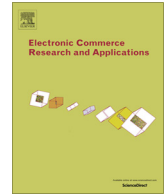




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## Exploring the effects of patient-generated and system-generated information on patients' online search, evaluation and decision



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### ABSTRACT

Owing to the limited information possessed by patients, there exists significant information asymmetry between patients and physicians. In addition, as services are intangible, inseparable, and heterogeneous, patients are difficult to judge the physicians' service quality. With the development of online healthcare services, healthcare websites currently provide more information for patients, such as patient-generated and system-generated information. Those kinds of information can reflect the quality of physicians' service outcome and delivery process to help patients to select physicians. However, there is scant research on the role of patient-generated and system-generated information in patients' online behavior. Collecting data from a healthcare website, this paper develops a two-equation model to verify the effects of two kinds of information on patients' search, evaluation and decision-making on healthcare websites. The results of our empirical research show that positive patient-generated and system-generated information on physicians' service quality positively impact patients' reactions at different stages. Moreover, we also find that synergies between patient-generated and system-generated information are positively associated with patients' decisions to consult a physician. These findings provide valuable contributions to the online healthcare research.

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### 1. Introduction

The topic of physicians' services is one of the main paradigms of research on expert service (Dranove 1988). Such expert services refer to the goods or services (such as medical, legal and repair services) of which service provides have more information on their quality than consumers (Darby and Karni 1973). Because the patients lack professional knowledge about the services, healthcare services mainly rely on physicians who determine what kind of service is needed (Darby and Karni 1973, Dranove 1983, 1988, Woiinsky 1993). Therefore, there is significant information asymmetry between physicians and patients. In addition, as service is intangible, inseparable, and heterogeneous (Parasuraman et al. 1985), patients find it difficult to judge a physician's service quality before consultation. Hence, how to determine a physician's quality is a vital issue for patients.

In the past decade, with the progress of online healthcare services, there has been strong growth in the number of people who choose to visit healthcare websites for online healthcare

consultation (Fox and Jones 2010, Xiao et al. 2012). In those healthcare websites, there are many physicians who provide healthcare consultation service online, and also have a job in brick-and-mortar hospitals. According to patients' text description in a post, a physician would determine patients' disease condition and then give diagnosis, treatment and suggestion to patients through the Internet. Compared to traditional healthcare websites which just provide healthcare information and knowledge, online healthcare consultation service could be more suitable for patients since it is provided according to their health conditions. Without restrictions of space and time, this novel medical model can help patients reduce the charges and time spent, thus offering huge benefits for patients. Especially, for some patients in remote areas or with busy schedules, the healthcare websites are extremely useful.

Those novel healthcare websites also have become one of the most significant information channels for patients to understand physicians' service quality (Ba and Wang 2013, Kucukyazici et al. 2011, Yan and Tan 2010). More specifically, on healthcare websites, patients can obtain more information about the quality of physicians' services than is available in hospital buildings. Generally, in concrete hospitals, patients just can obtain information about hospital standing and physicians' position. Although the two kinds of information is doubtlessly useful for patients, there is scant information that can effectively reveal physicians' service quality (Gao et al.

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2011). Different from offline hospitals, healthcare websites offer patient-generated and system-generated information to patients, and thus represent a novel way of disclosing physicians' service quality. Patient-generated information is the information generated by patients who have online consultation experiences, such as feedback, reviews and ratings. System-generated information refers to the information generated by the system of a website where physicians work for, and reveals service providers' behavior, such as contribution, grade, popularity, and so on. For patients, not only can they find cues about the outcome of physicians' service from patient-generated information, they can also find cues about the process quality of physicians' service from system-generated information. Both patient-generated and system-generated information are designed to reflect physicians' service quality, thus reducing information asymmetry.

On the healthcare websites, patients need to go through different stages for choosing a physician to consult, which includes the process of search, evaluation and decision. First, in the search stage, patients can obtain an initial list of physicians on the basis of their disease information for the later process of evaluation and decision. In the initial list, only a part of information is available for patients, such as the patient-generated information. Relying on this information, patients can decide whether or not they would visit the homepages of the physicians in the list. After patients visit some specific physicians' homepages, they can obtain the system-generated information of the physicians, which help them to further evaluate the physicians' information. Based on the results of evaluation, patients can make their decision to choose among the multiple physicians to consult. Before consulting a physician, patients could not understand physicians' service quality. At different stages, patients obtain different kinds of information, and the effects of those kinds of information may be different. Patient-generated and system-generated information can help patients understand service quality and reduce search cost.

An increasing number of papers on the effects of online user-generated information (such as online feedback and ratings) and system-generated information (such as product ranking) on sales and consumer decision-making have recently been published (Chen et al. 2013, Chen et al. 2011, Chen and Xie 2008, Dellarocas 2003, Dellarocas et al. 2010). However, most studies have only focused on products such as books (Chevalier and Mayzlin 2006), movies (Duan et al. 2008), and games (Zhu and Zhang 2010). Notably, there is little research focused on online healthcare (Gao et al. 2011). Online healthcare consultation is a kind of services that significantly distinguishes from products because services possess many characteristics, such as intangibility, heterogeneity, and inseparability (Parasuraman et al. 1985). Compared to traditional e-commerce, online healthcare service quality is more difficult to evaluate. Therefore, for patients, they need more information to understand physicians' service quality from different aspects.

Moreover, although there have been extensive studies on online healthcare (Ba and Wang 2013, Xiao et al. 2012, Yan and Tan 2010), there is a dearth of research on the effects of physicians' information on patients' online behaviors in different stages. Both types of information (patient-generated and system-generated information) reflect physicians' online service quality. The difference between both is that one reflects feedback from patients who have received physicians' online services, and the other presents the ratings of physicians by healthcare websites. To enable a better understanding of the effects of patient-generated and system-generated information on patients' search, evaluation, and decision-making on healthcare websites, more studies are needed. This paper examines the role of patient-generated and system-generated information at different stages. The main research questions are:

- (1) What is the role of patient-generated information in the search and evaluation & decision stage?
- (2) How does system-generated information affect patients' decisions to consult a physician online?
- (3) What are the effects of the synergies between patient-generated and system-generated information on patients' decision-making?

We establish a two-equation model using 742 physicians' data collected from a healthcare website to investigate the effects of patient-generated and system-generated information on patients' search, evaluation and decision. The empirical results show that patient-generated and system-generated information positively impact patients' action in different stages. In addition, we also find that synergies between patient-generated and system-generated information are positively associated with patients' decisions to consult a physician.

This paper makes a three-fold contribution. First, our research adds to online healthcare literature by examining the effects of patient-generated and system-generated information on patients. Second, we find the role of both kinds of information on patients' online activities at search, evaluation and decision stages. Third, this paper also finds that synergies between patient-generated and system-generated information will be positively associated with patients' decision-making. These findings enable us to understand the effects of such information on patients' online behaviors.

This paper is organized as follows: In Section 2, we review literature on online healthcare, purchase process, and online user-generated information. Section 3 focuses on theory and hypotheses. Data and the results are presented in Section 4. In Section 5, we discuss our results. The conclusion is presented in Section 6.

## 2. Literature review

To better explore the effects of the patient-generated and system-generated information on patient search, evaluation and decision-making, this paper draws from three streams of literature, i.e., online healthcare, the search and purchase process, as well as the user-generated information and system-generated information.

### 2.1. Online healthcare

With the increasing popularity of Web 2.0 technologies, the Internet provides a safer and more convenient platform for patients to engage in communication between physicians and patients (Ziebland et al. 2004). On healthcare websites, patients can obtain information and knowledge about diseases and treatments. Healthcare websites provide for patients with physicians' online service, information about physicians' quality (Gao et al. 2011), knowledge, and emotional support (Yan and Tan 2010). Therefore, online healthcare websites are considered as a potential way to solve problems of healthcare demand and information asymmetry between physicians and patients.

Many studies have started to explore the benefits of healthcare websites from different perspectives. For example, Gao et al. (2011) points out that online physician ratings can help patients to understand physicians' quality and reduce information asymmetry. Xiao et al. (2012) investigates factors that affect individuals' online healthcare information search. Ba and Wang (2013) investigates the effect of motivation mechanisms on individuals' participation on health communities.

However, there is scant research to explore the effects of physicians' information on patients' online behaviors in different stages. Because of information asymmetry and service characteristics,

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