Personality traits, gender, and information competency among college students

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ABSTRACT

This study examines the influence of personality traits on information competency. Furthermore, it seeks to determine whether or not gender moderates the relationship between personality traits and information competency. Data were collected using standardized survey instruments, including Costa and McCrae's NEO-Five Factor Inventory. The surveys were administered to a convenient sample of 185 college students at a large public university in the southeastern United States. The study results show that three of the five personality traits were significant determinants of information competency among the population sample. Those students, who are more conscientious, open to experience, and extroverted tended to report greater information competency than students who are not. Neither neuroticism nor agreeableness was identified as determinants. Revealing the moderating role of gender, the study uncovers gender-specific personality traits that affect information competency. Specifically, the study finds extroversion to be a male-specific trait and openness to experience a female-specific trait. The results identify conscientiousness as the most consistent and robust determinant of information competency across both genders. The concluding analysis relates the findings' implications to information literacy.

Keywords: Information competence; Information literacy; Information seeking; Personality traits; College students

INTRODUCTION

Competent information literacy (information competency) is essential for effective learning and performance in the 21st century. Recognizing its importance, the Association of College and Research Libraries (ACRL) developed standards measuring information competencies (American Library Association 2000). Collective efforts have been made to equip college students with information competencies in the higher education. Such efforts include implementation of information literacy programmes and defining measures of information competency (Eisenberg and Berkowitz 2003; O'Connor, Radcliff, and Gedeon 2002; Salem and Radcliff 2006).

Despite the efforts to enhance information competency among college students, little is known about the psychological mechanism that can measure it. For example, it is unclear

whether introversion or extroversion play a role in how well someone uses information, whether creativity or conservatism play a role, etc. It seems that disclosing the influence of personality traits, or lack thereof, on information competency is worth investigating. Different from psychological attributes contingent to situation and context, personality is regarded to be fairly stable and predictable and its influences are largely invariable (Phares 1991).

Researchers have examined personality traits to explain information behaviours (Bellardo 1985; Borgman 1989; Halder, Roy and Chakraborty 2010; Heinström 2002, 2003; Hyldegård 2009). Findings suggest possible associations between personality traits and information competency. For example, browsing and wide enthusiastic exploration of information tend to be common among those who are outgoing and open to experience (Heinström 2002). This suggests that such traits increase the opportunity to encounter the information sought. However, researchers have yet to study a direct association between personality and information competency. Therefore, this research attempts to examine such associations.

In addition to the relationship between personality traits and information competency, this research also investigates the possible influence of gender. Literature from multiple disciplines documents gender differences in personality traits (Costa, Terracciano and McCrae 2001). With respect to information behaviour such as Wikipedia use, research reports differences between women and men (Lim and Kwon 2010). Considering the gender differences in information behaviour and personality traits, gender should be taken into consideration to more accurately examine the relationship between personality and information competency.

LITERATURE REVIEW

Information Competency

Competency is a comprehensive term that includes the ability, skill, knowledge, and experience required to perform a specific job or role. A competent person is more likely to perform a job better, in less time, and with less effort than an incompetent person. The terms competency and intelligence are often used interchangeably, but competency is one's functional ability, rather than potential ability, to adapt to one's environment (Saarni 1990, 1999). In this sense, competency encompasses self-motivated control and self-evaluative strategies as well as essential skills (Bandura 1982, 1997).

Therefore, performing a certain task generally involves a set of competencies. To be competent in searching and using information, one needs a set of abilities, skills, knowledge, and experience in various related activities including technology use, problem solving, search strategy development, and relevance judgment. The ACRL clearly delineates information competencies in "Information Literacy Competency Standards for Higher Education". Since publication, these standards have guided the efforts of information literacy education. It states that information literacy entails the capacity "to recognize when information is needed" and "the ability to locate, evaluate, and use effectively the needed information" (American Library Association 2000, p.1).

More specifically, one who is information literate can: (a) determine the extent of information needed; (b) effectively and efficiently access the needed information; (c) critically evaluate information and its sources; (d) incorporate selected information into

one's knowledge base; (e) use information effectively to accomplish a specific purpose; and (c) understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally (American Library Association 2000, p. 1-2). Equipped with those qualities, an information literate person can become more self-directed, take a greater control over their own learning, and extend their knowledge. Competencies in information literacy provide a sound base for lifelong learning.

Personality Traits

Personality is a critical psychological mechanism that guides a behaviour. Genetic and environmental influences determine the set of psychological characteristics comprising personality (Schaffer 2005). Among many personality theories, trait models emphasising individual differences in thoughts, feelings, and behaviours assume that personality consists of several dispositions. Since personality traits tend to form a stable pattern of reactions in any given situation, they can explain the mechanisms of an individual's information behaviour with little variability (Phares 1991). A widely used personality model, McCrae and Costa's NEO Five Factor Model, or "Big Five Model" (1990), consists of the following personality components: neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness.

According to McCrae and Costa (1990), *neuroticism* refers to the tendency to experience negative feelings such as depression and anxiety. It includes the tendency to be temperamental and feel vulnerable. Thus, a high level of neuroticism likely leads to emotional instability and frustration. *Extroversion* refers to the tendency to prefer social interaction. Extroverted people are socially active, fun-loving, and tend to take group leadership positions. *Openness to experience* entails preference and acceptance of new ideas and experiences. It reflects creativity, imagination, and liberalism. *Agreeableness* refers to the tendency to be cooperative, compassionate, and good-natured. Agreeable people tend to avoid interpersonal conflict. In contrast, people with low agreeableness are likely competitive, critical, suspicious, and impatient. Finally, *conscientiousness* refers to the tendency to be self-disciplined, goal-oriented, and ambitious. Conscientious people are organised and have self-efficacy and persistence. Those without conscientiousness are easygoing, impulsive, and careless.

Personality and Information Behaviours

A handful studies demonstrate the influence of personality on information behaviours (Bellardo 1985; Halder et al. 2010; Heinström 2002; 2003; 2006a; 2006b; 2006c; Miculincer 1997). In his research, Miculincer (1997) reports that people who were more emotionally secure tend to actively seek information and accept new knowledge. In contrast, those who are insecure tend to have difficulty coping with uncertainty and make decisions with insufficient information. In their study consisting of 600 Indian college students, Halder et al. (2010) report solid association between personality traits and information seeking.

The association between personality traits and information behaviours is most extensively investigated by Heinström (2002; 2003; 2006a; 2006b; 2006c) in her series of studies conducted in Finland and the United States. Heinström's research explains unique behavioural patterns of information seekers using Costa and McCrae's Five Factor Model. In particular, she identifies three unique information seeking styles explained by different combinations of personality traits: fast surfing, broad scanning, and deep diving. Fast surfers tend to put minimal effort into searching and thus their searches lack thoroughness.

This group exhibits the personality traits of emotional instability, lack of conscientiousness, and little openness to experience. Broad scanning is characterized by wide browsing and thorough information exploration using diverse sources. Broad scanners tend to have greater opportunity to encounter relevant information and feel at ease evaluating information. The characteristic personality traits of this group are strong extroversion and openness to experience, and low agreeableness due to their competitive tendencies. Deep divers tend to put considerable effort into finding information and very discerning of information quality. A strong personality trait of this group is openness to experience. These findings suggest that certain personality traits might be prominent among competent in searchers and users of information.

Gender, Personality Traits and Information Competencies

Several studies on personality, learning-related competencies, and information behaviours report gender differences. This suggests gender is important when examining the influence of personality on information competency. Feingold's (1994) research on five personality traits documents gender differences although it reports some inconsistent findings. Women in both Western and Euro-Asian countries scored higher on neuroticism, agreeableness, and conscientiousness, whereas men scored higher on assertiveness. Gender differences are replicated across cultures in a secondary analysis of the data from 26 cultures: While women reported higher scores on neuroticism and agreeableness, men were higher in openness to new ideas (Costa et al. 2001). Yet in another study, women scored higher on neuroticism, extroversion, agreeableness, and conscientiousness than did men (Schmitt et al. 2008). So the common findings of all of these studies are that women are stronger in neuroticism and agreeableness than are men, which indicates clear gender differences in personality traits.

Several learning-related competencies also report gender-stereotypes. For example, Maccoby and Jacklin (1974) find higher mathematical and spatial ability in men and higher levels of language ability and compliance in women. In children's emotional competency, Denham, Bassett and Wyatt (2010) find girls showing better emotional knowledge and expression ability than boys. However, very little is known about gender differences in information competency involving a complex set of skills and knowledge (i.e., technology use, problem solving, decision-making, relevance judgment and search strategies).

Finally, gender differences in information behaviour have been well documented. Such differences include Internet use (Dholakia 2006; Fallows 2005; Jackson et al. 2008; Jones et al. 2009), the level of involvement in online activities (Fallows 2005; Jones et al. 2009), and confidence in computer and other online-related skills (Abbiss 2008; Enochsson 2005; Hargittai and Shafer 2006; Loanna Vekiri and Chronaki 2008). Specifically, females tend to evaluate their online skills lower than males do (Hargittai and Shafer 2006). Males have higher computer self-efficacy than females (Abbiss 2008; Loanna Vekiri and Chronaki 2008). Enochsson (2005) reports consistent findings regarding confidence: males display their technological knowledge and used technological language more often than females despite the same level of interest between men and women in technology. Similarly, male students demonstrate higher confidence in their ability to evaluate Wikipedia information than their female counterparts (Lim and Kwon 2010). In part, gender-stereotyped personality traits seem to account for these findings. That is, females tend to report more internalizing tendencies while males report more externalizing tendencies. Considering the reported gender differences in personality, learning-related competencies, and various information behaviours, one can speculate that gender could affect the relationship between personality and information competency.

RESEARCH QUESTIONS AND HYPOTHESES

The present study asks the following four research questions:

RQ1: Do personality traits affect information competency?

RQ2: Do females and males differ in their information competency?

RQ3: What differences, if any, are there in personality traits between females and males?

RQ4: Is gender moderated in the relationship between personality traits and information competency?

The following hypotheses are formulated for each of the four research questions respectively:

H1: Information competency will be significantly affected by each of the five subcomponents of personality traits: neuroticism, extroversion, openness to experiences, agreeableness, and conscientiousness.

H2: Females and males will significantly differ in their level of information competency.

H3: Females and males will differ significantly in each of the five personality traits.

H4: An account of information competency will show significant interaction between gender and the five personality traits.

RESEARCH METHOD

Data were collected from 185 college students at a large public university in the southwestern United States. The current study uses a convenient sample where the participants were recruited from the population of students taking an undergraduate course at the university. Table 1 presents the sample statistics.

The majority of the respondents were under the age of 20 (37.5%, n=69), and 34.2% (n=63) of the respondents were between the ages of 20 and 21. The rest (28.3%, n=52) were between the ages of 22 or older. The sample consisted of the following racial demographics: white (58.2%, n=106), African-American (19.2%, n=35), (15.4%, n=28) Hispanic American, (3.3% n=6) Asian or Pacific, and (3.8% n=7) other. The highest proportion of the respondents were juniors (31.9%, n=59), followed by sophomores (27.6%, n=51), seniors (27.0%, n=50), and freshmen (11.9%, n=22). The distributions of students' major and academic standing were fairly widespread. However, the demographics of the students enrolled in the university indicate that the sample distributions of gender, age, and race were not greatly skewed, and largely represent the university's student population.

Table 1: Sample Characteristics of Participants

Variable	Sample distribution	Frequency	Percent (%)
Gender (N=185)	Male	75	40.5
	Female	110	59.5
Age (N=184)	Under 20	69	37.5
	20-21	63	34.2
	22-23	52	28.3
Race (N=183)	African-American	35	19.2
	Asian	6	3.3
	Hispanic-American	28	15.4
	White	106	58.2
	Other	7	3.8
Academic standing (N=182)	Freshmen	22	11.9
	Sophomore	51	27.6
	Junior	59	31.9
	Senior	50	27.0
Major (N=178)	Social Sciences	124	69.7
	Arts & Humanities	43	24.2
	Sciences	9	5.0
	Other	2	1.1
Library instruction attendance (N=185)	Yes	58	31.4
	No	127	68.6

Two questionnaires were administered to participants to measure their information competency and personality traits during the Spring 2008. The participation was voluntary, and participants received extra credit as a compensation for their participation. Each person took approximately 20 minutes to complete the two questionnaires. After removing two participants form the total sample who did not report their gender, the responses of the 185 participants were analyzed as the final dataset.

Information Competency Scale

One questionnaire measuring information competency consists of ten items derived from the components listed in the ACRL *Information Literacy Competency Standards for Higher Education* (ALA 2000). The ten items measure a personal sense of competency in (a) determining the nature and extent of the information needed; (b) identifying and distinguishing different types of sources; (c) evaluating information and its sources critically; (d) selecting a relevant source among different sources; (e) selecting good search keywords when looking for information; (f) formulating search terms effectively; (g) maintaining search strategies in a very organised and systematic manner; (h) revising search results when desired information is not found; (i) selecting good information from multiple information sources retrieved; and (j) incorporating and utilizing the selected information to write a paper. Participants rated each item on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

The construct validity of this questionnaire, which is based on ACRL's conceptualization, was examined by a factor analysis technique. An exploratory factor analysis with principal axis factoring and varimax rotation identified two-factors, explaining 57.6% of the total variance. Table 2 shows the results of the factor analysis.

In Table 2, items (1), (2), (3), (4), and (10) were loaded on Factor 1 and items (5), (6), (7), and (8) on Factor 2 (See Table 1). Item (9) was removed because of a double loading. Factor 1 with five items was labeled as "competency in information evaluation" and Factor 2 with four items was labeled as "competency in information search strategies." The reliability scores were 0.87 for Factor 1 and 0.85 for Factor 2. This result is summarised in Table 3.

Table 2: Exploratory Factor Analysis for Information Competency

"I am competent in …."	**Factor 1**	**Factor 2**
(1) determining the nature and extent of the information I need.	0.866	
(3) evaluating information and its sources critically	0.762	
(2) identifying and distinguishing different types of sources	0.759	
(4) selecting a relevant source among different sources	0.690	
(10) incorporating and utilizing the selected information to write a paper	0.379	
(6) formulating search terms effectively		0.955
(5) selecting good search terms when looking for information		0.805
(8) revising search results when I don't get what I want		0.633
(7) maintaining search strategies in a very organised and systematic manner		0.544

Table 3: Scale Reliability (N=185)

Factors	**Observed Items**	**Mean**	**Std.Dev.**	**Item Reliability (R^2)**	**Cronbach's alpha (α)**
Competency in information evaluation	determining the nature and extent of the information I need.	3.74	0.86	0.73	0.87
	identifying and distinguishing different types of sources	3.77	0.81	0.72	
	evaluating information and its sources critically	3.68	0.86	0.73	
	selecting a relevant source among different sources	3.79	0.80	0.73	
	incorporating and utilizing the selected information to write a paper	3.81	0.75	0.55	
Competency in search strategies	selecting good search terms when looking for information	3.79	0.65	0.71	0.85
	formulating search terms effectively	3.74	0.88	0.76	
	maintaining search strategies in a very organised and systematic manner	3.63	0.90	0.58	
	revising search results when I don't get what I want	3.83	0.78	0.69	

Note: The following cutoff values were employed for the validity and reliability criteria of the observed variables: item reliability > 0.5; and Cronbach's α > 0.7.

Personality Traits

Personality traits were measured using a short version of NEO-Five Factor Inventory that Costa and McCrae (1992) originally developed as 240 items. The shorter version used in the present study includes 60 items on the five personality subscales: neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness. Each personality subscale includes 12 items. Both long and short versions of this inventory were translated into many different languages and widely used across countries. Each item describes a personal tendency toward behaviours, feeling, thoughts and values. This questionnaire was rated by participants on a five-point Likert scale, anchored by 1 for "disagree strongly" and 5 for **"**agree strongly." The subscales generated scores for the sample that had a classical theory alpha reliability coefficient of 0.86 for neuroticism, 0.79 for extroversion, 0.71 for openness to experience, 0.77 for agreeableness, and 0.84 for conscientiousness (Table 4)

Table 4: Dimensions of the NEO Five-Factor Model Personality Traits with Reliability Scores

NEO-FFI Dimensions	High	Low	Mean	Std.Dev.	Cronbach's alpha (α)
Neuroticism	anxious, nervous, social fear, emotional temperamental, worrying,	emotionally stable, confident,	32.91	8.22	0.86
Extroversion	outgoing, energetic, open, ambitious, assertive sociable, affectionate, active, fun-loving	Introvert, reserved, work individually, shy	42.58	6.45	0.79
Openness	Broadminded, inventive, curious, creative, imaginative, prefer variety	cautious, simple, narrow, concrete, conventional, conservative,	40.02	5.96	0.71
Agreeableness	friendly, tolerant compassionate, flexible, cooperative,	competitive, outspoken, skeptical, obstinate	41.34	6.51	0.77
Conscientiousness	careful, thorough, organΩigent, hardworking, ambitious, methodical, competent	easy-going, careless, inconsistent, impulsive, undisciplined, unreliable	43.76	6.69	0.84

RESULTS OF HYPOTHESIS TESTS

Personality traits and information competency

H1: Information competency will be significantly affected by each of the five subcomponents of personality traits: neuroticism, extroversion, openness to experiences, agreeableness, and conscientiousness.

The influence of personality on information competency was examined using multiple regression analysis technique. Table 5 presents the results.

Table 5: Multiple Regression Analysis for Variables Predicting Two Subscales of Competency

	Variables	Standard. Coefficients (β)	Prob. (ρ) [a]	Explained Variance (R^2)
Total information competency	Neuroticism	.070	.375	
	Extroversion	**.175***	**.021**	
	Openness	**.237****	**.001**	.278***
	Agreeableness	-.011	.890	
	Conscientiousness	**.347*****	**.000**	
Competency in information evaluation	Neuroticism	.079	.306	
	Extroversion	**.221****	**.003**	
	Openness	**.253*****	**.000**	.291***
	Agreeableness	-.042	.582	
	Conscientiousness	**.336*****	**.000**	
Competency in information search strategies	Neuroticism	.046	.577	
	Extroversion	.092	.248	
	Openness	**.178***	**.013**	.185***
	Agreeableness	.028	.733	
	Conscientiousness	**.303*****	**.000**	

Note: N=185
[a] * p < .05, ** p < .01, *** p <.001

Among the five personality traits, extroversion (p=0.021), openness (p=0.001), and conscientiousness (p=0.000) were identified as significant predictors, explaining 27.8% of the total variance of information competency. Thus, H1 was partially supported in the present study.

We further examined the determinants of information competency in each of two subscales. First, for the competency in information evaluation, extroversion (p=.003), openness (p=.000), and conscientiousness (p=.000) were significant predictors (R^2=.291). However, for the competency in information search strategies, only openness (p=.013) and conscientiousness (p=.000) were significant predictors (R^2=.185). These results indicate that students with higher levels of openness to experience and conscientiousness are likely be more competent both in evaluating the information and in using relevant strategies for their information search. Extroversion affected competency in information evaluation but not competency in search strategies use.

Gender and Information Competency

H2: Females and males will significantly differ in their level of information competency.

Gender differences in information competency were examined using independent sample t-tests. As shown in Table 6, there were significant differences between males and female students in total information competency (p=.049): female students reported higher information competency than did male students. Thus, H2 was supported.

Examining the two subscales, significant differences between genders were found in information evaluation competency (p=.015), but not in information search strategy. In

other words, female students perceived themselves to be more competent than did their male counterparts, specifically in evaluating information sources.

Table 6: Comparison of Females and Males in Information Competency

	Female (n=110) Mean (SD)	Male (n=75) Mean (SD)	t-value [a]	Prob. of Mean Difference (2-tailed)
Total information competency	34.45 (5.14)	32.80 (6.25)	1.984*	.049
Competency in information evaluation	19.30 (2.82)	18.03 (3.78)	2.470*	.015
Competency in information search strategies	15.15 (2.77)	14.77 (2.90)	.903	.368

Note: *df* =183 * $p < .05$

[a] Calculated by the mean difference between females' mean score and males' mean score, a positive t-value indicates that female students have a higher mean score than male students.
Missing values for composite scores were replaced with a mean of the corresponding variable.

Gender and Personality Traits

H3: Females and males will differ significantly in each of the five personality traits.

T-tests were conducted to examine gender differences in the five subscales of personality traits. Table 7 presents the results. Differences between genders were found in three of the five personality trait subscales. More specifically, female students scored significantly higher than males students in openness to experience (p=.020), agreeableness (p=.026), and conscientiousness (p=.019). No differences were found in neuroticism and extroversion. Thus, H3 was supported.

Table 7: Comparison of Female and Male Personality Traits

	Female (n=110) Mean (SD)	Male (n=75) Mean (SD)	t-value	Prob. of Mean Difference (2-tailed)
Neuroticism	33.37 (7.93)	32.24 (8.64)	.916	.361
Extroversion	43.17 (6.13)	41.71 (6.84)	1.516	.131
Openness	40.85 (5.90)	38.79 (5.86)	2.353*	.020
Agreeableness	42.23 (6.32)	40.06 (6.60)	2.247*	.026
Conscientiousness	44.71 (6.78)	42.37 (6.36)	2.372*	.019

Note: *df*=183 * $p < .05$

[a] Calculated by the mean difference between females' mean score and males' mean score, a positive t-value indicates that female students have a higher mean score than male students.

Influence of Gender on the Relationship between Personality Traits and Information Competency

H4: An account of information competency will show significant interaction between gender and the five personality traits.

This study assumes gender as a moderator variable affecting the relationship between personality traits and information competency. According to Baron and Kenny (1986), the relationship between a predictor and a criterion variable changes between the levels of a moderator variable. In this study, the moderator effect of gender was examined using multiple regression technique as follows. In each step of multiple regression analysis, gender and each of the five personality traits were entered first. Then, the interactions between gender and a personality trait were entered. The significance of the interaction term suggests the moderating effect of gender. If the moderating effect is significant, one has to analyze the relationship between personality traits and information competency within each category of the moderator variable separately. Table 8 shows the results.

The results of regression analyses reveal that gender moderates the relationship between information competency and extroversion (p=.024), and the relationship between information competency and conscientiousness (p=.038). Therefore, H4 is partially supported. Revealing a significant moderating effect of gender, the researchers further examined how personality traits affect the total information competency within each gender.

Table 8: Interaction between Personality Traits and Gender in Explaining Information Competency (N = 185)

	Variables	Standard. Coefficients (β)	Prob. (ρ) [a]	Explained Variance (R^2)
1	Gender	-.057	.845	.069**
	Neuroticism	-.273*	.012	
	Gender x Neuroticism	.235	.448	
2	Gender	1.128*	.014	.147***
	Extroversion	.491***	.000	
	Gender x Extroversion	**-1.063***	**.024**	
3	Gender	.548	.250	.132***
	Openness	.415***	.000	
	Gender x Openness	-.486	.329	
4	Gender	.579	.209	.081**
	Agreeableness	.325**	.004	
	Gender x Agreeableness	-.501	.297	
5	Gender	.983*	.027	.224***
	Conscientiousness	.615***	.000	
	Gender x Conscientiousness	**-.970***	**.038**	

Note: N=185
* p < .05, *** p <.001

In Table 9, both openness to experience (p=.003) and conscientiousness (p=.001) are significant determinants of information competency among female students. Among male students, extroversion (p=.008) and conscientiousness (p=.009) significantly account for information competency. These results imply that female students who reported

themselves to be more competent were more conscientious and open to new experiences. Male students who reported themselves to have a greater competency were more conscientious and extroverted.

Table 9: Personality Traits Explaining Information Competency within Each Gender

	Variables	Standard. Coefficients (β)	Prob. (ρ) [a]	Explained Variance (R^2)
Female students (N = 110)	Neuroticism	.019	.860	.211***
	Extroversion	.033	.745	
	Openness	**.271****	**.003**	
	Agreeableness	.037	.719	
	Conscientiousness	**.329****	**.001**	
Male students (N = 75)	Neuroticism	.109	.376	.366***
	Extroversion	**.319****	**.008**	
	Openness	.190	.114	
	Agreeableness	-.089	.487	
	Conscientiousness	**.378****	**.009**	

Note: N=185 ** p < .01, *** p <.001

In the subsequent analyses, the researchers further examined how personality traits affect each of the two subscales of information competency within each gender. Table 10 presents the test results of competency in information evaluation.

Among female students, both openness to experience (p=.001) and conscientiousness (p=.000) proved to be significant predictors. This result was consistent in all participants. However, among male students, only extroversion (p=.004) was a significant predictor. That is, only the extroverted, but not conscientious, males tended to report themselves to be more competent in information evaluation.

Table 10: Personality Traits Explaining Competency in Information Evaluation within Each Gender

	Variables	Standard. Coefficients (β)	Prob. (ρ) [a]	Explained Variance (R^2)
Female students (N = 110)	Neuroticism	.048	.655	.257***
	Extroversion	.084	.398	
	Openness	**.298****	**.001**	
	Agreeableness	.007	.942	
	Conscientiousness	**.367*****	**.000**	
Male students (N = 75)	Neuroticism	.059	.642	.319***
	Extroversion	**.363****	**.004**	
	Openness	.231+	.065	
	Agreeableness	-.131	.325	
	Conscientiousness	.256+	.082	

Note: N=185 +p<.1, * p < .05, ** p < .01, *** p <.001

Table 11 presents the result on the second subscale: competency in information search strategies. Once again, findings on female information competency were consistent: openness to experience (p=.033) and conscientiousness (p=.034) significantly accounted

for competency in information search strategies. These results mean that female students who were conscientious and open to experience tended to be more competent in using information search strategies. However, among male students, conscientiousness (p=.001) was the only significant predictor, but not extroversion. In other words, only the male students with a higher conscientiousness were more competent in using strategies for searching.

Table 11: Personality Traits Explaining Competency in Information Search Strategies within Each Gender

	Variables	Standard. Coefficients (β)	Prob. (ρ) [a]	Explained Variance (R^2)
Female students (N = 110)	Neuroticism	-.011	.926	.114*
	Extroversion	-.026	.813	
	Openness	**.201***	**.033**	
	Agreeableness	.063	.566	
	Conscientiousness	**.229***	**.034**	
Male students (N = 75)	Neuroticism	.160	.204	.340***
	Extroversion	.211^{+}	.083	
	Openness	.102	.403	
	Agreeableness	-.014	.918	
	Conscientiousness	.480**	**.001**	

Note: N=185 $^{+}$p<.1, * p < .05, ** p < .01, *** p <.001

All hypothesis test results are summarized in Table 12.

Table 12: Summary of Hypothesis Tests

	Tested Components	Test Results	Statistical Techniques
H 1	Information competency will be affected by each of the subscales of personality traits, including neuroticism, extroversion, openness, agreeableness, and conscientiousness.	Partially Supported (Table 5)	Regression analysis
H 2	Females and males will differ in their level of information competency.	Supported (Table 6)	t-test
H 3	Females and males will differ in their personality traits.	Supported (Table 7)	t-test
H 4	An account of information competency will show significant interaction between gender and the five personality traits.	Partially Supported (Table 8)	Hierarchical multiple regression

DISCUSSION

The present inquiry tested the following four research hypotheses:

(H1) Information competency will be significantly affected by each of the five subcomponents of personality traits;

(H2) Females and males will differ significantly in their level of information competency;

(H3) Females and males will differ significantly in the five personality traits; and

(H4) An account of information competency will show significant interaction between gender and the five personality traits."

Because answers to H2 and H3 are prerequisites of answers H4, discussion of the key findings focused on H1 and H4: the influence of personality traits on information competency (H1); and the effect of gender on their relationship (H4), respectively.

Influences of Personality Traits on Information Competency

The results of the study show that personality traits indeed affect information competency, confirming the prediction in H1. In particular, three subscales of personality traits of the Costa and McCrae's Five Factor Model were found to be significant: conscientiousness, openness to experience, and extroversion, explaining 27.8% of the total variance. Students who were conscientious, open to experience, and extroverted were more likely to be competent in searching and using information. These findings are somewhat different from the previous studies that report associations between all five personality traits and information behaviours (Halder et al. 2010; Heinström 2002, 2003, 2006a, 2006b, 2006c). In the present study of information competency, neither neuroticism nor agreeableness is a significant determinant.

A further examination of the determinants within each of the two competency subscales (information evaluation and search strategies) shows somewhat different results. For competency in information evaluation, the three determinants (i.e., conscientiousness, openness, and extroversion) show significance. While both conscientiousness and openness show significance, extroversion shows no significant determinacy in information competency. That is, although it was trait demonstrated to be beneficial to competent information evaluation, students more competent in making search strategies were not necessarily extroverted.

A plausible explanation for the mixed results in the examination of extroversion might be found in previous literature. Extroversion is generally defined as the tendency to prefer social interactions. Highly extroverted people are outgoing and socially active (Costa and McCrae 1992; McCrae and Costa 1990). According to Heinström (2003), outgoing students do not look for information systematically, but rather employ strategies that bring them prompt answers. Thus, their strategy uses their social abilities, and their sources of information include teachers, supervisors, and friends. McCown and Johnson (1991) further support this claim by reporting that extroverted students tend to prefer devoting their time to social activities instead of studying. In short, an extroverted personality seems useful for finding information sources including human sources, but it does not necessarily entail a systematic, methodological approach which is an important element of competent information strategy.

Evidently, conscientiousness is the most robust and consistent determinant of information competency among the three identified determinants because its influence is prominent in both genders. Conscientiousness was also found to be critical to both subscales of information competency. Moreover, conscientious searchers tend to be good at evaluating and selecting relevant information sources, diagnosing their own information needs, and determining its boundaries. They are also effective at strategically approaching their information tasks, formulating search terms, modifying search results, and maintaining their focus on search strategies. Conscientious people are characterized as self-disciplined,

organised, thorough, and goal-oriented. According to Heinström (2002), conscientious students are willing to spend more time and money and work harder to obtain relevant information. These behavioural tendencies seem crucial to information users' competencies when looking for information.

Gender Effect on the Relationship between Personality Traits and Information Literacy

The results of this study reveal significant difference between genders in some subscales of information competency and personality traits, supporting H2 and H3. Compared to male students, female students tended to exhibit greater information competency and marked significantly higher scores in three personality traits (openness to experience, agreeableness, and conscientiousness). More importantly, the study helps confirm the moderating role of gender as revealing gender-specific personality traits that affect information competency (H4). In the female group, students who were more conscientious and open to experience reported a greater overall competency than the students who were not. This result was consistently observed in the two subscales of competency: evaluation and search strategies. However, partially different sets of personality traits affected information competency in the male group. Extroversion and conscientiousness, but not openness to experience, were found to be a significant determinants. In further examination of the two competency subscales, extroversion was found to be the only determinant of competency in information evaluation; conscientiousness was the only determinant of competency in information strategies.

This study identifies gender-specific personality traits. Openness to experience is a particularly salient predictor among female students; whereas extroversion is a predictor among male students. Perhaps this male-extroversion and female-openness link is the most important finding of this study and thus warrants further explanatory research. According to Heinström (2002), the power that motivates active information seeking among extroverted students is their energetic character; whereas, the force that activates the broad information seeking among the open-minded students is their intellectual curiosity. This implies that both an outgoing character and a curious character are beneficial to information competency through different mechanisms.

The link between male-extroversion and female-openness also requires further explanation. Gender role socialization theory generally suggests that social norms about gender-appropriate behaviour result in the development of gender stereotypes (Eagly 1987). Its influence has led to the gender-stereotyped personality traits. The influence of extroversion was significant only among male students in our study. Its influence on information evaluation was especially strong to the extent that the effect of conscientiousness disappeared. Previous studies on gender and personality consistently describe the assertive and dominant disposition of extroversion as a male-stereotyped trait (Abele 2003; Wang, Heppner and Berry 1997). Thus, the traditional gender-stereotyped personality seems to explain the significant influence of extroversion in the male group.

However, it is interesting to note that female-openness does not fit the explanation of gender stereotyped-personality traits because openness to experience is not a typical female trait. It is suspected that educational environments and women's improved social status have influenced females to deviate from stereotypical traits. Most female students in contemporary higher education settings are encouraged to perform advanced cognitive activities and seek better career options. Female college students' experiences have cultivated intellectual curiosity and imagination, characteristics which could be considered

subsets of the personality trait openness to experience. Cognitive dispositions of openness such as curiosity, creativity, and imagination are essential to successful academic and job achievement (Costa and McCrae 1992). Furthermore, the female students' personality traits in the present study seem to reflect a transition from the traditional gender-stereotype model toward gender-role transcendence. As scholars have proposed (Garnets and Pleck 1979; Hefner, Rebecca and Oleshansky 1975), gender role transcendence implies that ideal gender identity in a modern society may fit neither a polarized concept of masculinity and femininity, nor a simple combination of them.

Clearly, the findings in the current study show much evidence of gender role transcendence in personality traits and information competency. The information competency of female students was generally higher than that of male students; openness to experience was higher among female students and was a significant predictor in the female group only. Moreover, the findings observe deviations from stereotypical differences between genders in neuroticism and agreeableness.

Neuroticism and Agreeableness

Contrary to previous studies (Heinström 2003; Howell and Higgins 1990; Kernan and Mojena 1973; Kirton 1989; Halder, Roy and Chakraborty 2010), neuroticism and agreeableness did not affect information competency in the present study. One can speculate on the discrepancies. Regarding the insignificant influence of neuroticism characterized by emotional instability, anxiousness, and low in self-confidence, one can speculate that both positive and negative sides of neuroticism may have cancelled each other out. The negative side of neuroticism generally debilitates. However, neurotic people have a mechanism protecting them from confusion unfamiliar information presents: when facing many and often conflicting messages, they tend to select less confusing ones. This protective mechanism of neuroticism helps reduce anxiety and increases a sense of control. It seems that both the positive and negative sides of neuroticism can improve information competency. Nevertheless, the effect of neuroticism should be further investigated.

Also contrary to Heinström's (2003) findings, the influence of agreeableness on information competency was insignificant. She reports that competitive students, those low in agreeableness, are better at evaluating information quality due to good critical thinking skills. The personality trait of impatience in competitive students may explain this finding. Impatient individuals are less likely to devote time to thorough information seeking (Heinström 2003). Therefore, the different aspects of competitiveness might nullify its influence on information competency. Again, further research is warranted to better understand the insignificant effect of agreeableness in the present study.

Interestingly, the above two personality traits that did not predict information competency are typical among females. Although their findings are mixed, Costa et al. (2001) show that females exhibiting a greater tendency toward neuroticism and agreeableness. To a large extent, the findings the current study suggest that stereotypical female traits have little influence on information competency.

Limitations

The present study has a few limitations. First, the data were collected via convenience sampling. The sample largely represents the entire undergraduate population of the institution where the study was conducted, except that it under-represents students majoring in science and engineering. This limitation should be taken into account when reading the results.

Furthermore, the measure of information competency is based on an instrument designed for the current study. The instrument captured all the major areas of the competency standards of information literacy delineated by the ACRL (ALA 2000). The measurements were found to be statistically valid and reliable. However, the instrument should be further tested for reliability and validity in future studies of different samples.

Finally, competency was measured using participant self-reports. Despite this limitation, the findings corroborate existing literature on personality, the self, and information behaviour. Previous studies find that conscientiousness and openness to experience are the strongest predictors of a variety of competencies such as general self-competency (Marr et. al. 2006). Marr and his colleagues point out those actual competencies in performing a task affect self-perception, and in turn self-perception may prompt an individual to make strive for achievement. This argument is consistent with Bandura's (1982, 1997) that development of self-efficacy is based on direct and indirect experiences of successful performance and positive evaluation by others. Furthermore, Crew (2010) states that "personal competency requires students to look inward and examine their own value as human beings (p.9)." This implies that performance is an important source of one's self-perceived ability. Yet the current study's findings should be further consolidated by future research examining information competency using test-based measures.

CONCLUSIONS AND IMPLICATIONS

Information seeking is a complex and dynamic process. It is contingent on both context and individual performance (Wilson 2000). Personality is a critical psychological mechanism guiding an individual's behaviour. A fairly consistent psychological mechanism across contexts, personality has been examined to understand users' thoughts, feelings, and behaviours. Those who maintain optimal thoughts, feelings, and behaviours demonstrate strong competencies in task performance. Thus, it is useful to ask which personality traits are observed more often among people demonstrating higher competency in searching and information use. To the best of our knowledge, this is the first study attempting to disclose the relationship between personality and information competency by studying college students who are the most pivotal target group for teaching information literacy.

This study reveals that three specific personality traits influence information competency. Students who were more outgoing and energetic were more efficient and better at accessing needed information. Students with creative and imaginative traits tended to be better at exploring needed information than more conventional students. Furthermore, more methodological and organised students tended to be more competent and critical in evaluating retrieved information. This research also uncovered gender-specific personality traits affecting information competency. It revealed an important link between male-extroversion and female-openness. These findings help enrich the existing body of literature on the influence of personality traits on information behaviour.

One can draw several practical implications from the findings, particularly for the librarians teaching information literacy. Frequent personality traits among more competent students were conscientiousness, openness to experience, and extroversion. This finding is consistent with the view that college students who employ a more systematic and orderly approach and inquisitive attitude in information searching are more likely to perform task-relevant information searches (Kwon 2008). Thus, regarding conscientiousness, librarians could promote a systematic, orderly, and persistent approach to students to help them

understand their tasks more clearly and perform them more effectively. Moreover, librarians should articulate the importance of diligent and focused attitudes when facing information tasks. Students must learn what federated search engines can and cannot do and how to formulate better search strategies.

Instruction librarians might also emphasise an open attitude toward information search. The present research suggests that students open to experience are more likely competent in their information literacy. Openness to experience reflects the tendency to welcome new ideas and situations because it incorporates creativity, imagination, and liberality (McCrae and Costa 1990; McCrae and John 1992). Curious and interested students do not fear unfamiliar information and feel more at ease modifying search strategies and diversifying search terms. This tendency improves opportunity to encounter different interpretations, viewpoints, and quality content. The value of this open, positive, explorative attitude is well documented in a study of college students' Wikipedia use (Lim and Kwon 2010). Wikipedia is often considered an irrelevant information source lacking credibility. Nevertheless, if it is explored strategically as an initial information source, curious students find Wikipedia a valuable asset. Therefore, librarians could teach the value of exploration and openness to experience when teaching information literacy. In sum, the findings of our study encourage instruction librarians to create a learning environment promoting intellectual curiosity and diligence so that students can build the habit of persistence when facing intellectual challenges.

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REFERENCES

Abbiss, J. 2008. Rethinking the "problem" of gender and IT schooling: Discourse in literature. *Gender and Education,* Vol. 20, no.2: 153−165.

Abele, Andrea E. 2003. The dynamics of masculine-agentic and feminine-communal traits: Findings from a prospective study. *Journal of Personality and Social Psychology,* Vol. 85: 768-776.

American Library Association. 2000. The *Information Literacy Competency Standards for Higher Education.* Available at: http://www.ala.org/acrl/ilcomstan.html.

Bandura, Albert. 1982. Self-efficacy mechanism in human agency. *American Psychologist,* Vol. 37, no.2: 122-147

Bandura, Albert. 1997. *Self-efficacy: The exercise of control*. New York: Worth Publishers.

Baron, Reuben M. and Kenny, David A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology,* Vol.5: 1173-1182.

Bellardo, Trudi. 1985. An investigation of online searcher traits and their relationship to search outcome. *Journal of the American Society for Information Science,* Vol. 36, no.4: 241-250.

Borgman, Christine L. 1989. All users of information retrieval systems are not created equal: An exploration into individual differences. *Information processing and management*, Vol. 25, no.3: 237-251.

Costa, Paul T. Jr., Terracciano, Antnio and McCrae, Robert R. 2001. Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology,* Vol. 81, no.2: 322-331.

Costa, Paul T. Jr., and McCrae, Robert R. 1992. *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual.* Odessa, FL: Psychological Assessment Resources.

Crew, Rudy. 2010. *Four competencies for a 21st-century education and how to implement them. Multimedia & Internet@Schools*. Available at: http://www.internetatschools.com/Articles/PrintArticle.aspx?ArticleID=69721

Denham, Susanne A., Bassett, Hideko H and Wyatt, Todd M. 2010. Gender differences in the socialization of preschoolers' emotional competence*. New Directions for Child and Adolescent Development,* Vol. 128: 29-49.

Dholakia, R. R. 2006. Gender and IT in the household: Evolving patterns of Internet use in the United States. *Information Society*, Vol. 22: 231−240.

Eagly, Alice H. 1987. *Sex differences in social behavior: A social-role interpretation*. NJ: Erlbaum.

Eisenberg, Michael B., and Berkowitz, Robert E. 2003. *The definitive Big6 workshop handbook*. Worthington, OH: Linworth Publishing.

Enochsson, A. 2005. A gender perspective on Internet use: Consequences for information seeking on the net. *Information Research*, Vol. 10, no. 4, paper 237. Available at: http://InformationR.net/ir/10-4/paper237.html

Fallows, D. 2005. *How men and women use the Internet.* Available at: http://www.pewInternet.org/pdfs/PIP_Women_and_Men_online.pdf

Feingold, Alan. 1994. Gender differences in personality: A meta-analysis. *Psychological Bulletin,* Vol. 116: 429-456.

Garnets, Linda, and Pleck, Joseph H. 1979. Sex role identity, androgyny, and sex role transcendence: A sex role strain analysis. *Psychology of Woman Quarterly,* Vol.3, no.3: 270-283.

Halder, S., Roy, A. and Chakraborty, P. K. 2010. The influence of personality traits on information seeking behavior of students. *Malaysian Journal of Library & Information Science,* Vol.15, no.1: 41-53.

Hargittai, E., and Shafer, S. 2006. Differences in actual and perceived online skills: The role of gender. *Social Science Quarterly*, Vol. 87, no. 2: 432−448.

Hefner, R., Rebecca, M., and B. Oleshansky. 1975. Development of sex-role transcendence. *Human Development,* Vol.8: 143-156.

Heinström, Jannica. 2002. *Fast surfers, broad scanners and deep divers – personality and information seeking behavior*. PhD thesis, Åbo Akademi University Press.

Heinström, Jannica. 2003. Five personality dimensions and their influence on information behaviour. *Information Research,* Vol.9. no.1: paper 165. Available at: http://InformationR.net/ir/9-1/paper165.html

Heinström, Jannica. 2006a. Broad exploration or precise specificity: Two basic information seeking patterns among students. *Journal of the American Society for Information Science and Technology,* Vol.57, no.11: 1440-1450.

Heinström, Jannica. 2006b. Psychological factors behind incidental information acquisition. *Library & Information Science Research,* Vol.28, no.4: 579-594.

Heinström, Jannica. 2006c. Fast surfing for availability or deep diving into quality - motivation and information seeking among middle and high school students. *Information Research,* Vol. 11, no.4: paper 265. Available at: http://informationr.net/ir/11-4/paper265.html]

Howell, Jane M. and Higgins, Christopher A. 1990. Champions of technological innovation. *Administrative Science Quarterly*, Vol. 35, no.2: 317-341.

Hyldegård, Jette. 2009. Personality traits and group-based information behaviour: An exploratory study. *Information Research,* Vol.14, no.2: paper 402. Available at: http://InformationR.net/ir/14-2/paper402.html]

Ioanna Vekiri, I. and Chronaki, A. 2008. Gender issues in technology use: Perceived social support, computer self-efficacy and value beliefs, and computer use beyond school. *Computers & Education,* Vol. 51: 1392−1404.

Jackson, L., Zhao, Y., Kolenic, I.A., Fitzgerald, H.E., Harold, R. and Von Eye, A. 2008. Race, gender, and information technology use: The new digital divide. *CyberPsychology & Behavior*, Vol. 11: 437−442.

Jones, S., Johnson-Yale, C., Millermaier, S. and Pérez, F.S. 2009. U.S. college students' Internet use: Race, gender and digital divides. *Journal of Computer-Mediated Communication,* Vol. 14: 244−264.

Kernan, J. B. and Mojena, R. 1973. Information utilization and personality. *Journal of Communication*, Vol.23, no.3: 315-327.

Kirton, M. J. 1989. A theory of cognitive style. In M. J. Kirton, Ed. *Adaptors and innovators. Styles of creativity and problem-solving.* London: Routledge: 1-36.

Kwon, Nahyun. 2008. A mixed-methods investigation of the relationship between critical thinking and library anxiety among undergraduate students in their information search process. *College & Research Libraries,* Vol . 69, no. 2: 117-131.

Lim, Sook, and Kwon, Nahyun. 2010. Gender differences in information behavior concerning Wikipedia, an unorthodox information source? *Library Information Science Research,* Vol.32, no.3:212-220.

Marr, Raymond A., DeYoung, Colin G., Higgins, Daniel M. and Peterson, Jordan B. 2006. Self-liking and self-competence separate self-evaluation from self-deception: Associations with personality, ability, and achievement. *Journal of Personality,* Vol.74, no.4: 1047-1078.

Maccoby, Eleanor E., and Jacklin, Carol N. 1974. *The psychology of sex differences*. Stanford, CA: Stanford University Press.

McCown, W. G. and Johnson, J. L. 1991. Personality and chronic procrastination by university students during an academic examination period. *Personality and Individual Differences*, Vol. 12, no.5: 413-415.

McCrae, Robert R. and Costa, Paul T Jr. 1990. *Personality in adulthood*. NY: Guilford Press.

McCrae, Robert R. and John, Oliver P. 1992. An introduction to the Five-Factor Model and its applications. *Journal of Personality*, Vol. 60: 175-215.

Miculincer, Mario. 1997. Adult attachment style and information processing: Individual differences in curiosity and cognitive closure. *Journal of Personality and Social Psychology*, Vol. 72, no.5: 1217-1230.

O'Connor, Lisa G., Radcliff, Carolyn J. and. Gedeon, Julie A. 2002. Applying systems design and item response theory to the problem of measuring information literacy skills." *College and Research Libraries,* Vol. 63, no.6: 528-543.

Phares, E. Jerry. 1991. *Introduction to psychology* (3rd. ed.). New York: Harper Collins Publishers.

Saarni, Carolyn. 1990. Emotional competence: How emotions and relationships become integrated. In R. A. Thompson, Ed. *Nebraska Symposium on Motivation: Socioemotional development*. Lincoln: University of Nebraska Press: 115-182.

Saarni, Carolyn. 1999. *The development of emotional competence*. NY: Guilford Press.

Salem, Jospeh A., and Radcliff, Carolyn J. 2006. "Using the SAILS Test to Assess Information Literacy." Building Effective, Sustainable, Practical Assessment: Proceedings of the Second Library Assessment Conference (Charlottesville: 2006), 131-137. Online Proceedings.

Schaffer, David. R. 2005. *Social and personality development*. CA: Thomson Wadsworth.

Schmitt, David. P., Realo, Anu, Voracek, Martin, and Allik, Juri. 2008. Why can't a man be more like a woman? Sex differences in Big Five personality traits across 55 cultures. *Journal of Personality and Social Psychology,* Vol. 94: 168–182.

Wang, Li-fei, Heppner, Paul P. and Berry, Thomas, R. 1997. Role of gender-related personality traits, problem-solving appraisal, and perceived social support in developing a meditational model of psychological adjustment. *Journal of Counseling Psychology,* Vol. 44, no.2: 245-255.

Wilson, Tom D. 2000. Human information behavior. *Informing Science*, Vol.3, no.2: 49-56. Available at: http://209.68.25.5/Articles/Vol3/v3n2p49-56.pdf