How Do Students Trust Wikipedia? An Examination across Genders

Introduction

The academic community has begun to pay considerable attention to how students use Wikipedia (Lim, 2009). Many early studies make unfavorable observations about its use. For instance, Giles (2005) reports that Wikipedia content contains more inaccurate information than other online versions of the Encyclopedia. Magus (2006) concurs in this observation but states that "this does not mean that Wikipedia is worthless or that we ought not to use it at all. Yet, it does mean that we should be wary of it and that we should try to develop methods which are suitable to it" (p. 7).

Trustworthiness is the main concern raised by researchers, who have been reluctant to give credit to Wikipedia because its content lacks authority and credibility (Denning, Horning, Parnas, & Weinstein, 2005; Luyt, Aaron, Thian, & Hong, 2008; McGuinness et al., 2006). In academia, Chen (2010) reports that many faculty members still do not consider Wikipedia suitable for teaching and research because of the lack of credibility and reliable sources. This is, however, beginning to change, with Wikipedia now considered as a potential knowledge resource for those faculty

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members who are conversant with online sources. For instance, Bravo and Young (2011) report that many teachers show less concern about Wikipedia after learning about how it works and how it can be used as a form of collaborative practice to work on assignments. In the field of psychology, Schweitzer (2008) concludes that students consider Wikipedia to provide them with comprehensive information about psychology topics, but it is reported that students are still restricted to using it for personal and school-related activities and not as a formal reference in academic work. Therefore, Harouni (2009) suggests that teachers should develop a critical research strategy for how students should use Wikipedia as background knowledge for their research. Knight and Pryke (2012) also conclude that students generally use Wikipedia as an initial source of investigation for background information about, and definitions of, a subject despite the fact that its use is prohibited by professors. In library science, Maehre (2009) also reports on the negative perception of Wikipedia in a university campus and proposes that faculty should not simply ban students from using Wikipedia but encourage them to use it as a source of "thinking process" which takes into account concerns about its accuracy. In comparing conventional library helpdesks with the Wikipedia reference help desk, Schachaf (2009) analyzes service quality using the SERVQUAL scale and reports that Wikipedia generally outperformed the traditional reference service in terms of information completeness

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and responsiveness. Thus, it is not surprising to note that Bawden et al. (2007) strongly recommend that all librarians should now be familiar with the shift to using Wikipedia technology.

We strongly believe that it is important for both academics and librarians to gain a full understanding of how students actually trust the information in Wikipedia. In addition, Midha (2012) recently reports that males and females approach online trust differently. Lim and Kwon (2010) compare the effect of gender on Wikipedia use and report that males perceived exploring and using Wikipedia more positively, had more belief in it, and displayed more stable emotional usage; they also showed a higher expectation of, and confidence in, the quality of the information on Wikipedia and saw it as less risky than did females. Lately, the study of such gender effects has shifted to focus on "gender-based differences in decision making process about technology" (Venkatesh & Morris, 2000, p. 34). For instance, many researchers have studied the moderating effect of gender on the use of web technology such as blogs (Zhang, Lee, Cheung, & Chen, 2009), mobile learning (Wang, Wu, & Wang, 2008), Internet Service Provider (ISP) selection (Sanchez-Franco, Ramos, & Velicia, 2009), and e-learning (Chu, 2010). One important observation made in these studies is that the gendered perception of technologies is strongly dependent on their different applications and working environment (Ahuja & Thatcher, 2005). In this paper, we

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propose the following research questions:

Q1: How do students trust Wikipedia?

Q2: Does gender have a moderating effect on the association between students'

perception of trustworthiness towards Wikipedia and Wikipedia use?

This research is important for the following reasons. Firstly, mass collaboration

via Wikipedia is among the most popular ways of sharing and adopting information

online (Fallis, 2008). Secondly, many educators are encouraging students to learn

from one another using collaborative learning activities via Wikipedia (Bravo &

Young, 2011). Thirdly, the schematic processing of males and females is different

and hence so is their approach to Wikipedia (Bem & Allen, 1974). Lastly, Hazari et al.

(2009) claim that future enterprise systems used as management tools will be based on

Web 2.0 that accommodates the collaborative features of social computing like

Wikipedia.

In the following sections, we present a conceptual review of trustworthiness and

its structural dimensions, followed by a report on the validation of the instrument and

the study design, and a discussion of the findings and their implications. The final

section discusses the limitations and conclusions of the study.

Theoretical background

Conceptualization of Trustworthiness

McKnight et al. (2002) defined trustworthiness as the confident perception by a truster that the trustee has certain attributes to serve the truster in a beneficial manner. This widely cited definition embeds "attributes" as one critical component of trustworthiness. Each of these attributes contributes to the confidence held by the truster that the trustee is willing and able to fulfill the trust.

Past studies point out that it is important to understand the clear distinction among the definition and formation of trustworthiness and trust (Akter et al., 2011). Trust is generally defined as a willingness to depend on a trustee, while trustworthiness is the attributes of the trustee that influences one's trust (McKnight, Choudhury, & Kacmar, 2002a). As McKnight et al. (2002b) stated, "Trusting beliefs are perceptions of the trustworthiness of the object of trust" (p.303). Therefore, trustworthiness forms the foundation of one's trusting belief. Trusting belief and trusting intention together constitute one's trust (McKnight et al., 1998). In other words, trustworthiness affects people's trusting beliefs, which, in turn, impacts people's trusting intentions towards trust related behaviors (Fishbein and Ajzen, 1975). Therefore, trustworthiness (i.e., attributes of trustee) plays a distinct role from trust (i.e., trusting belief and intention) in people's decision-making process. The blending of trust and trustworthiness may result in misinterpretation of behavior antecedents in

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certain context.

Although trustworthiness and trust play distinct roles in affecting people's decision-making, they are two closely related concepts. According to Hardin (1996), the best device for creating trust is to establish and to support trustworthiness. Yamagishi and Kakiuchi (2000) also point out that, assessing another person as trustworthy makes the trustor be willing to take a risk and make himself/herself vulnerable to the actions of the trustee. This means that an individual must firstly assess the trustworthiness of another person in order to determine how much to trust that person. Therefore, to benefit from the positive outcomes of trust in Wikipedia, it is critical to gain a better understanding of information trustworthiness. Most past research has already confirmed a positive relationship between information trustworthiness and trust in online environment (e.g., Rahimnia & Hassanzadeh, 2013) and in the Wikipedia context (e.g., Kittur et al., 2008). This study aims to focus on gaining in-depth understanding of trustworthiness and its impact on trust-related behaviors.

The concept of trustworthiness has been addressed in a broad range of research areas such as IS, e-commerce, sociology, marketing and organization theory. The attributes that contribute to trustworthiness vary according to the context of the relationships in different disciplines they are applied in (Lewis & Weigert, 1985).

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However, as noticed, some past research did not generate clear distinguish between trust and trustworthiness, thus resulting in confusion with regard to the multidimensional constructs of these two concepts. For example, in the study of Gefen and Straub (2004), e-commerce trust was captured with the dimensions of trustworthiness proposed in previous study (McKnight et al., 1998). More recently, the study of Luo et al. [39] did not differentiate trust attitude and trust belief, and instead they equated perceived trustworthiness toward a bank and the intention to trust a bank.

Previous literature posited that trustworthiness should be treated as a set of attributes about the trustee that has affects consumers' overall trust and behavioral intentions (Gefen, 2002; McKnight, Cummings, & Chervany, 1998; Palvia, 2009). Serva et al.'s (2005) study pointed out that trustworthiness is formed by multidimensional constructs instead of a one-dimensional construct. Aligned with this multidimensional view, the previous literature has considered trustworthiness a set of attributes that include integrity, benevolence and ability (Gefen, 2002; McKnight, et al., 2002; Palvia, 2009); competence, positive intentions, ethics and predictability (Kelton, Fleischmann, & Wallace, 2008); fairness, dependability, and openness (Schurr & Ozanne, 1985); and credibility and benevolence (Ganesan, 1994). All of these dimensions tend to measure the trustee's ability and willingness to fulfill

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promises and serve the truster in a beneficial manner.

Trustworthiness of Online Information

During a user's process of deciding whether to use information from Wikipedia, trustworthiness represents the basic information and evaluation the person has about this information source before extending trusting willingness and use intentions. Trustworthiness has been conceptualized as a multi-dimensional construct by previous studies. A most widely accepted way to define trustworthiness of a trustee includes three dimensions: integrity, benevolence and competence (McKnight et al., 2002a). These three dimensions, which highlight the attributes of human beings, are usually used to measure the trustworthiness of a trustee regarding its ability or willingness to fulfill promises. However, in the context of Wikipedia, the trustee is the specific online information, which is contributed by various users. Since information cannot itself extend good will or be vulnerable to betrayal (Chopra & Wallace, 2003), previous trustworthiness dimensions developed in the information systems or e-commerce context would be of limited use or even inappropriate. As an initial step, Chopra and Wallace (2003) proposed that the trustworthiness of information can be reflected in the criteria used to evaluate information quality. The field of information quality research has focused on identifying a variety of criteria to evaluate online information trustworthiness, such as authority, completeness, and consistency (Stvilia

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et al., 2005); currency and relevancy (Yi et al., 2013); objectivity (Arazy & Kopak, 2011); believability, reputation, understandability, and timeliness (Yang et al., 2002); and so on. In order to define the key constructs to measure trustworthiness of online information, Kelton et al. (2008) firstly studied the basic elements of trustworthiness in general contexts. By building an integrated model of trust, their study revealed that trustworthiness encompasses several attributes of the trustee, including competence, predictability, positive intentions, and ethics. Then, by modifying these four dimensions of trustworthiness for the specific case of online information, four equivalent constructs were identified to measure online information trustworthiness: accuracy, stability, objectivity, and validity. "Accuracy" represents the aspect of competence of information (Alexander & Tate, 1999). It measures the believability and credibility of the information, and refers to the extent to which information is free from error. "Stability" refers to the trustworthiness attribute of predictability (Brown & Duguid, 2002). It is the characteristic such that the information could not be easily altered, moved, or deleted without a record of it. "Objectivity" reflects the positive intentions aspect of trustworthiness (Strong et al., 1997). It refers to the idea that the information holds a neutral point of view and contains no deception. "Validity" corresponds to the ethics aspect of trustworthiness (Rieh & Belkin, 1998). It captures the idea that the information was collected through a valid approach and cited

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correctly.

These four dimensions cover the basic criteria of evaluating information quality, and mainly focused on measuring the trustworthiness of information or of the information source (Kelton, et al., 2008). In the context of Wikipedia, users mainly judge the information from two aspects: the information content and the references that were used to produce the information (Lucassen & Schraagen, 2010). Therefore, the above four dimensions of trustworthiness can be best applied in the context of this study to assess how trustworthiness affects users' intentions to adopt information in Wikipedia.

Gender Research on Trustworthiness

Gender has been long recognized as an important issue in online behavior research. Past studies have investigated the moderating role of gender from various aspects such as acceptance of information technology (Ahuja & Thatcher, 2005; Gefen & Straub, 1997), switching behavior (Dabholkar & Walls, 1999; Zhang, et al., 2009), information searching (Burdick, 1996; Hupfer & Detlor, 2006; Kim, Lehto, & Morrison, 2007), and e-loyalty (Sanchez-Franco, et al., 2009). The existing literature has indicated that there are moderating effects of gender in the process that men and women build trusting attitudes. As discussed above, trusting beliefs (i.e., trustworthiness) act as the antecedents of trusting attitude; therefore, we believe that

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gender differences may also exist in perceptions of trustworthiness and how they lead

to behavioral intentions.

More evidences can also be found in online behavior studies. Previous research

has shown that women are more rational and exhibit lower trusting beliefs towards

Internet transactions compared to men (Riedl, Hubert, & Kenning, 2010; Van Slyke,

Comunale, & Belanger, 2002). Riedland et al.'s (2010) study used a laboratory

experiment to capture men and women's brain activities when establishing their

online trust. The results showed that "most of the brain areas that encode

trustworthiness differ between women and men," which implies that women and men

perceive trustworthiness differently. In the context of Wikipedia, one study indicated

that women rate most aspects of Wikipedia lower than men, including beliefs in its

information quality and in the system itself. Furthermore, men are reported to be

more likely to "discount the risks involved when using Wikipedia information." (Lim

& Kwon, 2010, p. 1). These facts imply that the perceptions of trustworthiness in the

Wikipedia context may vary from men to women. Therefore in this study we tend to

focus on the moderating effect of gender on students' trust perceptions towards

information adoption from Wikipedia.

Model development

Fig. 1 presents our research model, which integrates Kelton et al.'s (2008)

multi-dimensions of trustworthiness. We use our model to exam the impact of

trustworthiness on information adoption intentions in Wikipedia, as well as the

moderating effects of gender. The four dimensions of trustworthiness act as the basis

of forming information in Wikipedia. This section addresses the key components of

our research model and their interrelationships.

[Insert Fig. 1 here]

Accuracy

Accuracy (AC) refers to the extent to which information is free from mistakes

(Kelton, et al., 2008). Existing literature has pointed out that the accuracy of online

information should also include how up to date it is, which is an advantage that

Internet sources have over printed sources (Smith, 2011). Previous studies have

established that accuracy is an important criterion for information quality and the

trustworthiness of information. For example, Yin et al. (2008) found that the

trustworthiness of information provided by websites does not depend on how many

facts it provides but on the accuracy of those facts. Stvilia et al. (2005) also confirmed

that accuracy is one of the key attributes that determines whether or not people intend

to trust and use Wikipedia. Therefore, we posit that:

H1: Accuracy is positively related to users' intentions to adopt information from

Wikipedia.

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Stability

Stability (ST) is considered a rather important component of the trustworthiness of online information, since online information is inherently malleable and easily modified (Alexander & Tate, 1999). Unlike printed material, which always stays the same after being published, information in Wikipedia faces the risk of being deleted or moved, making live links into dead links. Thus there is no guarantee that the information one user makes a reference to will still be available next time (Stvilia, Twidale, Smith, & Gasser, 2005). Denning et al. (2005) identified stability as one of the main risks that may prevent users from using Wikipedia. Moreover, Kittur et al.'s (2008) study concluded that providing users with transparency about the stability of information and modifying history increases their judgments of trustworthiness and usage intentions for information in Wikipedia. Thus we posit that:

H2: Stability is positively related to users' intentions to adopt information from Wikipedia.

Objectivity

The criterion of objectivity (OB) measures the extent to which the information is free from misrepresentation, bias and deception (Kelton, et al., 2008). Since the information in Wikipedia is contributed by various users from different regions, it is possible that the contents contain personal opinions rather than objective facts.

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Though Wikipedia claims to hold the absolute and non-negotiable principle of Neutral Point of View, a lot of users still regard this principle as fairly shaky in practice (Scott, 2006). Users may perceive information objectivity as important, especially when there is little knowledge about the source of the information. Therefore, in the context of Wikipedia, belief in the objectivity of information may be a core antecedent of users' intentions to use information. Thus we posit that:

H3: Objectivity is positively related to users' intentions to adopt information from Wikipedia.

Validity

The criterion of validity (VA) refers to the use of standard and responsible practices, such as using a fair approach, containing verifiable data, and citing appropriate sources (Kelton, et al., 2008). Many previous studies on information quality considered validity to be one of the main factors that determine whether people select or reject information (Olaisen, 1990; Rieh & Belkin, 1998). In Wikipedia, users have little knowledge about the credibility of the author, and it is usually hard for them to trace how the author collected such information. Therefore, as one of the key component of the trustworthiness of Wikipedia, belief in validity may help reduce wide-held concerns about the expertise of authors and the credibility of the information source. Thus we posit that:

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H4: Validity is positively related to users' intentions to adopt information from Wikipedia.

Gender Effect

As discussed earlier, there are moderating effects of gender in many aspects of online information searching and adoption. Research on online trust and trustworthiness also suggests that gender differences cannot be neglected. Previous research has used various approaches to investigate and explain gender differences (e.g., Ahuja & Thatcher, 2005; Ragowsky & Awad, 2008; Weiser, 2000; Zhang, et al., 2009).

According to the social role theory (Eagly, Wood, & Diekman, 2000), women and men differ in two dimensions: instrumentality and emotionality. Previous IS studies indicate that men are more task-oriented and motivated by achievement needs (Venkatesh & Morris, 2000). Meanwhile, women are found to care more about emotional perceptions (Gefen & Straub, 1997). Several empirical studies have supported this general observation. For example, Zhang et al. (2009) examined the moderator effect of gender on blog switching behavior, and found that women's decisions to switch blogs were more influenced by satisfaction, which is related to emotionality, and men were more influenced by the relative advantage of alternatives, which is related to instrumentality. Moreover, the study of Smith and Whitlark (2001)

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revealed that men tend to focus on more detailed and useful online information to meet personal needs and interest. Hence it is reasonable to predict that, in their decision-making process of whether or not to adopt information from Wikipedia, men will be more sensitive to emotionality (or affective) factors, and men will be more motivated by instrumentality (or cognitive) factors.

Per the information trustworthiness, McAllister (1995) analyzed it in terms of two aspects: cognitive and affective. The cognitive aspect emphasizes the rational aspects of trustworthiness. This part of trustworthiness focuses on knowledge- and ability-related attributes, such as competence, reliability, and credibility (Chopra & Wallace, 2003). The affective aspect focuses on emotional aspects of trustworthiness, and mainly contributes to the emotional bond between truster and trustee. Examples of the affective dimension of trustworthiness include positive intentions, and ethics (Kelton, et al., 2008).

According to Kelton (2008), the four dimensions of trustworthiness in online information are linked to the corresponding aspect of trustworthiness. On one hand, accuracy corresponds to the competence of a trustee, and stability is reflected as the aspects of predictability. Therefore these two criteria are rooted in the cognitive dimension of trustworthiness, and they emphasize the ability of the trustee to uphold one's trust (Chopra & Wallace, 2003). According to the social role theory, men are

found to be more sensitive to cognitive aspects as compared with women. During the

decision-making process of online information adoption, men will choose to process

trustworthiness attributes of information based on their preferred clues and thus

focuses more on judging the cognitive aspects of information trustworthiness. As

perceived by men, the accuracy and stability of Wikipedia information reflect the

cognitive trustworthiness (i.e., competence and predictability) of a trustee. Therefore,

if men perceive higher levels of information accuracy and stability, they will

experience a higher level of perceptual fluency as compared with women. Such a high

level of perceptual fluency could improve men's evaluation of information

trustworthiness and further motivate their information adoption intention. Therefore it

is reasonable to predict that:

H5: The association between accuracy and intention to adopt information from

Wikipedia will be stronger in men than in women.

H6: The association between stability and intention to adopt information from

Wikipedia will be stronger in men than in women.

On the other hand, objectivity corresponds with positive intentions, and validity

is based on the ethical attribute of a trustee. These two criteria belong to the affective

aspect of trustworthiness because they mainly reflect the trustee's goodwill and moral

principles (Chopra & Wallace, 2003). According to the social role theory, women

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focus more on affective aspects as compared with men. That is, during women's

decision-making process of information adoption, their intention to adopt information

will be more motivated by the affective aspects of information trustworthiness (i.e.,

objectivity and validity). When evaluating Wikipedia information, if women perceive

a higher level of affective aspects of trustworthiness, which is consistent with their

motivation orientation, their emotional experience will be enhanced (Aaker & Lee,

2006). Under such a condition, women's positive emotional experience during

information processing could significantly improve their evaluation of information

trustworthiness and further motivate their information adoption intention. Therefore

we propose that:

> **H7:** The association between objectivity and intention to adopt information from
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> Wikipedia will be stronger in women than in men.

> **H8:** The association between validity and intention to adopt information from
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> Wikipedia will be stronger in women than in men.

Research Method

Instrument Development

In this section, we first describe the development of a trustworthiness scale in the

context of online information, and then test its reliability for use with Wikipedia.

Previous work advocates a rigorous approach for developing and validating an instrument that will produce a highly reliable and valid multi-item scale (Compeau & Higgins, 1995; Moore & Benbasat, 1991). In this study, we followed the work of Cheung and Lee (2000), which uses a simplified version of Moore and Benbasat's (1991) analytical process, to delineate our trustworthiness scale below.

There were three stages in our instrument development process. The first was item creation, which identifies potential items from the literature. Appendix A lists the studies we surveyed and items we identified. A total of 13 items were selected. The second stage was the scale-development or "card sorting" process, in which we invited a group of experts to assess whether the 13 proposed items captured the real nature of the constructs of trustworthiness. After the experts had finished the card sorting process, we calculated the Kappa coefficients and "placement ratio" to measure the level of agreement of two groups: (1) between all experts and (2) between experts and our proposed scale as outlined in stage one. The overall degree of agreement among experts on item assignments was 0.83, indicating high reliability between experts' categorizations (Moore & Benbasat, 1991) (see Appendix B). The placement ratio was 88.5%, which is a highly acceptable value (Moore & Benbasat, 1991) (see Appendix C). We thus concluded the proposed measurement scale would be reliable. Another essential aspect of measurement specification is to understand the

nature of relationships between measures and constructs (reflective or formative), since this choice determines the suitable methods for evaluating the measurement and structural models (Diamantopoulos & Winklhofer, 2001). Based on the definitions of reflective and formative constructs, we conceptualized the constructs of stability, objectivity, and validity as reflective constructs for the following reasons (Petter, Straub, & Rai, 2007): (1) the direction of causality is from constructs to items, such that changes in constructs cause changes in respective items; (2) the items of each construct are conceptually interchangeable since they measure similar aspect; (3) they have to co-vary with each other; and (4) they have the same antecedents and consequences. The construct of accuracy was conceptualized as a formative construct since its four indicators (i.e., the information is accurate, current, verified, and has good coverage) are conceptually distinct and the direction of causality is from indicators to the construct. Appendix D lists the items used for information trustworthiness in Wikipedia. We proposed to measure each using a Likert-scale ranging from 1=strongly disagree to 7 =strongly agree.

The third stage was pilot testing. The main objective of this stage is to ensure that the proposed scale demonstrates an appropriate level of reliability. Since this was an initial test, we kept our sample size relatively small. We invited 40 university students to pilot the instrument. Table 1 shows the number of items and their mean

values. For reflective constructs, we further analyzed their Cronbach's alpha values, and for the formative construct (i.e., accuracy), we computed the variance inflation factor (VIF) for its four indicators to assess its dimensionality. The mean values ranged from 3.92 to 4.88. The Cronbach's alphas for reflective constructs ranged from 0.70 to 0.93, which all exceeded the threshold of 0.7. The VIF values for the four indicators of the formative construct range from 1.17 to 1.74, which are all lower than 10 (Petter et al., 2007). The results of pilot study jointly indicated that the proposed scale had achieved high reliability and internal consistency (Tatham, Hair, Anderson, & Black, 1998).

[Insert Table 1 here]

Based on above, the validated scale includes 13 items; 4 for accuracy (accurate, current, good coverage, and verified information), 3 for stability (susceptible to alternation, deletion from network, and broken links), 3 for objectivity (free from bias, deception and distortion), and 3 for validity (sound collection method, data verification, and citation of sources). The scale can be used in future empirical studies of trustworthiness for Wikipedia and online information in general. The In the next section, we applied the proposed scale in a full test to verify our proposed research model.

Data Collection for Full Scale Testing

To test our research objectives, we used a survey approach to collect data. We developed our questionnaire based on two parts. Part one consisted of 13 proposed items of trustworthiness that we developed and 4 questions of "intention to adopt information from Wikipedia" (i.e., INT) from Palvia's study (Palvia, 2009), with wording modifications to fit our research contexts. Part two collected demographic data, which included our control variables, such as frequency of Wikipedia use, purpose of Wikipedia use, years of Wikipedia use, age, and education level. We prepared our questionnaire using the online software "Qaultrics" and collected data by conducting a Web survey. Lucky draws were offered to encourage a high response rate. We also included a screen question to ensure that our responders had experience using Wikipedia.

In total, 267 students participated. We discarded 43 responses for incomplete information. Therefore a total of 224 usable questionnaires were collected. Table 2 shows the demographic data of our respondents, consisting of 108 females and 116 males. The majority (90%) of students had been using Wikipedia for at least one year. Thus we considered our respondents all experienced users of Wikipedia.

[Insert Table 2 here]

Data Analysis and Results

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We followed a 2-step analytical procedure for data analysis by firstly assessing

the measurement model, and the structural model (Tatham, et al., 1998). This 2-step

approach ensures the high validity of our result on structural relationship derived from

survey method.

Measurement Model Assessment

Following Xu and Chen (2006), we firstly used Confirmatory Factor Analysis

(CFA) to examine the dimensionality of our proposed scale. CFA is an adequate

approach for this type of analysis because it confirms that underlying factors emerge

from the data and the items have a high correlation with the intended construct only.

For reflective constructs, we assess their reliability, convergent validity and

discriminant validity. We evaluated the construct reliability by checking whether the

Cronbach's alpha values and composite reliability values are above 0.7 (Chin, 1998).

As shown in Table 3, the Cronbach's alpha values of constructs range from 0.73 to

0.94, with composite reliability ranges from 0.84 to 0.96, thus indicating that our

constructs demonstrate good reliability. Then we test convergent validity by

examining whether all factor loadings are greater than 0.7 (Chin, 1998) and all

average variance extracted (AVE) values greater than 0.5 (Fornell & Larcker, 1981).

As presented in Table 3, all factor loadings are above 0.7 and our AVE values range

from 0.63 to 0.89, suggesting that our constructs have sufficient convergent validity.

Finally, we tested the discriminant validity by assessing whether the square root of the

AVE for each construct is greater than its correlations with other constructs (Chin,

1998). This test does not detect any anomalies (see Table 4). Overall, our reflective

constructs show good measurement properties in terms of reliability, convergent and

discriminant validity.

[Insert Table 3 & 4 here]

The formative construct should be assessed differently than reflective constructs

because traditional examinations of reliability and validity do not apply well to

formative constructs (Petter et al., 2007). We check for multi-collinearity, weights and

the level of significance for the formative construct of accuracy. We firstly assess

multi-collinearity by estimating the VIF for the four indicators. VIF values for the

four indicators of accuracy range from 1.21 to 2.04, which are all below the threshold

value of 10, thus suggesting that multi-collinearity is not a threat in our data (Petter et

al., 2007). We then assess the indicator weights and their level of significance. A

formative indicator should be retained when its weight is significant. However, an

indicator with a non-significant weight can be retained at discretion of the authors to

preserve the content validity of the construct (Cenfetelli & Bassellier, 2009). The

indicator weights of accuracy range from 0.16 to 0.49**. Overall, this analysis shows

good properties for our formative construct (Chin, 2010).

Structural Model Assessment

We used Partial Least Squares (PLS) to assess the validity of the scale and construct models. PLS is highly suitable for this study because it has relatively low requirements for sample size and no requirement for normal distribution (Chin, 1998). We first validated our model by assessing the effects of five control variables on "intention to adopt information from Wikipedia" (i.e., INT). Results indicated that only one control variable have a significant effect on our proposed model: frequency of using Wikipedia. Thus, we included this variable to assess the structural model below.

Next, we tested the direct effects of the proposed structural model. Table 5 presents the results for control variable, direct effects of four factors of trustworthiness, and their corresponding values of path coefficients, t-values and significance levels. The R^2 of the model was 30.3%. Table 6 summarizes the findings of proposed hypotheses. The results indicate that all direct effects for the full sample were significant, except for the association between objectivity and intention. Thus, hypotheses H1, H3, and H4 were supported, while hypothesis H2 was not supported.

[Insert Table 5 & 6 here]

Gender Effects

To examine the moderating effects of gender, we used the method of sub-group analysis, as proposed by previous studies (Ahuja & Thatcher, 2005; Keil et al., 2000). We obtained the standard error of each significant path and the corresponding standard path coefficient from the PLS results and then calculated the differences of each path between female and male groups using the formula proposed by Chin (2004). Table 7 shows the results of the sub-group analysis. The R^2 values of the model were 29.8% for female sample and 34.5% for male sample. Table 8 summarizes the results of the proposed hypotheses H5-H8. Results showed that H7 was the only proposed gender difference not supported. Hypotheses H5, H6, and H8 were supported.

[Insert Table 7 & 8 here]

Discussions

Implications for Theory and Research

This is one of the very few studies to provide a holistic overview of the underlying drivers of students' trust in Wikipedia. Our results empirically demonstrate the importance of perceived Wikipedia trustworthiness on students' usage intentions. Our study contributes to the literature in three ways. First of all, building on the previous literature about online information, we have developed and verified a new

trustworthiness scale characterized by accuracy, stability, objectivity, and validity. The validated scale can be used in future empirical studies of trustworthiness of both online information and Wikipedia. The scale has 13 items in total: 4 covering accuracy (accurate, current, good coverage, and verified information), 3 for stability (susceptible to alternation, deletion from network, and broken links), 3 for objectivity (free from bias, deception and distortion), and 3 for validity (sound collection method, data verification, and citation of sources).

Secondly, we have tested the significance of our trustworthiness scale on students' intention to adopt information obtained from Wikipedia. All of the factors, except objectivity, are shown to have a direct relationship with intention to use Wikipedia information. Our results show that the accuracy factor had the strongest link with intention (β= 0.204), followed by stability and validity (both β= 0.122). The influence of the objectivity factor was not significant. One possible explanation for this lies in how users treat Wikipedia. Previous interviews with students have confirmed that they consider Wikipedia an encyclopedia that focuses on "factual information to cover the thing or concept for which the article name stands" (Hartmann & James, 1998). They do not pay much attention to whether the information in such an open online environment is presented from a neutral point of view (Scott, 2006).

Thirdly, the study contributes to our understanding of moderating effects of gender in the context of Wikipedia information adoption. We developed our hypotheses based on the dimensionality of trustworthiness and the social role theory. Our results confirm that male students are more motivated by cognitive factors; both accuracy (H5) and stability (H6) affect males' information adoption intentions more than females'. Conversely, validity (H8) but not objectivity (H7) affected female students' intentions more than those of males. These results are reasonably consistent with previous findings that men tend to be more cognitive-oriented and women are more affect-oriented (Venkatesh & Morris, 2000). Using social role theory to understand gender differences in online information adoption may offer new directions for future studies in this area. Many past studies tend to study gender differences in information technology adoption but ignores the role of gender in online information adoption (e.g., Lee, 2011). For information technology adoption, studies generally share the view that men are more driven by utility-based factors (e.g., perceived usefulness) and women are more drive by emotional-based factors (e.g., perceived enjoyment). Our study reveals that, for online information adoption in collaborative information repository such as Wikipedia, similar patterns of gender differences also exist. That is, men are more concerned about the cognitive aspects of information trustworthiness (i.e., accuracy and stability), and women care more about

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the affective aspect of information trustworthiness (i.e., validity). Moreover, past studies investigating gender differences of trust mainly focused on trusting attitudes and intentions (e.g., Ragowsky & Awad, 2008). However, the understanding of how trusting attributes (i.e., trustworthiness) are perceived differently by female and male should also be highlighted in trust literature. Our study analyzed the trustworthiness of online information from the affective-cognitive perspective, and matched them with female and male's motivational focus (emotion vs. utility). Our findings are helpful to explain certain differences exist between women and men regarding the adopting, rating, and sharing of online information. At the same time, our research can help to enrich the trustworthiness research regarding individual differences.

Implication for Practice

Our study may have several important implications for library practitioners. Given the widespread and high-frequency use of Wikipedia in universities, most students are frequent users. As a matter of fact, compared to a university library database, Wikipedia is used more frequently by students (Lim, 2009). Although many scholars point out that the information quality of Wikipedia is not comparable with conventional library sources, the popularity of Wikipedia indicates that university libraries need to acknowledge this phenomenon and pay attention to guiding students to use such an information source appropriately. Our results suggest that information

accuracy, validity, and stability are the most salient factors driving students to use

Wikipedia, so university library and teaching staff should make an effort to help them

evaluate these aspects more effectively. Furthermore, an alternative approach could

be used to promote library sources to students by integrating them with Wikipedia;

such an exercise should emphasize the three most valued dimensions of Wikipedia

trustworthiness (that is, accuracy, validity, stability). An example of good practice

using this approach can be seen in the work of the University of Washington library,

which inserted library sources into the information repository of Wikipedia in order to

reach their students (Lally & Dunford, 2007). On the other hand, responding to Lim's

(2009) call for contributions to find ways to improve the information quality of

Wikipedia, our research offers a systematic approach by considering the four

dimensions of Wikipedia trustworthiness, with empirically validated measurements

serving as guidance.

Our findings also have several important implications for Wikipedia's managers

and designers. Firstly, our results reveal that the level of trustworthiness of its

accuracy, stability, and validity have a direct and positive influence on information

adoption intentions. Editors in Wikipedia could use these criteria to evaluate whether

their information is accurate, stable, and valid. Our model also suggests techniques

that can be used to promote the trustworthiness of information in Wikipedia, such as

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incorporating citations and links to additional sources that verify content, recording the modifying history of information to ensure its stability, guaranteeing efficient and suitably qualified control to users, and publishing a policy clarifying its standards for information trustworthiness.

In addition, Wikipedia managers should be aware of the moderating effect of gender, since men care more about the accuracy and stability of information while women place more value on validity. When encouraging people to adopt certain information in Wikipedia, different strategies could be used for females and males. With the rapid development of Internet marketing, there are now many Wikipedia-like websites in the market, including websites for cars, restaurants, fashion, and magazines. Managers of these informational websites could manage gender segmentation by applying different strategies according to their preferences. Specifically, emphasizing information accuracy and stability could significantly increase male users' trusting beliefs and their adoption intention, whereas promoting the validity of information to female users could more effectively build their trust in the website.

Limitations and Future Research

This study has some limitations that should be considered in terms of future

research. First, we have only considered the framework of four factors of trustworthiness proposed in a previous study; there may be various other factors that could contribute to the trustworthiness of online information. Second, we didn't include trust in our research model. Future studies could consider exploring trust-related contextual factors in the online information context, and study their relationships with trustworthiness and user behaviors. Third, this study was carried out in the specific context of Wikipedia, so the potential for generalization of the theoretical findings to other sources of online information may be limited. Forth, we used a convenience sample of 224 university students. Both the sample size and region could affect the generalizability of our study. Moreover, according to previous studies (e.g., Ahuja & Thatcher, 2005; Zhang, et al., 2009), the effects of gender are closely related to culture. Since Wikipedia is a large online community that contains users from all around the world, the gender differences in our findings may not be capable of being generalized to other regions. In addition, future studies could consider using other research method such as experiment to explore further possible underlying mechanism that contributes to gender differences in this context.

Finally the results also imply that there is more work to be done. As Cohen (1988) states, an R^2 of 15% explains a moderate amount of variance, while 35% explains a large amount. Our moderate R^2 (30.3% for the full sample, 29.8% for female students

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and 34.5% for male students) indicates that additional factors could be incorporated to explain students' intentions to adopt information from Wikipedia, such as perceived ease of use, perceived usefulness, social identity, or social influences.

Conclusion

This study represents an attempt to respond to and assess the growing concerns about trustworthiness in Wikipedia, given its increasing popularity. Furthermore, we address a gap in the research by developing and validating a scale for trustworthiness in online information. This study has also empirically investigated the relationship between perceptions of trustworthiness and students' intentions to adopt information from Wikipedia. Gender differences have also been explored in order to understand the moderating role of gender in terms of the association between students' trust in Wikipedia and their intention to adopt information from Wikipedia. Our results have confirmed that accuracy, stability, and validity are directly related to users' intention to adopt information from Wikipedia. In addition, this study has found evidence for moderating effects of gender in most paths in the model, except for the relationship between objectivity and intention. Consistent with previous research on gender differences (Gefen & Straub, 1997; Venkatesh & Morris, 2000; Zhang, et al., 2009), our subgroup analysis has showed that males are more motivated by cognitive factors (accuracy and stability) in terms of intention to use, while females are more

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influenced by affective factors (validity).

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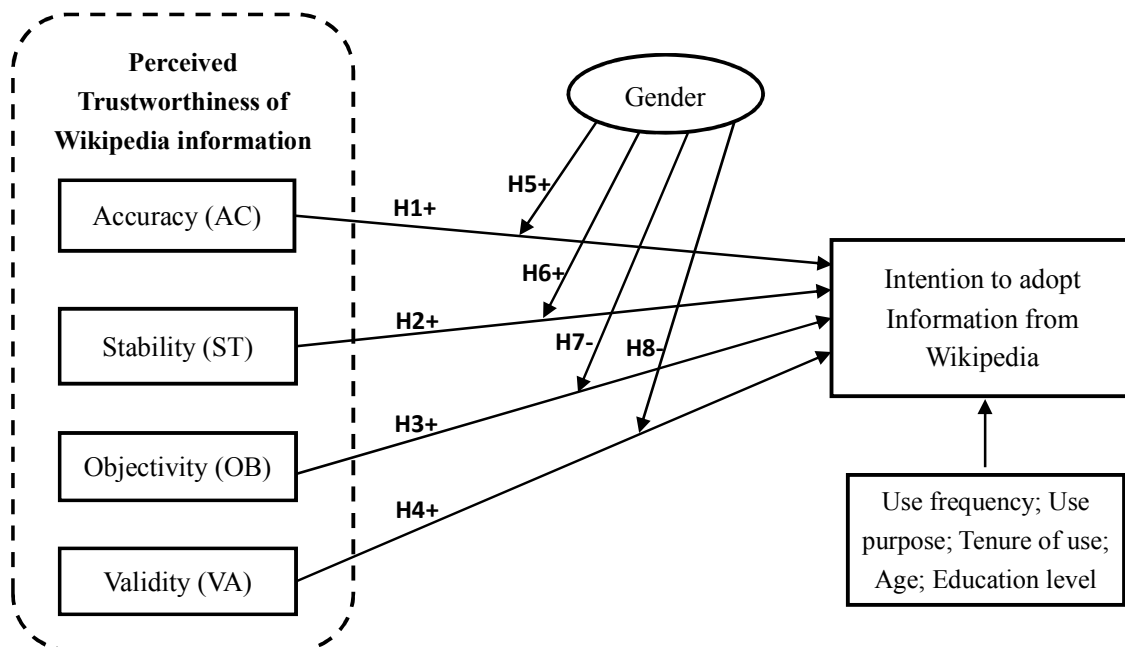
Note: For moderating effects, + (-) indicates that the effect is stronger (weaker) for the male sample than for the female sample.

FIG. 1. Research Model

TABLE 1.Results of pilot test

Constructs	Number of Items	Mean	Cronbach's Alpha	VIF value range
Formative				
AC	4	4.80	-	1.17-1.74
Reflective				
ST	3	4.66	0.70	-
OB	3	3.92	0.93	-
VA	3	4.61	0.75	-

TABLE 2. Demographics of the sample

Control variables	Categories	Female no. (48.2%)	Male no. (51.8%)	Full sample
Years of using Wikipedia	Less than 1 year	2 (1.9%)	6 (5.2%)	8 (3.6%)
	1-2 years	15 (13.9%)	17 (14.7%)	32 (14.3%)
	2-3 years	25 (23.1%)	26 (22.4%)	51 (22.8%)
	3-4 years	32 (29.6%)	23 (19.8%)	55 (24.6%)
	4 or more years	34 (31.5%)	44 (37.9%)	78 (34.8%)
Frequency of using Wikipedia	Several times a day	4 (3.7%)	20 (17.2%)	24 (10.7%)
	Once a day	8 (7.4%)	10 (8.6%)	18 (8.0%)
	Once a week	37 (34.3%)	49 (42.2%)	86 (38.4%)
	Once a month	44 (40.7%)	27 (23.3%)	71 (31.7%)
	Once a year	2 (1.9%)	4 (3.4%)	6 (2.7%)
	Others	13 (12%)	6 (5.2%)	19 (8.5%)
Purpose of using Wikipedia	Academic work	61 (56.5%)	68 (58.6%)	129 (57.6%)
	Personal need	23 (21.3%)	25 (21.6%)	48 (21.4%)
	Entertainment	14 (13%)	17 (14.7%)	31 (13.8%)
	Information for others	8 (7.4%)	5 (4.3%)	13 (5.8%)
	Others	2 (1.9%)	1 (0.9%)	3 (1.3%)
Age	Below 18	19 (17.6%)	12 (10.3%)	31 (13.8%)
	18-20	76 (70.4%)	82 (70.7%)	158 (70.5%)
	20-22	12 (11.1%)	16 (13.8%)	28 (12.5%)
	Above 22	1 (0.9%)	6 (5.2%)	7 (3.1%)
Educational level	Students of Association Degree	15 (13.9%)	31 (26.7%)	46 (20.6%)

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Students of University degree	93 (86.1%)	85 (73.3%)	178 (79.5%)

TABLE 3. Factor analysis results

Constructs	Measures	Factor loading	t-value	AVE	Cronbach's Alpha	Composite Reliability
Stability (ST)	SA1	0.79	5.55	0.63	0.73	0.84
	SA2	0.77	4.26			
	SA3	0.83	6.47			
Objectivity(OB)	OB1	0.91	40.85	0.89	0.94	0.96
	OB2	0.95	95.27			
	OB3	0.96	115.42			
Validity (VA)	VA1	0.84	30.07	0.66	0.75	0.85
	VA2	0.84	23.34			
	VA3	0.76	13.14			
Intention (INT)	IN1	0.83	34.11	0.65	0.82	0.88
	IN2	0.83	33.05			
	IN3	0.79	22.73			
	IN4	0.77	20.21			

TABLE 4. Discriminant validity

	Descriptive data				Correlation between constructs			
	Mean	SD.	Min	Max	ST	OB	VA	INT
ST	4.71	1.12	3	7	*0.80**			
OB	3.90	1.17	1	7	-0.02	*0.94**		
VA	4.63	1.05	2	7	0.07	0.58	*0.81**	
INT	4.90	1.01	3	7	0.22	0.25	0.38	*0.81**

* Diagonal elements in the "correlation of constructs" matrix are the square root of the AVE.

TABLE 5. Hypothesis testing for the full model

Hypothesis	PLS path coefficient	t-value	p-values
Control Variable			
Frequency of using Wikipedia → Intention	$\beta= 0.050$	$t = 3.799$	< 0.001
Structural Model Variables			
(H1): Accuracy → Intention (AC → INT)	$\beta= 0.316$	$t = 4.474$	< 0.001
(H2): Stability → Intention (ST→ INT)	$\beta= 0.181$	$t = 3.266$	< 0.01
(H3): Objectivity → Intention (OB→ INT)	$\beta= -0.043$	$t = 0.658$	> 0.10
(H4): Validity → Intention (VA → INT)	$\beta= 0.159$	$t = 2.040$	< 0.05
$R^2 = 30.3\%$			

TABLE 6. Summary of hypothesis testing

Hypotheses		Supported or not
H1	AC → INT	YES
H2	ST→ INT	YES
H3	OB→ INT	NO
H4	VA → INT	YES

TABLE 7.Results of the sub-group analysis

Construct	Female		Male		Comparison between female and male
	path coefficient	t-value	path coefficient	t-value	
Accuracy (AC)	0.240	2.267*	0.445	4.968**	-15.67**
Stability (ST)	0.117	1.108^{ns}	0.198	2.426*	-6.46**
Objectivity (OB)	-0.031	0.304^{ns}	-0.124	1.297^{ns}	N.A.
Validity (VA)	0.237	2.347*	0.133	1.210^{ns}	7.35**
R^2	29.8%		34.5%		

Note: * $p<0.05$; ** $p<0.01$; ^{ns}: not significant;

Table 8.Summary of hypothesis testing for sub-groups

Hypothesis		Supported or not
H5	AC → INT, men > women	YES
H6	ST → INT, men > women	YES
H7	OB→ INT, women > men	NO
H8	VA → INT, women > men	YES

Appendix A
Literature Review of Item Creation

Model construct	Code	Measures	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
AC (Accuracy)	AC1	The information is accurate.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	AC2	The information is current.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	AC3	The information has good coverage.		✓		✓		✓	✓	✓		✓	✓	✓
	AC4	An editor or someone has verified the information.			✓	✓	✓	✓	✓	✓		✓		✓
ST (Stability)	ST1	The information is susceptible to alternation.	✓			✓	✓	✓					✓	
	ST2	The information may be deleted from the network entirely.	✓		✓	✓	✓							✓
	ST3	The information may be moved to an unknown location.	✓			✓	✓	✓	✓				✓	✓
OB (Objectivity)	OB1	The information is free from bias.	✓			✓	✓	✓	✓	✓		✓	✓	
	OB2	The information is free from deception.	✓			✓	✓	✓	✓	✓				
	OB3	The information is free from distortion.	✓			✓	✓	✓	✓	✓		✓		
VA (Validity)	VA1	Sound methods were used to collect information.	✓				✓	✓		✓			✓	✓
	VA2	The information includes verifiable data.	✓	✓			✓	✓		✓	✓	✓	✓	✓
	VA3	The information has an appropriate citation of sources.	✓							✓	✓	✓	✓	✓

Note: P1: (Kelton, et al., 2008); P2: (Rieh & Belkin, 1998); P3: (Smith, 2011); P4: (Alexander & Tate, 1999); P5: (Wang & Strong, 1996); P6: (Liu & Chi, 2002); P7: (Strong, Lee, & Wang, 1997); P8: (Wilkinson, 1997); P9: (Rieh, 2002); P10: (Arazy & Kopak, 2011); P11: (Yang W. Lee, 2002); P12: (Stvilia, Twidale, Gasser, et al., 2005)

Appendix B
Kappa Coefficients

	Level of Agreements	
Judge	**Judge**	**Kappa coefficients**
1	2	0.90
1	3	0.90
1	4	0.79
2	3	0.79
2	4	0.90
3	4	0.69
Overall		0.83

Appendix C
Placement Ratio

	Actual Categories					
Target Categories	**AC**	**ST**	**OB**	**VA**	**TOTAL**	**TOTAL %**
AC	14			2	16	87.5%
ST		11		1	12	91.7%
OB	1		10	1	12	83.3%
VA		1		11	12	91.7%
Total Placement: 52		**HITS:** 46		**Overall Hit Ratio:** 88.5%		

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Appendix D
Measurement Items for Wikipedia Trustworthiness

Construct	Item
Accuracy	
AC1	The information in Wikipedia is accurate.
AC2	The information in Wikipedia is current.
AC3	The information in Wikipedia has good coverage.
AC4	An editor or someone has verified the information in Wikipedia.
Stability	
ST1	The information in Wikipedia is susceptible to alternation.
ST2	The information in Wikipedia may be deleted from the network entirely.
ST3	The information in Wikipedia maybe moved to an unknown location.
Objectivity	
OB1	The information in Wikipedia is free from bias.
OB2	The information in Wikipedia is free from deception.
OB3	The information in Wikipedia is free from distortion.
Validity	
VA1	Wikipedia uses sound method to collect information.
VA2	The information in Wikipedia has included verifiable data.
VA3	The information in Wikipedia has an appropriate citation of sources.
Intention to adopt information in Wikipedia (Adopted from (Palvia, 2009))	
INT1	I would feel comfortable seeking information from Wikipedia.
INT2	I would feel comfortable receiving free information in Wikipedia.
INT3	I would feel comfortable providing information to Wikipedia.
INT4	I would feel comfortable developing a valuable relationship with Wikipedia.