

# Presage Criteria for Blog Credibility Assessment using Rasch Analysis

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## ABSTRACT

*Credibility is an entrance path to trust model environment and its impact is so tremendous to the blogosphere and real world. The natural unique of blogs features compared with ordinary websites, the rise of information propagation through blogs and the scarcity of blog credibility research have sparked the impetus to investigate blog credibility assessment. This paper presents an exploratory study to identify credibility factors used by local blog users in assessing blogs. Our survey respondents are from local university that consisting of academic staff and students who are computer and Internet literate. Data was analyzed using person-item distribution map (PIDM) Rasch analysis. The results indicated that 75% credibility criteria, which was validated using misfit item, are preferable for assessing blog credibility. However, only 46% credibility criteria, which was validated using person gap difference, are acceptable. It also shows that update blog content, reputation of blog authors as well as recognition and performance of blog site are inapt criteria to assess blog credibility. In spite, most of our credibility criteria are fit to formulate our new blog credibility model. Our study also suggests that Rasch analysis is significantly worthy to validate criteria that most of previous researches employed descriptive statistics and factor analytic approach'.*

**Keywords:** *Blogs, Blog Users, Credibility Assessment, Rasch Analysis*

## Introduction

In the early emergence of blogs in 1999, many studies are concerned with the impact of blog usage to the existing and future Internet users. The boundless Internet users can post their free voices on the blogs so

that their opinions conspicuous. Internet users forward and re-forward many opinions on immense topics, which discussed from variant of personal or international perspectives, among them. This two-way instant communication encourages dynamic and emotional actions among Internet users.

These unique traits of blog make blogging become a new phenomenon in the Internet. The numbers of blogs and blog posts is rising. According to BlogPulse, there were 101,645 new blogs and 1,058,897 blog posts indexed in the last 24-hours.<sup>1</sup> The heat of blogging attracts millions of Internet users becoming blog users. According to ComScore March 2008, there were 346,000,000 people globally who read blogs.<sup>2</sup> It shows that the blogosphere is vibrant.

The dynamic blogosphere is comprised of credible and not credible information that difficult to distinguish (Goodman & Lin, 2007; Hilligoss & Rieh, 2007). Blog users with unlimited characteristics may use various criteria to process their credibility judgment on both blog sites as well as information sources inside the blogs. Besides, different blog users perceive blogs differently and generate different acceptable viewpoints (Mohd Rajib Ghani, 2010). Among the potential blog users' decisive factors utilized for blog credibility assessment are criteria based on blog authors who create the blog content, blog sites where the information published and blog content of that information are conveyed.

This paper discusses the preferred blog credibility criteria by visualizing the selection patterns in two ways. First, the researchers visualize the exploratory findings through graphical maps based on blog authors, blog sites and blog content. Second, we generate the users profiling based on gender and either blog users or non-blog users.

## **Related Work**

Since Aristotle, credibility has been examined as a factor influencing receivers' perceptions, attitudes, and behaviours from communicators (McCroskey & Young, 1981) that can be in a form of people, animals or things such as books, media, computers and web applications. These perceived communicators can convey with their receivers through such various contents or information such as speech, writings, texts, videos, pictures, signals and symbols. The terms source, message and medium have also been considered as communicators in some credibility studies. Yet, the new advance and dissemination of information and

communication technologies using the Internet and Web applications such as blogs has invigorated attention in this relatively old construct (Burbules, 2001; Fogg, 2003; Rieh & Danielson, 2007).

Blogs as one of Web 2.0 applications get outstanding interest from Internet users all over the world as one of powerful democratic (Ruggiero, 2004) information sources. Many persuasion researchers from various domains probed blog credibility issues such as profusion of content (Hillan, 2003; Tanaka, 2010), unidentified or pseudonym blog authors (Hillan, 2003; Litman, 2002; Takhteyev, 2004), unawareness of blog users (Tanaka, 2010) as well as bogus images and videos (Tanaka, 2010).

Blog credibility is not crucial in the early stage of blogging phenomena. In Malaysia, blog credibility drew attention to many researchers during 2008 Malaysian General Election (Ibrahim Suffian, 2008; Maznah Mohamad, 2008; Smeltzer, 2008) which similarly happened to the United States in 2004. Yet, two years earlier, Malaysia's blog credibility was first pointed out on how to evaluate opinions disseminated on problems of cloning in the blogs (Adnan Hussein, Hamidah Abd Hamid & Siti Hajar Abd Aziz, 2006). It exhibits that blog and election share a collective objective – democratic voices can be heard.

### **Defined Credibility**

The most found definition of credibility is a perceiver-based construct (H. Gass & S. Seiter, 2003; J.O'Keefe, 2002). Credibility is a multidimensional construct that represents a composite of several characteristics that perceivers perceive in a source (Fogg & Tseng, 1999; H. Gass & S. Seiter, 2003; McCroskey & Young, 1981). Credibility is not only perceptual phenomenon (H. Gass & S. Seiter, 2003; J.O'Keefe, 2002) but also situational or contextual phenomenon (H. Gass & S. Seiter, 2003). Besides, credibility is dynamic or can change over time (H. Gass & S. Seiter, 2003).

In computer science, the popular definition of credibility is believability (Fogg & Tseng, 1999). Thus, a credible blogger is believable blogger and credible blog is a believable blog. Later, Human Computer Interaction (HCI) researchers defined credibility as a characteristic of information sources that influences message persuasiveness, attitudes toward the information source, and behaviours relevant to message content, consisting of two primary dimensions: expertise and trustworthiness (R. Danielson, 2006).

## **Credibility Assessment Theory**

Persuasion researchers have tried to determine essential dimensions of credibility by using a statistical analysis known as the factor analytic approach (A. Hamilton, 2007). Others used SMCR model (Berlo, 1960) by assessing the role of source, message, channel and receiver (thus, the acronym) variables that may influence users perception concerning credibility. Some treated credibility as peripheral cues to persuasion that applied Elaboration Likelihood Model (Fogg, 2003; Hilligoss & Rieh, 2007), Prominence-Interpretation Theory (Fogg, 2003) and heuristic principles (Hilligoss & Rieh, 2007).

The Elaboration Likelihood Model (ELM) was designed by Petty and Cacioppo in 1979. ELM assumes that elaboration exists when people generate positive thoughts when exposed to strong arguments, and negative thoughts when exposed to weak arguments (Bhattacharjee & Sanford, 2006; Fogg, 2003).

Fogg's Prominence-Interpretation theory (2003) consists of two core components: prominence and interpretation. Prominence represents a web site element noticed by users. Interpretation represents user's decision on the noticed web site element whether it is credible or not. Fogg's theory was also relevant with Elaboration Likelihood Model.

The unifying framework of Hilligoss and Rieh (2007) contained three levels credibility assessment for evaluating credibility of the Internet-based sources: construct, heuristic and interaction. They defined their heuristic level as general rules of thumb for Internet users, did quick assessment by looking at the general credibility indicators while interaction level required specific credibility indicators.

## **Blog Credibility**

The current blog credibility studies (T. Johnson & Kaye, 2004; Thomas J. Johnson & Kaye, 2010; T. J. Johnson, Kaye, Bichard, & Wong, 2008; Rahayu Ahmad & Lutters, 2011; Rubin & Liddy, 2006; Ulicny, J. Matheus, & M. Kokar, 2010) employ various credibility criteria, which are dependent on the domains and objectives of the researches.

In comparing blogs with other media in political news, Johnson and his teams (2004, 2008 and 2010) used believability, fairness, accuracy, depth, reliance and political involvement criteria. Their research showed that reliance was the only strong factor for blog credibility. However, the reliance factor did not clearly associate with blog authors, blog site or blog content as our study aims.

For mining Malaysian socio-political news blogs, Ulicny and his researchers (2010) adapted the SMCR model and used accountability, authority, experience and engagement criteria to evaluate blog authors individually and established the value calculated as either the blog was credible or not. Alas, the extracted attributes of these credibility criteria were from distributed system that cannot distinguish facts from fictions (Goodman & Lin, 2007). Thus, the attributes used to calculate credibility for each criterion may or may not affect blog users' perception especially blog users from local blogosphere.

In identifying suitable blog's credibility criteria for future Natural Language Processing (NLP), Rubin and Liddy (2006) used evidential theory to propose trustworthiness and expertise criteria to evaluate blog author, quality criterion to evaluate blog content and personal nature criterion to evaluate blog site. However, there was no empirical evidence on those criteria.

Later, Rahayu Ahmad and Lutters (2011) combined believability, bias, persuasiveness and interest criteria from Flanagan and Metzger (2000) and eight attributes from Rubin and Liddy (2006) to investigate what makes blog credible. They provided empirical evidences on five out eight attributes from Rubin and Liddy (2006) that showed moderate and weak correlation to blog believability, while the other three attributes were not stated. These empirical evidences are only related to the quality of blog content and personal nature of blog site.

The above reviews show that the acceptable blog credibility criteria for either universal or local blogosphere are yet unattainable. Besides, the local blog credibility research is the most lacking. Thus, we want to focus our blog credibility investigation on local blog users who would give better insights on the local credibility blogosphere. As credibility is the perceptual and situational phenomenon, it is necessary to manage the change in perception of individual blog users that will represent communal perception of all blog users.

## **Rasch Analysis**

The Rasch (1960) determined that the probability of success depends on the difference between the ability of the person and the difficulty of the item. Rasch applied logit, log odds unit, as unit of measurement thus resulting in a linear construct (Sick, 2008). The Rasch model incorporates an algorithm that expresses the probabilistic expectations of an item '*i*'

and person 'n' performances is mathematically expressed as (Azrilah Abdul Aziz, 2010; T. Bond & C. Fox, 2007):

$$P_{ni}(x_{ni} = 1|\beta_n, \delta_i) = \frac{e^{(\beta_n - \delta_i)}}{1 + e^{(\beta_n - \delta_i)}} \quad (\text{Theorem 1})$$

where:

$P_{ni}(x_{ni} = 1|\beta_n, \delta_i)$  is the probability of person n in item i scoring a correct response ( $x = 1$ ); given the person ability,  $\beta_n$  and item difficulty,  $\delta_i$ .  $e$  is the mathematical constant also known as Euler's number and the base of the natural logarithm which approximate value is 2.718.

This can further be simplified by introducing log to this probability and reduced the whole as:

$$\log P_{ni}(x_{ni} = 1|\beta_n, \delta_i) = \beta_n - \delta_i \quad (\text{Theorem 2})$$

Rasch measurement model produces the Wright person-item distribution map (PIDM) where the person and the items are plotted on the same *logit scale*. By high calibre of the same unit scale, then the basic rule of additivity, the correlation person ability ( $\beta_n$ ) to agreement and task difficulty ( $\delta_i$ ), the degree of acceptability can be established (T. G. Bond & C. M. Fox, 2007).

## Methodology

After doing a comprehensive literature reviews, our study has identified four basic components of blogging system as shown in Figure 1. The blogging system depicts the roles or tasks of blog authors and blog users toward blog site, which generally consists of blog posts, blog comments, blogrolls, trackbacks and blog widgets. Thus, both blog authors and blog users should be able to evaluate blog credibility using any noticeable features in the blog.

Our study concentrated on how blog users assess blog credibility based on blog authors, blog site and blog content. This study employed the method of self-administered email-based survey in identifying suitable blog credibility criteria. We chose undergraduate students and staff at the Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Johore because the previous top management of that university

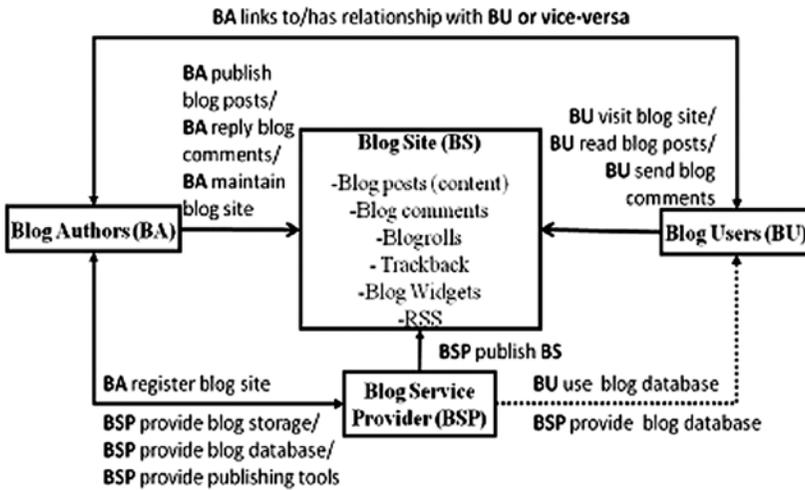


Figure 1: Basic Components of Blogging System

used blogs as one of the alternative communication with the students and staff. Thus, it clearly indicated that research participants would have knowledge and exposure about blogs. Given one-month duration, the participants need to return the questionnaires. Forty-eight responded data were tabulated and processed using Winstep Rasch measurement software (2006) and analyzed via item and person measures.

### Instrument

The questionnaire comprises of 32 credibility criteria (as shown in Table 1) that require respondents to state their agreement (7-likert scale with 1 as strongly disagree to 7 as strongly agree) on criteria to be used for measuring credibility of the blogs. There are three categories of items – blog authors (nine items), blog sites (ten items) and blog content (thirteen items) for blog credibility. In this study, these 32 items measured are called criteria.

### Findings

The survey results presented acceptable credibility criteria in four different analyses based on overall person-item distribution, misfit items,

Table 1: Credibility Criteria

Blog Authors	Blog Site	Blog Content (Posts)
Identity	Privacy Policy	Design/ Structure
Sponsorship	Site Functionality	Focus
Affiliations	Design Look	Accuracy
Credentials/ Qualifications	Performance	Bias
Motivation	Name Recognition	Usefulness
Geography Location/ Country	Past Experience with site	Clarity
Experience	Customer Service	Readability
Reputation	Advertisings	Update
Social Relationship	Affiliations	Writing Tone
	Engagement	Source
		Corrections
		General Suspicions
		General Dislike

person gap differences and person descriptive scale. In this way, we can compare reliability between items and establish the most acceptable items for blog credibility assessment.

### Analysis of Overall Acceptable Items

The Wright PIDM plots the distribution of persons and the items according to respective person and task *logit* location. This provides a clearer picture on the person’s ability to agree ( $\beta_v$ ) and the difficulty accepting the task or item denoted as  $\delta_i$ .

From Figure 2, the level of agreement given by the users for the credibility criteria can easily be established. The central limit theorem states that the mean of a sample average designated as  $\mu_A$ , will estimate the mean of the population denoted as  $\mu_p$ . Thus, the mean of the users can be taken as representative measure of the users.

## Presage Criteria for Blog Credibility Assessment using Rasch Analysis

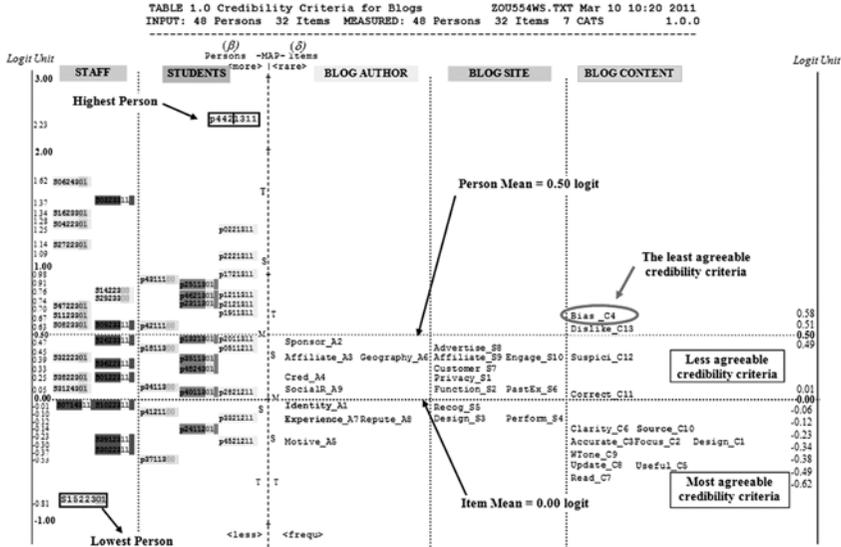


Figure 2: Wright Person-Item Distribution Map (PIDM)

Since we are trying to establish the users' perception to the criteria; the item mean which is denoted as  $\mu_i$  is gauged at *zero* to serve as the reference mark. Substitute the overall average of person ability at 0.50 *logit* and item difficulty of 0.00 *logit* into the probability formula of Rasch (refer to Theorem 1).

$$\frac{e^{(0.50 - 0.00)}}{1 + e^{(0.50 - 0.00)}} = 0.6225 = 62.25\%$$

The validity level of agreement on suggested blog credibility criteria is **62.25%**. This result indicates that on average not all users agree to the credibility criteria suggested.

However, the value of Cronbach Alpha provided by Rasch is 93% which indicates a high reliability as shown in Figure 3. Thus, further investigation can be done by calculating the probability of agreement (T. Bond & C. Fox, 2007) of each item by the users.

TABLE 3.1 Credibility Criteria for Blogs	ZOU554WS.TXT Mar 10 10:20 2011
INPUT: 48 Persons 32 Items MEASURED: 48 Persons 32 Items 7 CATS	1.0.0
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Person RAW SCORE-TO-MEASURE CORRELATION = .99 (approximate due to missing data)	
CRONBACH ALPHA (KR-20) Person RAW SCORE RELIABILITY = .93 (approximate due to missing data)	

Figure 3: Summary Statistic on Face Validity Test

### Analysis of Acceptable Items Based on Misfit Item

The research refers to the common *logit* scale, which the same scale used in measuring both person ability and item difficulty, comparing both variables on the same interval scale.

The spread of *logit* scale from Table 2 shows that maximum value is at +0.58 *logit* and the minimum value is at -0.62 *logit*. The difference between maximum *logit*<sub>max</sub> where **Bias** is and the minimum *logit*<sub>min</sub> where **Readability** is located is  $\delta = 1.20 [0.58 - (-0.62)]$ . This indicates that the item difficulty of the credibility criteria spread over 1.20 *logit* unit.

Credibility criteria were then check on the point measure correlation (PTMEA Corr) with acceptable parameters are between 0.4 and 0.8 (Azrilah Abdul Aziz, 2010). Table 2 shows that all credibility criteria are within the PTMEA Corr range except **Bias** and **General Suspicions**.

Rasch requires further verification by looking at the OUTFIT column for mean square value (MNSQ) where value is between 0.5 and 1.5 (Azrilah Abdul Aziz, 2010). **Privacy Policy**, **Corrections** and **Update** were found in this parameter.

Further checking is done on the Z-std value where value z should be between -2 and +2 and results show that **Privacy Policy**, **Corrections**, **Update**, **Name Recognition**, **Performance** and **Reputation** is within the set value.

Based on our analysis above and Figure 4 below, 75% items are acceptable criteria for further analysis **except** for:

1. one from blog authors criteria: **Reputation**
2. three from blog site criteria: **Privacy Policy**, **Performance** and **Name Recognition**
3. four from blog content criteria: **Bias**, **Update**, **Corrections** and **General Suspicions**.





Table 3 below summarizes the comparison between the two extreme perceptions on the credibility criteria. The common agreeable credibility criteria are Identity, Motivation, Experience, Reputation, Name Recognition, Performance, Design Look, Structure Content, Focus, Accuracy, Usefulness, Clarity, Readability, Update, Writing Tone and Source.

Table 3: Comparative Evaluation on Extreme Perceptions of the Credibility Criteria

Highest person (p4421311)	Lowest person (S1522301)
Agreement <i>logit</i> at 2.23	Agreement <i>logit</i> at -0.81
Agrees on ALL the credibility criteria	Agrees only 46%
Probability agree on <b>Bias</b> criteria at 84%	Probability agree on <b>Bias</b> criteria at 20%
Probability agree on <b>Readability</b> criteria at 95%	Probability agree on <b>Readability</b> criteria at 45%
Gap difference of 11%	Gap difference of 25%
Average probability agree at 90%	Average probability agree at 31%
Both the users agree to criteria; <b>Identity, Motivation, Experience, Reputation, Name Recognition, Performance, Design Look, Structure Content, Focus, Accuracy, Usefulness, Clarity, Readability, Update, Writing Tone and Source.</b>	
The common agreeable credibility criteria is 46%	

### Analysis of Acceptable Items Based on Person Descriptive Scale

Notable information from Table 3 will be used to develop the key and fundamental profile based on their classification which is called ‘Descriptive Scale’. The descriptive scale is depicted in Figure 6.

It is observed that 48% respondents which are all in **Profile 1**, agree that credibility assessment need to have all the credibility criteria prescribed in this survey. The **Profile 1** consists of:-

- 83% is blog users and 17% is non-blog users
- 65% female and 35% male respondents
- 87% female and 75% male blog users.

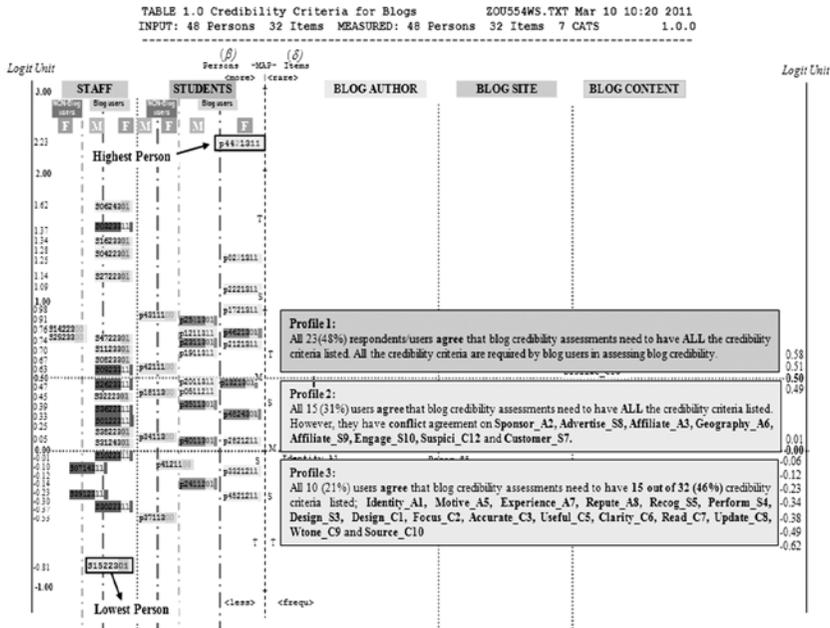


Figure 6: Development of Descriptive Scales on Credibility Criteria Profiles

Meanwhile, the Profile 2 of 31% agrees on all the credibility criteria but with some disagreement. The Profile 2 consists of:-

- 87% is blog users and 13% is non-blog users
- 60% female and 40% male respondents
- 100% of female and 67% of male blog users

The **third profile**; 21% agree only to 15 criteria and disagree at 17 criteria prescribed in the survey. The **Profile 3** consists of:-

- 80% is blog users and 20% is non-blog users
- 60% female and 40% male respondents
- 100% of female and 67% of male blog users.

From all the above three profiles, it is observed that 83% of our respondents are blog users whose knowledge and experience about blogs are acknowledged in judging the credibility criteria. More noteworthy that our analysis based on person gap differences show that both the highest and lowest persons are blog users. Our study also shows that a higher percentage of female than male blog users agree on all credibility criteria to be used in assessing blog credibility.

## **Discussion and Conclusion**

From the exploratory analysis, we discovered four credibility criteria which turn up as rejected items in the analysis based on misfit items and as accepted items in the analysis based on person gap differences. These four items represent one credibility criteria from blog authors (**Reputation**), one from blog content (**Update**) and two from blog site (**Performance and Name Recognition**). By excluding these four items, we can conclude that the other 28 prescribed credibility criteria are acceptable items to be used in assessing blog credibility.

From blog users perception, eight criteria for blog authors, eight criteria for blog site and twelve criteria for blog content are suitable for determining blog credibility. The updating blog content is rejected possibly because updating activity is transparent through the blog post and archive features. Whilst, the reputation of blog authors and name recognition of blog site criteria are cast off probably because they are complementary to each other. The performance criteria for blog site may not be suitable because current statistics features in blog site are typically features used in traditional websites.

The Rasch measurement model gives profound and intensity analysis on blog credibility criteria and respondents of the research. Credibility criteria can be deeply analyzed using various methods in order to validate the reliability of each criterion being accepted. Rasch also helps us in generating the users' profile that indicates the pattern of person preferable which blog credibility criteria. Importantly, both items and persons measured use the same *logit* unit that guarantee consistent and reliable measurement throughout the analysis.

The results in this study would be useful for future research in investigating factors that could influence the behaviour for local *blog* users, who IT literate and Internet users, in seeking and using blogs as the credible information source. Therefore, in the next stage of our study, the selected credibility criteria from the above findings are employed in our new proposed blog credibility model and the success of the model shall be investigated.

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