed at which a medium can deliver a message to the intended recipients), parallelism (the number of simultaneous transmissions that can effectively take place) and visual sets (the number of ways in which a medium allows information to be encoded for communication) are important in deriving a medium’s ability to support information transmission. Rehearsability (the extent to which the media enables the sender to rehearse or fine tune a message during encoding, before sending) and reprocessability (the extent to which the medium enables a message to be re-examined or processed again, during decoding) are important for information processing. Social media offers functions that provide help to exchange information, such as posting and comment, variety of visual symbol and posting share. Hence, this study adopts the media capability to measure an attribute of material resources in the HISM. It can be defined as “the extent to which a user perceives the HISM that makes available users to transmit and process information.”

**Research Model and Hypotheses**

**Research Model**

To verify the relationship between Structure-Process-Outcome in HISM, the developed research model is suggested, as depicted below in Figure 1. Based on the research model, as depicted in the below diagram, this study identifies the impact of HISM on one’s health management, the so-called self-management, and investigates the influence factors of the HISM in terms of healthcare service.

![Figure 1. Research Model](image-url)
Research Hypotheses

Outcome: Social Media Impact on Self-Management

Activation refers to knowledge, skill and confidence for managing one’s health and healthcare. Hibbard et al. (2004) developed a comprehensive measure for activation, referred to as PAM (Patient Activation Measure). According to prior research findings, PAM predicts healthy behaviors, such as appropriate medicine intake, diet, exercise and partaking in relaxation. Hibbard et al. (2005) identified that if activation is increased, a variety of improved health behaviors follow. Mosen et al. (2007) examined PAM’s association with self-management outcome among adults; further, they identified that patients with high PAM scores were significantly more likely to perform self-management behaviors compared to patients with low PAM scores. Fowles et al. (2009) also found that PAM scores were positively related to engaging in some healthy behaviors, including exercise, eating breakfast, eating fruits and vegetables. Therefore, we can expect that the activation of HISM users have a positive impact on health behavior that is related to self-management.

H1: Activation positively influences Health Behavior.

Process and Its Relationship to Outcome

Condition-specific supports in this research are primarily about receiving personalized health options related to one’s health condition, such as prognosis and health management action plan, through HISM. Diagnosis that is based on personal health conditions draws an appropriate decision about one’s care; moreover, it can lead successful health outcome. Positive health outcome originates from the precision of diagnosis to one’s health condition. Individual assessment (with goal setting, action planning and problem solving) is a critical first step to draw self-management efforts necessary to manage the health problem (Novak et al. 2013). When the needs and problems of people are understood, many possible solutions, which are easily acceptable to them, are generated (Lorig and Homan 2003). Providing acceptable solutions for specialized one’s condition allows people more available to be knowledgeable and confident to what they should do. Therefore, we can expect that condition-specific supports have a positive impact on the activation of HISM users.

H2: Condition-specific support positively influences Activation.

Inter-personal supports in this research are primarily about receiving social support. In the content analysis, we found that users in the HISM build a relationship exchanging information and sharing emotion they have through the comments and postings. In prior research (Uchino 2006), social support is referred to as the interpersonal social relationship in care; further, it is identified that there is a positive relationship between social support and psychological, behavioral and physical health outcomes. Ievers-Landis et al. (2003) identified that social support from a family significantly predicts knowledge and confidence to perform health-related tasks. Sherbourne and Stewart (1991) elaborated that the reassurance and emotional support provided in a close interpersonal context may foster a sense of control over the situation. Activation consists of knowledge, confidence to perform health behaviors, and a sense of control over the situation. Therefore, we can also expect that interpersonal support, which refers to social support, has a positive impact on the activation of social media users.

H3: Inter-personal Support positively influences Activation.

Structure and Its Relationship to Process

Human Resources and Its Relationship to Process

This study adopts source credibility as a human resource in social media. Source credibility refers to the ability of a spokesperson to favorably or unfavorably affect a receiver’s acceptance of the information (Dholakia and Sternthal 1977). It is measured by both the expertise and trustworthiness of the information provider (Hu and Sundar 2010; Tormala and Petty 2004). Ohanian (1990) identified that source credibility favorably enhances the believability or validity of a spokesperson’s message, as perceived by the receiver of the message. Wright (2002) identified that perceptions of the credibility of another group member affects the participant’s perceptions of emotional support, which is part of social...
support, from the messages given by the source. In these regard, we assumed that when people have higher source credibility to the information provider and their believability become higher, they perceive more support from the information. Therefore, we can expect that source credibility has an impact on users' perception of condition-specific support and interpersonal support.

H4-1: Source Credibility positively influences Condition-Specific Support.

H4-2: Source Credibility positively influences Inter-personal Support.

**Intellectual Resources and Its Relationship to Process**

Intellectual resources are related to knowledge, information and know-how for care. In social media, these factors can be conveyed by the information or content of messages, such as postings and comments. By using the postings and comments in HISM, social media account owner and users communicate and share the health information they have, the health experience they faced, emotions they felt and non-health topics, such as weather forecasting or news.

In the content analysis of the HISM, we discovered four types of message content in social media – Knowledge-Based Health Information, Experience-Based Health Information, Emotional Appeals and Non-Health Topic. Knowledge-Based Health Information refers to health-related information based upon existing objective medical knowledge or facts. Experience-Based Health Information refers to health-related information based on one's personal experience. Emotional Appeals are statements that convey one's emotional status. Non-Health Topic refers to non-health-related information or chats. Prior research (Hartzler and Pratt 2011) identified that clinicians provide medical topic information, which could stimulate an improved understanding of the medical domain or strategies to better fit one's life; furthermore, patients commonly share their expertise regarding personal health experience, which involves the provision of information and advice used to guide one's personal health management.

In the content analysis, we found that when one asked something about his (or her) health condition in HISM, the account owner or other users provided some comments on the question with the medical knowledge and health experience they have. More specifically, with Knowledge-Based Health Information or Experience-Based Health Information, HISM account owner and its users may offer condition-specific supports to HISM users. Therefore, we can expect that Knowledge-Based Health Information and Experience-Based Health Information have an impact on users' perception of condition-specific support and interpersonal support.

H5-1: Knowledge-Based Health Information positively influences Condition-Specific Support.

H6-1: Experience-Based Health Information positively influences Condition-Specific Support.

In addition, even when one did not ask, regardless of the health relatedness, a number of information is uploaded and people in HISM exchange additional information or share their emotions using postings and comments. When information in postings and comments are uploaded, people respond to them with "like" function or comments in order to provide additional information. When one appeals his (or her) emotion on postings and comments, people also respond to them with the "like" function or offer comments with encouragement or compliment. That is to say, with emotional messages, Knowledge-Based Health Information, Experience-Based Health Information and Non-Health Topic, postings and comments may support the interpersonal relationships in HISM, which serve particular functions, such as emotional support, appraisal support, informational support and social companionship. Therefore, we can expect that Knowledge-Based Health Information, Experience-Based Health Information, Emotional Appeals and Non-Health Topic have an impact on users' perception of condition-specific support and interpersonal support.

H5-2: Knowledge-Based Health Information positively influences Inter-personal Support.

H6-2: Experience-Based Health Information positively influences Inter-personal Support.

H7: Emotional Appeals positively influences Inter-personal Support.

H8: Non-Health Topic positively influences Inter-personal Support.
Material Resources and Its Relationship to Process

Material resources refer to the service facilities for healthcare services. In this study, material resources in social media is regard as social media capability, which influences the manner that social media users can transmit and process information. According to Dennis and Reinicke (2004), depending on media capability, users’ interactions can either be easier or more difficult. Prior research on health information community for cancer patients, the physical ability of community for multiple people to respond to a message, increases the number of potential supporters and interactions (Wright 2002). That is, social media capability facilitates users’ interactions, and may increase the perception on supporting interactions in social media. As more interactions occur in the HISM, users may perceive more support. Therefore, we can expect that media capability has an impact on users’ perception of condition-specific support and interpersonal support.

H9-1: Media Capability positively influences Condition-Specific Support.
H9-2: Media Capability positively influences Inter-personal Support.

Data Collection and Analysis

Given that this study focused on identifying the influence of HISM and its procedure, it is important to probe the perceptions of those who use the HISM. Hence, we adopted a survey approach in order to examine our research model and hypotheses.

To increase the reliability of the survey measurement, multiple measurement items were adopted and developed for each variable. The operationalized definitions of the variable and its measure items are suggested in Table 2.

Measurement Development

To empirically test the research hypotheses, all variables in the research model were evaluated by perceptual measures. In the questionnaire, most perceptual measures used multiple-items to improve both the reliability and validity. Variables and its related measurement items that have already been used and validated in other research were adopted whenever possible. However, due to the lack of empirical investigation into the subject of HISM, the measures were mostly operationalized or modified from the theoretical statements in the relevant literature.

In addition, the measurement items of 5 independent variables concerning the structure, and the measurement items of 1 mediate variable concerning the process in the social media were newly developed – Knowledge-Based Health Information, Experience-Based Health Information, Emotional Appeals, Non-Health Topic, media capability and condition-specific support. These were developed by operationalizing the existing theory and from the result of the content analysis of HISM. Table 2 presents the operational definitions of all research variables in this study along with their references.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variable</th>
<th>Definition</th>
<th>Items</th>
<th>Key Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Resource</td>
<td>Source Credibility</td>
<td>The extent to which the user perceived that the information provider has the expertise and the trustworthiness to fulfill his (or her) needs.</td>
<td>6</td>
<td>Ohanian, 1990; Cugelman, 2009</td>
</tr>
<tr>
<td>Intellectual Resource</td>
<td>Knowledge-Based Health Information</td>
<td>The degree to which the user perceived that (s)he can get the posting/comment dealing with health-related information based upon existing medical knowledge or facts in the HISM.</td>
<td>3</td>
<td>Newly Developed</td>
</tr>
<tr>
<td></td>
<td>Experience-Based Health Information</td>
<td>The degree to which the user perceived that (s)he can get the posting/comment dealing with health-related information based upon one’s personal experience in the HISM.</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Operational Definition of Variables

For the measurement items for source credibility, this study adopts and modifies Ohanian’s (1990) items measuring the perception of trustworthy and expertise to the information provider. To measure inter-personal support, this study adopts Ware Jr and Sherbourne’s (1992) MOS (Medical Outcome Study) social support survey items. Although the original MOS social support items has 20 items, this study modifies it applicable to the online environment. To measure activation, this study adopts Hibbard et al.’s (2004) short form PAM items, which includes 13 survey items. For measurement items for health behavior, the survey items in the self-management outcome study (Mosen et al. 2007) are adopted.

To measure Knowledge-Based Health Information, Experience-Based Health Information, Emotional Appeals, Non-Health Topic, media capability and condition-specific support, this study developed the measure items following Hinkin’s (1998) measure development process for use in the survey questionnaires. To establish the reliability and validity for the newly developed measure items, we conducted the rating task, as suggested by Schriesheim et al. (1993). Further, we detected no major problems, indicating that each variable possesses an adequate conceptual validity. Table 3 indicates the items measuring all of the research variables in this study along with their references.

Table 3. Measurement Items for Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Credibility</td>
<td>The informant who is providing information on social media seems: 1. Unqualified-Qualified 2. Not an expert-Expert 3. Unknowledgeable-Knowledgeable</td>
<td>5-point semantic deferential</td>
</tr>
<tr>
<td>Knowledge-Based Health Information</td>
<td>On the (____) social media, 1. I can get the postings/comments that have general health information (e.g., disease/symptom, nutrition/exercise explanation, prevention guide/cure method, etc.). 2. I can get the postings/comments that introduce healthcare services offered from healthcare organizations (e.g., Introduction of medical office, professional, medical facilities, etc.). 3. I can get the postings/comments that have one’s health opinion based on objective facts (e.g., “Smoking is not good for health”).</td>
<td>5-point Likert</td>
</tr>
</tbody>
</table>
| Experience-Based Health Information | On the (_____) social media,  
1. I can get the postings/comments that have one’s health experience (e.g., Diet experience, Hospital/doctor review, etc.).  
2. I can get the postings/comments that includes one’s battling disease/treatment process story.  
3. I can get the postings/comments that have one’s health opinion based on one’s subjective beliefs (e.g., “Diet is moderation”) | 5-point Likert |
| Emotional Appeals | On the (_____) social media,  
1. I can get the postings/comments that show positive emotional expressions (e.g., Respect, Affection, Compliment, Sympathy, etc.).  
2. I can get the postings/comments that convey negative emotional expressions (e.g., Skepticism, Anxiety, Complaint, etc.).  
3. I can get the postings/comments that encourage others. | 5-point Likert |
| Non-Health Topic | On the (_____) social media,  
1. I can get the postings/comments that talk about daily life.  
2. I can get the postings/comments that deal with non-health related topics, such as news, weather report, job opening, etc.  
3. I can get the postings/comments that have a small talk between (__) social media members. | 5-point Likert |
| Media Capability | When I use the (_____) social media…  
1. It has functions that allow other users and I to give and receive necessary information in real time (e.g., Message alarm).  
2. It allows me and other users to log-in and exchange a considerable amount of information at the same time.  
3. It has functions that allow other users and I to communicate with a variety of digital symbols, such as text, photos, video and maps.  
4. It has functions that allow other users and I to rehearse and confirm the sentences before uploading the messages.  
5. It has functions that allow other users and I to reexamine or process a past message again (e.g., Share, Retwit). | 5-point Likert |
| Condition-Specific Support | How often did you actually receive the following type of support from account owner on (_____) Social Media?  
1. I can get feedback that allows me to recognize the health problems I have.  
2. I can get recommendation considering the health condition I asked about, which provides the health goals to improve my health.  
3. I can get recommendation considering the health condition I asked about, which provides the action plans I need to perform in order to achieve my health goals.  
4. I can get advice on how to deal with a personal health problem I asked about. | 5-point Likert |
| Inter-personal Support | How often did you actually receive the following type of support from (__) Social Media account owner on (_____) Social Media?  
1. I feel love and affection from (__) Social Media account owner.  
2. (__) Social Media account owner embraces me.  
3. (__) Social Media account owner helps me get my mind off things.  
4. Posting/Messages from (__) Social Media account owner give me something enjoyable.  
5. (__) Social Media account owner gives me information about the situation that I can be faced with.  
6. (__) Social Media account owner gives me the advice I really want.  
7. (__) Social Media account owner encourages me to share worries and fears about my health problem.  
8. When I feel depressed, (__) Social Media account owner tries to understand me and makes me feel better. | 5-point Likert |
| Activation | After using (__) Social Media, I agree with each of the following statements:  
1. When all is said and done, I am the person who is responsible for managing my health condition.  
2. Taking an active role in my own health care is the most important factor in determining my health and ability to function.  
3. I am confident that I can take actions that will help prevent or minimize some symptoms or problems associated with my health condition.  
4. I know what each of my prescribed medications do.  
5. I am confident that I can tell when I need to go get medical care and when I can handle a health problem myself.  
6. I am confident I can tell my health care provider the concerns that I have even when he or she does not ask.  
7. I am confident that I can follow through the medical treatments I need to do at home. | 5-point Guttman |
8. I understand the nature and causes of my health condition(s).
9. I know the different medical treatment options available for my health condition.
10. I have been able to maintain the lifestyle changes for my health that I have made.
11. I know how to prevent further problems with my health condition.
12. I am confident I can figure out the solutions when new situations or problems arise with my health condition.
13. I am confident that I can maintain the lifestyle changes, such as diet and exercise, even during times of stress.

<table>
<thead>
<tr>
<th>Health Behavior</th>
<th>After using (__) Social Media …</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I follow a regular schedule of exercising.</td>
</tr>
<tr>
<td>2.</td>
<td>I follow a regular schedule of performing stress management.</td>
</tr>
<tr>
<td>3.</td>
<td>I do activities to manage my weight.</td>
</tr>
</tbody>
</table>

Table 3. Measurement Items for Variables

Administration of Survey

Data Collection and Sample Demographic

An online survey was utilized to collect data as well as to test the research model in November 2013. The subject population included social media users who were currently using the HISM account, which was officially run by Samsung Medical Center, and individuals recruited through Facebook in a convenience sampling procedure. Survey volunteers were recruited by postings on the walls of Samsung Medical Center Facebook account, and the data were gathered to google docs. The users who completed the survey were offered incentives in exchange for their participation. From those who responded (total 617), a total of 511 survey respondents provided an answer clearly on the name of HISM account they are using. The cases met our threshold and were retained for the analysis.

Participants in their 20s ~ 30s are 79.06% of the study population. The number of females (66.93%) are twice that of males (33.07%). Participants who had a bachelor’s degree (54.01%) are more than half of the population. The period of HISM experience was also evenly distributed. Almost two-third of users do not have disease experience (66.93%) and family history (71.82%).

Prior research identified that family history is associated with health-related behaviors (Jacobsen et al. 2004) and motivation (Audrain-McGovern et al. 2003; Jacobsen et al. 2004) to perform health behaviors. Kye and Park (2012) found that personality is associated with health behaviors and self-efficacy among Korean diabetes patients. Ross et al. (2009) identified that personality is associated with social activities on Facebook. In this regard, this study examined the impact regarding the significance of the above mentioned demographics and related factors to inter-personal support, activation and health behaviors in our research model. In the result, the impact of gender, education, period, and some aspect of personality (openness to experience) on activation, the impact of age, gender, family history, habits, disease experience, and some aspect of personality (agreeableness, anxiousness, extraversion) on health behaviors were significant. In the case of inter-personal support, the impact of habits, gender, education, and some aspect of personality (openness to experience, extraversion) were significant. We considered this test result to our research model, and the significant factors were controlled.

Survey Result

A path analysis, a statistical method of structural equation modeling (SEM), was used to test the hypothesized model. SmartPLS program was employed to test the research model and the hypotheses.

Table 4. Results of discriminant validity analysis (Correlation between variables)

<table>
<thead>
<tr>
<th></th>
<th>ACT</th>
<th>CSS</th>
<th>EA</th>
<th>EBHI</th>
<th>HB</th>
<th>IPS</th>
<th>KBHI</th>
<th>MC</th>
<th>NHT</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSS</td>
<td>0.273</td>
<td>0.841</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EA</td>
<td>0.179</td>
<td>0.427</td>
<td>0.830</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>EBHI</td>
<td>0.220</td>
<td>0.476</td>
<td>0.611</td>
<td>0.868</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HB</td>
<td>0.276</td>
<td>0.379</td>
<td>0.251</td>
<td>0.326</td>
<td>0.849</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPS</td>
<td>0.253</td>
<td>0.675</td>
<td>0.532</td>
<td>0.504</td>
<td>0.351</td>
<td>0.821</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4. Results of discriminant validity analysis (Correlation between variables)

Table 4 and 5 list the test result of the measurement model; the measurement model in this research satisfied the threshold criteria to establish both convergent validity and discriminant validity.

Table 5. Results of convergent validity analysis

Testing Result of Research Hypotheses

With an adequate measurement research model, the proposed hypotheses 1 to 7 were tested with PLS (Partial Least Squares). To examine the significance of the path coefficient, bootstrap resampling was applied (Chin 2001; Cotterman and Senn 1992). The size of the resampling is recommended as 250~500 (Chin 1998; Chin 2001; Efron and Tibshirani 1993) or 1,000 (Hair et al. 1998). This study adopted the recommended size of Hair et al. (1987), and applied it for examining the research model. Figure 3 presents the results of the research model. Among 13 Hypotheses, three were rejected.

As identified in the prior medical knowledge, the testing result of hypotheses 1 shows that an individual’s activation has a positive impact on one’s health behaviors (beta=0.249, t-value=7.035, p<0.05). Regarding the test of hypotheses on the impact of support (process) in HISM, hypotheses 2 and 3 examined the influence of each type of support in the HISM. As we hypothesized, the condition-specific
support and inter-personal support positively influenced one’s activation (beta=0.201, t-value=4.894, p<0.05; beta=0.095, t-value=2.405, p<0.05).

Observing the test of hypotheses regarding the impact of human resources (structure) on the process in HISM, Hypotheses 4-1 and 4-2 examined the influence of users’ credibility to information source on each type of support in the HISM. These are also, as we hypothesized, the source credibility that positively influenced the two kinds of support (beta=0.160, t-value=3.026, p<0.05; beta=0.133, t-value=2.685, p<0.05).

Looking into the test of hypotheses regarding the impact of intellectual resources (structure) on the process in the HISM, hypotheses 5-1 and 5-2 examined the influence of Knowledge-Based Health Information in HISM on each type of support. Contrary to our expectations, the influence of Knowledge-Based Health Information on the two kinds of support is not significant. However, in the case of examining the influence of Experience-Based Health Information - hypotheses 6-1 and 6-2 - both condition-specific support and inter-personal support are positively influenced by Experience-Based Health Information (beta=0.302, t-value=7.205, p<0.05; beta=0.211, t-value=5.102, p<0.05). Emotional Appeals and Non-Health Topic, as we hypothesized in hypotheses 7 and 8, also have a positive impact on inter-personal support in the HISM, respectively (beta=0.198, t-value=4.512, p<0.05; beta=0.175, t-value=4.424, p<0.05).

According to the test of hypotheses regarding the impact of material resources (structure) on the process in the HISM, hypotheses 9-1 and 9-2 examined the influence of media capability on each type of support. Inter-personal support is positively influenced by media capability (beta=0.130, t-value=3.544, p<0.05), whereas media capability’s negative influence on condition-specific support is not significant.

In an additional test, the influence of Emotional Appeals and Non-Health Topic on condition-specific support are positive (beta=0.111, t-value=2.293, p<0.05; beta=0.178, t-value=4.042, p<0.05).
Table 6. Path Coefficients (Mean, STDEV, T-Values)

<table>
<thead>
<tr>
<th>Path</th>
<th>Original Sample Mean (O)</th>
<th>Sample Mean (M)</th>
<th>Standard Deviation (STDEV)</th>
<th>Standard Error (STERR)</th>
<th>T Statistics (O/STERR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>ACT -&gt; HB</td>
<td>0.249</td>
<td>0.249</td>
<td>0.036</td>
<td>0.036</td>
</tr>
<tr>
<td>H2</td>
<td>CSS -&gt; ACT</td>
<td>0.201</td>
<td>0.198</td>
<td>0.044</td>
<td>0.044</td>
</tr>
<tr>
<td>H3</td>
<td>IPS -&gt; ACT</td>
<td>0.095</td>
<td>0.099</td>
<td>0.040</td>
<td>0.040</td>
</tr>
<tr>
<td>H4-1</td>
<td>SC -&gt; CSS</td>
<td>0.160</td>
<td>0.135</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td>H4-2</td>
<td>SC -&gt; IPS</td>
<td>0.133</td>
<td>0.130</td>
<td>0.035</td>
<td>0.035</td>
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<tr>
<td>H5-1</td>
<td>KBHI -&gt; CSS</td>
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<td>-0.064</td>
<td>0.039</td>
<td>0.039</td>
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<tr>
<td>H5-2</td>
<td>KBHI -&gt; IPS</td>
<td>-0.058</td>
<td>-0.061</td>
<td>0.036</td>
<td>0.036</td>
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<tr>
<td>H6-1</td>
<td>EBHI -&gt; CSS</td>
<td>0.302</td>
<td>0.299</td>
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<td>0.044</td>
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<tr>
<td>H6-2</td>
<td>EBHI -&gt; IPS</td>
<td>0.211</td>
<td>0.209</td>
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<td>0.040</td>
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<tr>
<td>H7</td>
<td>EA -&gt; CSS</td>
<td>0.111</td>
<td>0.116</td>
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<td>0.050</td>
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<tr>
<td>H8</td>
<td>NHT -&gt; CSS</td>
<td>0.178</td>
<td>0.178</td>
<td>0.046</td>
<td>0.046</td>
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<tr>
<td>H9-1</td>
<td>MC -&gt; CSS</td>
<td>-0.011</td>
<td>-0.012</td>
<td>0.042</td>
<td>0.042</td>
</tr>
<tr>
<td>H9-2</td>
<td>MC -&gt; IPS</td>
<td>0.103</td>
<td>0.131</td>
<td>0.037</td>
<td>0.037</td>
</tr>
</tbody>
</table>

Conclusion

This study empirically validated the impact of social media and identified the factors of the impact using a theoretically solid framework. However, the following limitations also exist. First, data in this study was collected from the Facebook of only one hospital. Further, there is a limit on generalizing the result due to the media characteristics of Facebook and the organizational characteristics of the hospital. To generalize the result of this study, data collection from various types of social media and healthcare service organizations is necessary. Second, even though this study considers many control variables as far as possible, there might be other factors related to the structure in HISM, which are important to the process in HISM, but are not included in our model yet, such as service organizational culture, financial resources and other externalities.

Nevertheless, we believe that this research represents a first step toward a comprehensive understanding of how social media influences one’s health management; moreover, the limitations offer promising avenues for future research. In addition, the research model in this study can be extended and enhanced. In this regard, this research is expected to provide the following theoretical and practical contributions to the field of medical and social media research.

Contributions

This research is expected to provide the following theoretical and practical contributions to the field of medical and social media research.

In an academic perspective, first, this study conducted a pioneering research on healthcare service in social media using the theoretically solid framework, the SPO framework, in order to figure out the influence of social media on an individual’s healthcare outcomes. Second, in order to achieve the above goal, because the SPO framework was developed for an off-line healthcare service environment, the study did not just apply the existing framework, but made significant adjustments to the context of the social media environment. Considering the HISM environment, activities in HISM and the changes after using HISM in accordance with structure, process and outcome in healthcare service, we identified that the factors should be considered in HISM as an healthcare service, and then draw variables to evaluate the attributes of such factors.
Based on prior social media research and content analysis, with regard to the structure in HISM, we draw source credibility and account owner credibility as attributes of human resources in HISM. For intellectual resources in HISM, 4 types of message contents – Knowledge-Based Health Information, Experience-Based Health Information, Emotional Appeals and Non-Health Topic – are drawn. Moreover, Media capability is drawn as an attribute of material resources in HISM. With regard to the process in HISM, we draw condition-specific support and inter-personal support, which are the reflected attributes of activities in HISM. Related to the outcome of using HISM, based on prior self-management research, we adopt activation and health behaviors as the dependent variables in this research. The measure items of drawn variables are also newly developed. Third, in consequence of such efforts, we suggest a framework that comprehensively examines the impact of HISM managed by healthcare service organizations in a healthcare service perspective. Although more and further comprehensive systematic studies on social media in healthcare service should be conducted in order to make progress, in this regard, this study begins the challenging of suggesting the framework for social media evaluation in healthcare service.

In a practical perspective, especially for healthcare service providers, with the comprehensive set of outcome variables, this study examined the impact of social media on an individual's healthcare more thoroughly. Considering the psychological and behavioral health outcomes as well as physical ones comprehensively by combining the changes in activation and health behaviors, this study demonstrates the potential of HISM as a healthcare service tool. Second, by examining the impact of HISM using a comprehensive solid framework, this study also suggests strategic guidelines regarding the online healthcare service through social media. Further, the related factors should be considered in order to increase users' interaction as well as to obtain a better health outcome. Considering the results related to the credibility of the information source, this study suggests that not highlighting the expertise and trustworthiness of the account owner, but having more information sources who have expertise and trustworthiness and displaying it to HISM users is more effective for providing support related to one's health management. In addition, the result related to health information with personal experience shows that providing motivation to share personal health experience to users and making a venue for it will be critical when a healthcare service organization designs the HISM with the aim of promoting user's health management. In sum, most concerns in HISM design deploy information providers with expertise and trustworthiness to HISM users as well as those with rich cases of personal health experience. Finally, compared to prior research on social media use in medicine, this study did not limit the scope of the respondents to patients who had chronic diseases. We extended the study to the general public by applying the self-management concept for healthcare service outcome in social media. This may provide implications to policy makers who are struggling to improve public healthcare by increasing the utilization of social media.

**Implications**

Based on the SPO framework and concept of self-management, this study validates the impact of HISM on individual's health management, and identified the influential factors of such impact in the survey targeting HISM users. When it comes to the effect of HISM use on one's health management, this study identifies that HISM influences the changes in one's psychometrical and behavioral health outcome. The result shows that the use of HISM draws increased activation, which refers to the status a person with knowledge, skills, beliefs and behaviors that a patient needs in order to manage one's health, and consequently, result in improvements with regard to behavioral changes for health. This implies that HISM has the potential as a tool to promote one's health management, and can be used in public health promotion. Thus, health professionals and health policy makers deserve considerations of using HISM on the population that requires continuous health management.

With regard to the factors affecting the impact of the HISM, first, in the case of intellectual resources, it is identified that health information with one's health experiences, one’s emotion, and non-health topics are influential on a user's perception of inter-personal support rather than health information with medical knowledge. In particular, health information with one’s health experiences has a positive impact on the user’s perception of condition-specific support. Health information with one’s health experiences describe certain circumstances or conditions more specifically than health information with medical knowledge. In the case of Experience-Based Health Information, an account owner – a healthcare service organization - provides the patient’s stories, which show what kinds of symptoms and pains the patient
experienced and what kinds of healthcare services the patient took. Users in HISM provide their own health experience or family experience, such as diet, exercise, etc. In a further analysis, Non-Health Topic is also influential on a user's perception of condition-specific support. This means that interaction and communication between the account owner and users in HISM are important; moreover, they provide health-related information. The result suggests that, when the healthcare service organization provides health information by using social media to support one's health management, health information with one's story or emotions are more effective rather than listing the medical knowledge; further, making continuous interactions and communication with users should be considered. This is consistent with the prior research result (Bradbury, 2007), that considerable numbers of adult Internet users have gone online in order to find others with health concerns similar to their own.

In the case of the impact of human resources in HISM, credibility of the information source was influential on the user's perception on both supports. We checked for the possibility that account owner filters out messages that provide pseudo information, and block out the access of uncertain information source. We interviewed a person in charge for managing the Samsung Medical Hospital Facebook account. Their policy is always to monitor all contents of every posting and comment in all HISM they own. However, the emergence of negative or uncertain message in HISM is rare, and even when such cases occur, they do not filter such messages. Further, they say that the responses to such messages are very few. Taking all of these considerations, we assume that this source credibility-related issue may be an attribute of social network service, such as Facebook or Twitter. Because compared to other social media, such as web blog or online community, the social network service easily reveals one's identity, it may make users beware of making an irresponsible comment in HISM, as well as make it easier to distinguish the credible information source.

With regard to the impact of material resources in HISM, social media capability supporting one's information transmission and processing is influential only on the user's perception of inter-personal support, referred to as social support. Diagnosis of one's health condition in the case of condition-specific support is not an instantaneous activity; rather, it needs time to analyze and decide while sharing one's emotion -- exchanging small talks are relatively instantaneous. In this regard, inter-personal support is largely influenced by social media capability rather than condition-specific support in HISM. This result offers the implication that, when a healthcare service provider wants to use social media with regard to relational treatments or service, the choice of media, which has various functions supporting information transmission and processing, can be a primary consideration.

References


