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Credibility of Health Site Based on Design and Information Content

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Abstact. Websites technology make health information searching easier. It shifts the activity from conventional to online. Therefore, a websites crediblity becomes important since there is no guarantee for truthful information which may cause a malpractice. The credibility of seven health websites is assessed by focusing on the visual design and the information content. The data collection is conducted by applying a quasi-experiment which adopted Bipolar Emotional Response Testing (BERT). The result shows that health websites credibility is affected by the accuracy, authority, objective, and currency as information content. It is also influenced by concise, beautiful, elegant, friendly, fresh, futuristic, sharp and valuable visual design. This article to reveals that the website credibility is still contextual and can be applied to other websites.

Key words: website, health, credibility, visual design, information content

Introduction

The presence of the Internet changes the way people obtain information on various events (Manno & Shahrabi, 2010: 3), including information about health (Fox & Jones, 2009; WHO, 2011). Health information previously obtained in the traditional way through a face to face relationship between doctors and patients, is currently being replaced by looking for information and health advice on the Internet (Lederman, Fan, Smith, & Chang, 2014: 14). The search of health and medical information becomes more popular (Eysenbach, 2008: 123). Pew Internet Research (2008) showed 80% of Internet users in the United States access health sites as the main topic when online. In Saudi Arabia, as many as 450 women surveyed put the internet in fifth position as a source of health information (Weber, Verjee, Rahman, Ameerudeen, and Al-Baz, 2014: 807).

Internet digital technology provides convenience for the users to update health information (Fardiah, Rinawati, & Kurniadi, 2014). Technology "Internet Relay Chat" also enables doctors and patients consult online (Ratnasari, 2008: 14). In Indonesia, there is a Mailing List of Indonesian physician (MDLI) which specifically handle with medical problems and health consultation. However, the emergence of various health sites does not necessarily provide comfort for users to access information (Sillence, Briggs, Harris & Fishwick 2007: 1853). There are issues related to the credibility of health sites that has implications on the users trust to the site. Uncertainty on health sites has grown since the development of health startup the business (Lederman, Fan, Smith, & Chang, 2014: 15); and furthermore there is no guarantee that the information on the health sites is correct and objective (Eysenbach, 2008: 143).

Anonymity of internet characteristics and democratization of message developer cause the development of health information that does not refer to health experts so it may lead to a false and untrustworthy report (hoax) (Fogg, et al., 2001: 62). A survey of patients in the city of Riyadh showed the most of them (51.4%) stated that sometimes they did not trust the online health information (Weber, Verjee, Rahman, Ameerudeen, & Al-Baz, 2014: 808). This is because the health advice in blogs and online discussion groups is not necessarily derived from health experts, but it was derived from the experience of

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common people about the certain health cases (Lederman, Fan, Smith, & Chang, 2014: 15). Only 0.5% of the 925 sites that qualify as a credible and trusted health websites (Weber, Verjee, Rahman, Ameerudeen, and Al-Baz, 2014: 808). So the site which is supposed to be the referral health community is considered to have low quality and unreliable information.

Sites credibility is judged differently depending on the site characteristics. However, in general, the design and the aesthetic appearance of the site and the quality of information that can be trusted (Fogg, 2003: 722) could increase the site credibility. Visual design of the site also significantly affect sthe credibility rating. Sites that are easily recognizable and has the power of visual could have an implication on the perception of credibility (Robins, Holmes, & Stansbury, 2010: 14). Technical display sites that provide contact information such as the "Contact Us," email address and website address profiles could increase the credibility rating (Freeman & Spyridakis, 2009: 152). While the interaction between users of the site marked with a comment and shared the link could significantly enhance the user's perception of health sites (Gao, Tian, and Tu, 2015: 25). Message characteristics and structural features of the site are also associated with the user's perception of the credibility of health sites (Rains & Karmikel, 2009: 545).

Understanding of Health Site Credibility

Credibility is defined as trustworthy (believability) (Fogg, et al., 2001: 62) which does not refer to an object, person or collection of certain information but refer to the perception of the quality (Fogg and Tseng, 1999: 67). Credibility of information or message always refers to the source of the message. Therefore, the credibility has two types: source characteristics and contact information (Sundar, 1998: 56).

Since 2001, discussions about the credibility of online sites have risen to the idea of the theory of Prominence-Interpretation that related to the credibility (Fogg, 2003: 722). This theory states two things when assessing the credibility of online readers: readers notice something (Prominence); and readers make an opinion about something (interpretation). Prominence has five factors: the involvement of the reader, the topic of the site, the purpose, the reader's experience, and individual characteristics. While the interpretation is the readers judgement on the observed site elements. Factors affecting intrepretation are the assumption of the reader, skill or knowledge of the reader, and the reader environmental context and situational conditions (Fogg, 2003: 723).

This paper focuses on the discussion of the site design and content of health site which is regarded to have affect on credibility. Visual design variable is involved because it is statistically proven influencing toward the credibility level of health sites (Robins, Holmes & Stansbury, 2010: 15). While variable of information content is also proven to determine the assessment of health sites (Lederman, Fan, Smith, & Chang, 2014: 13). In general, the visual aesthetic of site affects the attitude of the reader in the form of trust, satisfaction and loyalty (Cyr, 2008: 47; Bonnardel, Piolat, & Le Bigot, 2011: 69; Seckler, Heinz, Forde, Tuch, & Opwis, 2015: 39). The elements of graphic design affect the reader's first impression of the site (Wang & Emurian, 2005: 105). Therefore the first hypothesis (H1) is how visual design (X1) affects the credibility of (Y) health sites.

A further aspect is a significant of information content that determines the credibility of health sites (O'Grady, Bethel, & Shachak, 2010: 547). Site is recognized as a new medium of distributing information including health sites (Fox & Jones, 2009). However, a health site would be a last option for patients to get information (Williamson, Lepak, & King, 2003: 242). Readers still prioritize health information from physicians and health experts (Eysenbach, 2008: 123). Differences in characteristics between information on news sites and health sites are in the author or expert supporter that is illustrated as a "meta-message" (O'Grady, Bethel, & Shachak, 2010, p. 548). In a health site, meta message becomes more important than the message or health information itself. Expertise author on health information plays an important role to convince the reader toward the site's credibility. Therefore, the second hypothesis (H2) states that information (X2) have an effect on the credibility (Y) health sites.

Visual design, information content or credibility of the site are partially observed. Moreover, the comprehensive testing of the influence of visual design and information content on the credibility of the site have not been done in the context of health site in Indonesia. Therefore, this article proposes a third hypothesis (H3) to measure the influence

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of visual design (X1) and information content (X2) on the credibility (Y) of health sites.

Quasi Experiment with Bipolar Emotional Response Testing

Quasi-experimental method (Goldfarb & Tucker, 2014: 24) is used to investigate the relationship between visual design and information content that affect the site credibility. Quasi-experimental method adopts Bipolar Emotional Response Testing (BERT) to analyze the seven most active health sites in Indonesia: alodokter.com, dokter.id, meetdoctor.com, klikdokter.com, tabadoctor.com, tanyadok.com, and udoctor.co.id. BERT has been used to measure emotional responses on the credibility of online news sites by using semantic differential scale (Irwansyah, 2015: 872). Semantic differential scale measures the indicator of credibility by using adjectives opposite to indicate two different poles (Bradley & Lang, 1994: 49). The scale uses a range of 1-10 scale (Osgood, Suci, & Tannenbaum, 1957: 56) consisting of five negative score (-1, -2, -3, -4, -5) and five positive score (1, 2 , 3, 4, 5) (Irwansyah, 2015: 873). The zero score is intentionally omitted to avoid the ambigu answers.

The operationalization concept of three variables are formed from adjectives opposites. Variable visual design consists of 30 indicators, namely (1) uninteresting vs interesting; (2) unbalanced vs balanced; (3) blurred vs bright; (4) noise vs quiet; (5) not classic vs classic; (6) monotonous vs full color; (7) no quick vs quick; (8) conventional vs modern; (9) not beautiful vs beautiful; (10) not fancy vs luxury; (11) not elegant vs elegant; (12) not familiar vs familiar; (13) not fresh vs fresh; (14) not futuristic vs futuristic; (15) no hope vs full of hope; (16) not mystical vs mystical; (17) not flat vs flat; (18) unpopular vs popular; (19) no power vs full strength; (20) not promise vs promise; (21) not sexy vs sexy; (22) not sharp vs sharp (23) not simple vs simple; (24) static vs dynamic; (25) weak vs strong; (26) not surreal vs surreal; (27) not tense vs tense; (28) faint vs clear; (29) invaluable vs worthless; and (30) not excited vs excited (Tarrant, 2007). Variable information content consists of five indicators: (1) inaccurate vs accurate; (2) unwritten vs written authority; (3) subjective vs objective; (4) out of date vs up to date; and (5) local vs national. Then variable credibility has three indicators: (1) amateur vs professional, (2) untrust vs trust, and (3) uninterest vs interest (Irwansyah, 2015: 874).

Quasi-experimental design with the equivalent time-samples design does not do the pretest and does not have a control group (Campbell & Stanley, 1963: 67). Participants of experiment are involved voluntarily by registering with investigator. Participants who meet the criteria are only about 78 people. Each participant is selected based on the requirements whether they have ever been accessing one of seven health sites in last week before registering; and have a smartphone access of the site. During the experiment, participants are asked to access the seven health sites via smartphones available in the room. Participants are asked to access the site for 20 minutes and then filled out questionnaires for 20 minutes. The type of smartphone used in the experiment is a touch screen, a screen size of 4.7 inches and Android operating systems. Smartphone has been choosen because the market of it continues to rise each year compared to other technology products (Wan, Zhu, & Hou1, 2013: 107). Then smartphone Andoid operating system used since it dominates the market with a distribution rate of 78% with a screen size of 4.7 inches (IDC, 2015).

The validity of the data is done in two ways: content and concept validity. Content validity see item scale results generated from the three variables are observed through tests KMO and Bartlett Test of Sphericity (Constantin, 2014). Then concept validity (Dubowicz & Schulz, 2014) refers back to concepts and theories used in the literature. Measurement of internal consistency and adequacy of the samples shows that the three variables are statistically valid and could be done as a factor analysis. There is a change in the indicator of variable visual design and information content. Some of the validity and internal consistency of the indicators cause the low value of KMO and Bartlett Test. After the indicator is reduced, factor analysis could be done. However, before the factor analysis, there are several things to be considered. First, Bartlett Test of Sphericity is analyzed to see the relevance of indicators in a variable. If the level of statistical significance of $p < 0.0005$ for Approx. Chi Square, factor analysis could not be done and Ho would be rejected (Anastasiadou, 2011). Second, the Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO) was analyzed to look at the adequacy of the sample (Kaiser, 1974). If KMO value ≥ 0.5, it indicates the adequacy of the data and factor analysis could be done (Field, 2000). The validity results of the index or sample

sufficiency index according to the Kaiser-Meyer-Olkin (KMO) shows all the observed variables are valid for the value of KMO ≥ 0.5 (Field, 2000). Bartlett test with a significance level of $p < 0.0005$ with a coefficient of degree of freedom (df) is not zero, then the observed variables were considered satisfactory and could be processed on the next statistical analysis.

Furthermore, the reliability test results according Aplha's Cronbach shows each variable has a different value. Reliability test is a test for internal consistency of the questionnaire (Croanbach, 1984) to see the relationship between the measured variable (Anastasiadou, 2011). Index of alpha (α) is an important index of internal consistency and attributed as the average correlation across all variables (Anastasiadou, 2011).

The alpha's croncbach reliability results shown in Table 2 indicates three variables have a high reliability. The value between 0.7 and 0.9 showed high reliability (Dwivedi, Choudrie, & Weerakkody, 2006).

Furthermore, on factor analysis, the visual design conceptually has 30 indicators. After the factor confirmation analysis test , it is show that 22 indicators are not valid. Only eight indicators are valid and reliable (see table 3). The indicators are conciseness, beauty, elegant, familiarity, freshness, futuristic, sharpness, and valuable. Visual design variable is invalid (0.631) and reliable (α = 0.785). Variable information content consists of five indicators, but only four indicators are valid and reliable indicators based on factors confirmation analysis test. Indicator of coverage is excluded because it is considered statistically invalid and unreliable. Therefore the remaining four indicators that can be continued in the subsequent analysis, namely accuracy, authority, objectivity and up to date. Cronbach's Alpha reliability value for the variable information content shows high

Table 1
Validity Result of KMO and Bartlett Test of Spherecity

No.	Variable	KMO	Bartlett Test of Sphericity		
			Approx. Chi Square	Df	Sig
1.	Visual Design	0.631	213.041	28	.000
2.	Information Content	0.731	74.788	6	.000
3.	Credibility	0.600	48.465	3	.000

(SPSS Analysis, 2015)

Table 2
Reliability Result of Alpha's Cronbach

No.	Variable	α	n	Result
1.	Visual Design	0.785	8	High Reliability
2.	Information Content	0.713	4	High Reliability
3.	Credibility	0.893	3	High Reliability

(SPSS Analysis, 2015)

Table 3
The Result of Confirmatory Factor Analysis on Visual Design Variable

Indicator	Factor Loading	Result
Conciseness	0.593	Valid
Beauty	0.767	Valid
Elegant	0.624	Valid
Familiarity	0.544	Valid
Freshness	0.706	Valid
Futuristic	0.653	Valid
Sharpness	0.641	Valid
Valuable	0.629	Valid

(SPSS Analysis, 2015)

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Table 4
Result of Confirmatory Factor Analysis on Information Content Variable

Indicator	Factor Loading	Result
Accuracy	0.659	Valid
Authority	0.777	Valid
Objectivity	0.844	Valid
Up to date	0.754	Valid

(SPSS Analysis, 2015)

Table 5
Result of Confirmatory Factor Analysis on Credibility Variable

Indicator	Factor Loading	Result
Expertise	0.692	Valid
Trust	0.802	Valid
Interest	0.875	Valid

(SPSS Analysis, 2015)

reliability because it is in the range of 0.7 to 0.9 (α = 0.713). While, the value of validity by KMO and Bartlett's test showed 0.731. Thus, the entire indicators of the credibility variable can be analyzed further. Moreover, based on confirmatory factor analysis testing all indicators of credibility variable are valid (0.600) and reliable (0.893).

Prediction of Visual Design and Information Content on Credibility of Health Site

Variables of visual design, information content, and credibility are proven valid and reliable. Variabel of visual design can be explained by eight indicators that consist of conciseness, beauty, elegance, familiarity, freshness, futuristic, sharpness, and valuable. Conciseness emphasizes on human visual sight likely to want simplification (Santella, 2005: 56). Then indicator of beauty decrypts beautiful website design that involves many components including a basic principle of design (Beaird, 2007: 86). Another indicator that is elegant, is the first impression to see the website that the user sees in the context of a quiet room or crowded, and the repetition of shape or not (Alsudani & Casey, 2009: 512). While familiarity in user interaction and sites is associated with the easy navigation of user interface to access (Lehtonen, et al., 2006: 6). Then the indicator of freshness in site design is an important aspect to keep users emotionally in order to remain vibrant down the site. The visual appearance that monotonous and boring sites tends to be abandoned by users (Rosenholtz, Dorai, & Freeman, 2010: 14). In addition to the visual display, the content sites that consist of visual and information needs to be updated to make the site remain dynamic (Chovancek, 2012).

The display of futuristic site shows that the capacity of site on interactivity and dynamic element (Beaird, 2007). Interactive site is indicated by featuring the chat system, for example chatting with a physician. Then the dynamic element of the order of visible graphic and moving health sites can make good impression to invite the reader involved in the situation. Meanwhile, on the sharpness indicator, the display site is important to understand the user's ability to distinguish basic colors and themes which consisting of primary and secondary colors (Aro, 2014). The proportion of color sharpness allows users to differ the buttons and navigation of the site so as to facilitate access. Indicator of valuable site includes visual aesthetics, information content, the availability of existing links and keywords on search engine optimization (Tarrant, 2007: 19). Valuable indicator is often used as a reference to redesign the display of the site. Users rate a worthless sites tend to have a negative emotional reaction.

Variable of information content is reduced to four indicators: accuracy, authority, objectivity and circumstances. Accuracy is judged by the quality of existing content on health sites. The good articles are well-written without typos as well as information provided is clear and easy to understand. Factual data and verified information give a positive

impression and will be considered as a credible source by the reader (Lederman, Fan, Smith, & Chang, 2014: 16). In addition, authority relates to the author of the article who has medical background. The site that presents a list of contacts tends to be trusted. Objectivity can be observed from the purpose of articles. Any content that includes sponsorship or advertising in health articles will be concerned by the reader to determine the objectivity of the information content (Walther, Wang, Loh, 2004). Moreover, indicators of information content refer to the renewal of the availability information on health sites. Any updating of health articles and relevant topics based on the recent issues also determine the credibility of health sites (Metzger, et al., 2007: 293).

The credibility variable consistently have three indicators: expertise, trust and interest. Expertise explains the role of health sites that is trying to be alternative solutions to health problems (Cross, 2004: 427). Trust is associated with goodness and moral sources believed to be reliable (Fogg, et al., 2001: 61). Then, interest is related to the interaction between the user and the site, usability and loyalty to access the site. Interest in the visual design of the site is an important component in interacting with digital artifacts (Raptis, Tselios, Kjeldskov, and Skov, 2012: 127). User's interest to the site display is one of the acceptance factors on usability (Pourabedin & Nourizadeh, 2013: 675). Pourabedin and Nourizadeh also stated that atractive and interest site design can be accepted by user as a site that has credibility.

Results of linear regression testing on the first hypothesis (H1) indicates that the visual design variable affects the credibility variable of health sites. The result of R Square showed 0.590 which means the testing of H1 is accepted. Furthermore, the second hypothesis (H2) also showed a moderate number of linear regression testing on the influence of the information content on the credibility of health sites (R Square = 0.696). While the third hypothesis (H3) is conducted by multiple regression testing showed that variables of visual design and information content explained 70.3% toward credibility (R Square = 0.703).

The presence of new media technology transforms the conventional way to get information, including health information. Health site replaces the conventional way health information such as from the physician or hospital. The number of health sites increases and is managed by various parties, such as government and independent agencies. Even many health sites are also managed by the private that have economic purpose (Lederman, Fan, Smith, & Chang, 2014: 13). For privately managed health sites, the display ads or sponsored message included in the elements of the article may reduce the quality of information. Health sites also serve as a consultation place like a medical place or hospital. Under article 23 of the Code of Ethics Indonesia Hospitals (KODERSI), hospital is banned to have advertising which aims to gain profit or commercial including 'hard selling'. However, health sites are not regulated in the code of ethics so as to give opportunities online sites accepting advertisings.

Health sites which have low quality or unreliable information lead to potential malpractice on the reader (Walter Wang, Loh, 2004: 24). For example, someone is seeking information treatment of abdominal pain, but after a suggestion from the article the person got the disease worsens (Eysenbach, 2008: 123). This has encouraged the important of credibility assessment on health sites.

A series of experiments testing and statistics prove that the credibility of the health site is affected 70.3% by variables of visual design and information content. Visual design of the site gives the first impression for the reader. The first impression is a critical time to assess the ability of the overall site, including credibility (Alsudani & Casey, 2009: 512). In general, the display of visual design affects the credibility of health sites (Fogg & al, 2003: 1). In addition, the aesthetics of the site determines the user's perception of the overall content contained on a website (Hundley, 2009: 425).

The two variables that affect the credibility in linear regression is not in a balanced position. The information content variable is more affecting the credibility than the visual design variable of health sites. The quality of information is the most considered by the reader is assessing the credibility of the site. This finding is also supported by Lederman and his colleagues (2014: 20) which states that the trust of reader on the health site is based on the offered content of health information.

There are three types of information that sought readers when accessing health sites, namely medical information, experiences and non-medical factual information. Medical information is scientific information of medical

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science related to disease or health condition of the human body. Experience information is information that comes from the experience of others who suffer from certain diseases. Readers who have health problems, with themselves or their relatives, trying to find people who have similar experiences. By sharing the experience, these people learn the similar problems and get to know each other. For example, cancer patients will be looking for the experience of people who have similar diseases to know the experiences of others. Non-medical factual information relates to factual condition about the condition of treatment. How to claim the insurance or how to proceed the hospital administration could be examples of non-medical factual. This information helps other readers who have never experienced the same issues (Lederman, Fan, Smith, & Chang, 2014: 21).

Lederman (2014: 16) identified the criteria of reliable information from reader perspective on health site. There are four criteria for health information: the quality of arguments, verification, competence of contributors and group consensus. The quality of argument is determined from the logic of health information in the article. Then verification is related to the verified of health information on the site based on other resources or the knowledge of the reader itself. While mean contributors competence is based on the order of good writing. Good article writing style reflects the competence of the author of the article. It also relates to the profession of article contributor, physician, medical workers or not. Group consensus is the information that is agreed upon by the trustworthy group around the reader. Therefore, among four criteria, the verification of health information on the site is the most important for readers to determine the site credibility (Lederman, Fan, Smith, & Chang, 2014: 21).

Conclusions

Health sites as a source of contemporary information requires credibility associated with expertise, trust, and interest. Nevertheless, the credibility of health sites have been affected by accuracy, authoritativity, objectivity, and up to date of information content. At the same time, it is also important to have the display of visual design that shows good conciseness, beauty, elegance, intimacy, freshness, futuristic, sharpness, and aesthetic or appreciation.

This article shows that the indicators of credibility are still contextual and deserve to be discussed in further studies. Meanwhile the indicators of information content and visual design can be adapted according to the context. Therefore, further studies should be considered to test constantly the indicators of information content and visual design based on a particular context. Moreover, the results of this study showed that there are approximately 29.7% of unidentified variables. Therefore, further analysis is required to explore other factors such as portal services, domain suffix, privacy, and quality of the organization or domain name (Wogalter & Mayhorn, 2008: 75) to make the site as a source of contemporary information and media that has credibility for its users.

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