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Abstract

Purpose – The purpose of this paper is to explore how the Big-Five model of personality traits relates to the use of multiple internet functions and test if the relationship differs by gender, age, and education.
Design/methodology/approach – To test the research questions, this study uses data from a large-scale survey of 9,479 Korean media users. Poisson's regression is applied to model the count data, which accounts for the number of internet functions used. In the regression models, the first block entered is socio-demographics followed by a second block including personality traits.
Findings – Results indicate that openness to experience and conscientiousness are positively related to using multiple internet functions, whereas emotional stability has a negative relationship. The findings differed depending on age and education. The younger age cohort, with higher levels of conscientiousness and extraversion, are likely to use more internet functions. In addition, the relationship between conscientiousness and using multiple internet functions is relevant for users with higher education levels.
Originality/value – The present paper is the first that uses multiple internet functions as a critical variable to study individual difference factors. Overall, this study provides evidence that individual difference factors such as socio-demographics and personality traits have a strong role to play in internet research.

Keywords Internet use, Education, Big-Five, Gender, Personality, Multiple internet functions
Paper type Research paper

1. Introduction

The increasing use of the internet is unprecedented. According to Internet World Stats (2012), close to 34.4 percent of the global population are internet users. In highly wired countries such as Korea, the Netherlands, Singapore, and Sweden, the penetration rate ranges from 75 to 90 percent. With the internet pervading our lives, users access the web for a range of internet functions such as searching for information, reading news, and buying and selling products. New forms of human interaction are occurring on the internet through instant messaging, social networking, and internet forums. As such, accessing and using the internet has become integrated into people's daily lives that, for many, nowadays it is difficult to imagine how we can cope without it (Amichai-Hamburger and Vinitzky, 2010).

One of the changing trends is that users are starting to use multiple functions on the internet. One user might search for information online and browse for products on e-commerce sites but not engage in social media use such as accessing social

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networking sites or instant messaging services. In contrast, there may be a user who manages to use every type of internet function compared with another individual who chooses to not use the internet at all. What then determines the extent to which users need to use a number of internet functions?

Prior research has indicated that personality factors are strongly related to using internet functions (e.g. Barnes and Pressey, 2011; Correa *et al.*, 2010; Guadagno *et al.*, 2008; Landers and Lounsbury, 2006; Lu *et al.*, 2013; McElroy *et al.*, 2007). Amichai-Hamburger (2007) stressed that personality is one of the main factors in understanding why users behave the way they do on the internet.

Overall, the present study seeks to expand the literature by examining personality factors in relation to using multiple internet functions. In addition, this study classifies gender, age, and education into categories to measure the relationship between personality and the use of multiple internet functions. In part, this research applies Poisson's regression models to account for the number of functions used by an individual. The analysis involved using data from a survey conducted in Korea.

1.1 The case of using multiple internet functions

The majority of previous research on internet use that involves individual differences has examined using one internet function (e.g. social networking, blogging). Researchers are aware that a variety of individual differences exist among internet users, but they usually ignore the variety of internet uses (Amichai-Hamburger, 2007). Little research effort has been expended on investigating the diversity of internet functions used by an individual. With users now engaging with different types of internet functions, there is a need to understand why certain individuals decide to use multiple functions, whereas others use less.

The decision process concerning which internet functions to use is dependent upon all the internet functions available that are suitable for personal needs. Drawing on the Uses and Gratification theory in the mass communication literature, users are active in choosing which channels to use in order to meet their desires and needs to achieve gratification (Larose and Eastin, 2004). Users have power over their channel consumption and assume a role in interpreting and integrating channels into their lives. Individuals will choose communication channels to the extent that those channels serve their needs better than other channels (Tosun and Lajunen, 2010). Users deliberately choose channels that satisfy their need to enhance knowledge, relaxation, social interactions/companionship, diversion, or escape (McQuail, 2010). In the online context, it was found that users obtain three types of gratifications: content, process, and social gratification (Stafford *et al.*, 2004). To attain gratification, it has been shown users access the internet for interpersonal utility, passing time, information seeking, convenience, and entertainment (Papacharissi and Rubin, 2000). With all the functions available, users have the ability to evaluate, rank order, and select the functions that best gratify their needs (Jeffres and Atkin, 1996).

If certain channels exhibit positive and reinforcing influences on each other, the channels can co-exist as complements, but if they perform similar tasks, one channel will substitute for the role of the old channel (Shocker *et al.*, 2004). In that regard, the decision to use particular channels is determined by calculating the extent to which other channels need to be complemented or substituted. Applying the theory to internet functions, using one internet function can have a similar purpose by substituting or complementing another internet function. For example, in substituting cases within internet functions, an individual would not have to post blog messages if a person feels

that using social network sites can replace the role for interpersonal communication. In another case where complementing occurs within internet functions, a user can shop for a product from an e-commerce site but could find the urge to search for the product information with a search engine.

1.2 Individual differences in internet use

Rosengren (1974) contended that individual differences, such as socio-demographic factors and personality, influence the use of mass media. With the internet becoming the dominant platform for mass media, numerous studies tracing the relationship between socio-demographics, personality, and internet use have been published. Specifically, recently published articles suggest that beliefs, attitudes, and behavior of internet use may differ as a function of individual personality characteristics. As evidence, there is a growing corpus of empirical literature associating personality with internet use. Those articles have involved examining personality factors in using internet for general purposes (McElroy *et al.*, 2007), collaborative technology (Devaraj *et al.*, 2008), e-commerce (Bosnjak *et al.*, 2007), online reviews (Picazo-Vela *et al.*, 2010), blogs (Guadagno *et al.*, 2008), social media services (Amichai-Hamburger and Vinitzky, 2010), and disclosure of health information (Bansal *et al.*, 2010).

In brief, personality refers to the characteristics and patterns that determine the individual's commonalities and differences in beliefs, cognitions, and behavior (Maddi, 1989). Personality traits manifest the unique qualities of each individual and tend to be relatively enduring characteristics across a lifespan (Pervin and John, 1997). Typically, the different traits are reflected in the thoughts, feelings, and actions across a wide range of situations (Shaffer, 2000).

Contemporary research on personality has demonstrated that personality can be captured by five broad dimensions (Costa and McCrae, 1992; Digman, 1990; Goldberg, 1990): openness to experience, extraversion, neuroticism, conscientiousness, and agreeableness. These broad dimensions are typically referred to as the Big-Five model. The first trait, openness to experience, reflects an individual's propensity to be flexible with their thoughts, be curious, and pursue activities. The second trait, extraversion, represents the individual's tendency to be sociable, gregarious, ambitious, and experience positive emotions. Neuroticism, frequently measured as emotional stability (reverse), represents the third trait that characterizes the individual's insecurity, anxiousness, hostility, and emotional instability. The fourth trait, conscientiousness, relates to the degree to which an individual is persistent, diligent, organized, and motivated to pursue goals. The fifth dimension, agreeableness, reflects the interpersonal orientation to be trusting, compassionate, and cooperative.

Openness to experience, according to empirical evidence, has consistently been associated with various internet activities. Early internet studies have shown that openness to experience was positively related to using the web for browsing and seeking entertainment and specific information (McElroy *et al.*, 2007; Tuten and Bosnjak, 2001). More recent studies which focussed on computer-mediated communications provided support that individuals with strong tendencies of openness to experience have the propensity to use blogs (Guadagno *et al.*, 2008) and use social media (Correa *et al.*, 2010). Those with higher levels of openness to experience were more active users of Twitter (Hughes *et al.*, 2012) and Facebook (Ross *et al.*, 2009), and were willing to try out new functions within these social media sites. In sum, openness to experience is the personality trait most likely related to seeking and testing new functions on the web in order to gain "some" experience.

The influence of extraversion differs depending on what internet function is evaluated. Overall, extraversion was negatively correlated to total time spent on the internet (Landers and Lounsbury, 2006). It was reported that extraverts tended to search for more information online and were willing to buy products from e-commerce sites (McElroy *et al.*, 2007). Somewhat expected, individuals high on the trait of extraversion were more likely to use social network sites (Correa *et al.*, 2010; Ross *et al.*, 2009; Ryan and Xenos, 2011). However, Ross *et al.* (2009) noted that extraverts do not use social networks as a substitute for offline communications, but rather use social networks to voice their opinion, conduct research, and share music.

Whereas early personality theorists have shown that individuals high on the trait of neuroticism were more likely to avoid the internet (Tuten and Bosnjak, 2001) and use the internet solely for informational purposes (Amichai-Hamburger and Ben-Artzi, 2003), recent papers revealed that individuals with neurotic traits frequently use the web for blogs (Guadagno *et al.*, 2008) and social media services (Correa *et al.*, 2010). The logic is that, for social uses, users have the urge to avoid their shyness and loneliness by accessing the web where they can generate a sense of group membership (Amichai-Hamburger and Ben-Artzi, 2003; Ryan and Xenos, 2011).

There are mixed results in the relationship between conscientiousness and internet use. Prior literature suggests that conscientious individuals are less inclined to use the internet because using it promotes procrastination and serves as a diversion to important chores (Butt and Phillips, 2008; Landers and Lounsbury, 2006; Ryan and Xenos, 2011). Other studies failed to provide empirical support for such relationship, showing an insignificant correlation between conscientiousness and internet use (Guadagno *et al.*, 2008; Ross *et al.*, 2009). On the other hand, Hughes *et al.*'s (2012) empirical paper showed a positive contribution of conscientiousness on internet use for informational purposes, which the authors implied that conscientious individuals seek utilitarian value and cognitive stimulation.

Empirical evidence has shown that agreeableness tends to be unrelated to overall internet use (McElroy *et al.*, 2007), blog use (Guadagno *et al.*, 2008), and social media use (Correa *et al.*, 2010). One particular study found a negative relationship between agreeableness and internet use (Landers and Lounsbury, 2006). The authors implied that users would have difficulty interacting with others opting to spend time on the internet. Bansal *et al.* (2010) demonstrated that agreeable individuals had more intentions to disclose their health information on the web because of their trusting nature.

A large body of literature has also examined the relationship between personality and internet use by moderating socio-demographics. For instance, prior work has demonstrated that compared to males, females with higher levels of neuroticism were more likely to blog (Guadagno *et al.*, 2008). In the findings on gauging usage of social media services, males with greater degrees of neuroticism were associated with being regular users (Correa *et al.*, 2010), whereas another study demonstrated that females were higher volume users (Amichai-Hamburger and Ben-Artzi, 2003). When Correa *et al.* (2010) predicted social media use by different age categories, the young adult cohort with higher degrees of extraversion used social media services more regularly. While studies have not included education as a moderator, education is one of the most significant factors determining the likelihood of whether an individual used or did not use the internet (Aerschot and Rodousakis, 2008). For that matter, we include education as another moderator in addition to gender and age.

1.3 Research objectives

The main objective of this study is to examine the role of individual differences for using multiple internet functions. Particularly, we investigate how the Big-Five model (openness to experience, extraversion, neuroticism, conscientiousness, and agreeableness) explains the use of a variety of internet functions. In part, we examine the relationship between personality traits and using multiple internet functions by moderating socio-demographic factors (gender, age, and education). To explore this issue, we conducted analysis on self-reported measures on internet usage from a large Korean sample. Measures included whether an individual searched for information, read news, browsed products, used e-mail, used blogs, used social network services, used forums, and used cloud services.

Based on literature, the following research questions are proposed:

RQ1. What is the relationship between personality predictors and using multiple internet functions?

RQ2. Does the relationship between personality predictors and using multiple internet functions differ by gender?

RQ3. Does the relationship between personality predictors and using multiple internet functions differ by age?

RQ4. Does the relationship between personality predictors and using multiple Internet functions differ by education?

2. Methods

2.1 Sample

This paper builds on survey data collected between June and July 2012 among Korean media users. Directed by the Korean Information Society Development Institute, the survey was collected by visiting each household and asking the household members to complete the survey. The survey is an ongoing panel study of Korean households since 2010 using a multistage probability design with systematic sampling. All members of the household age ten or above were asked to participate in the study. The study used a sample frame that is representative of the Korean population. The total sample consisted of 10,319 users, but after eliminating missing data, the final sample resulted in 9,479 users. Missing data originated from users who did not answer the questions pertaining to personality. Table I describes the user demographics.

2.2 Measures

2.2.1 Multiple internet use. Eight internet functions were measured: search for information, read news, browse products, use e-mail, use blogs, use social network services, use forums, and use cloud services. The question asked to users was, "Do you […]?" for each internet function. Each function consists of a dummy variable (1 = yes, 0 = no). Table II contains the summary statistics for each internet function. To predict the number of internet functions used, each function was summed to calculate an overall total ($\alpha = 0.77$, $M = 3.05$, SD = 2.05).

2.2.2 Personality. Personality is measured by adopting the ten-item Personality Inventory (Gosling *et al.*, 2003). This scale is a shortened version of the Big-Five dimensions of personality, the frequently used inventory that combines all personality traits into five factors and, as such, represents a concise, broad, and comprehensive

Measure	Frequency	%
Gender		
Male	4,280	45.2
Female	5,199	54.8
Age (years)		
10-19	1,072	11.3
20-29	840	8.9
30-39	1,635	17.2
40-49	1,986	21.0
50-59	1,457	15.4
60-69	1,117	11.8
> 69	1,372	14.5
Education (completed)		
Elementary school	1,816	19.2
Middle school	1,251	13.2
High school	3,315	35.0
Undergraduate	2,913	30.7
Graduate (Masters, PhD)	184	1.9
Income ($)		
No income	4,149	43.8
< 6,000	574	6.1
6,000-12,000	867	9.1
12,000-24,000	1,621	17.1
24,000-36,000	1,180	12.4
36,000-48,000	680	7.2
48,000-60,000	210	2.2
> 60,000	198	2.1
Residency		
Urban	7,895	83.3
Rural	1,584	16.7

Table I.
User demographics

Notes: $n = 9{,}479$. Income was converted from Korean Won to US Dollars

model of personality (Costa and McCrae, 1992; Digman, 1990; Goldberg, 1990). The ten-item Personality Inventory has adequate levels of convergent and discriminant validity, test-retest reliability, and external correlates (Gosling *et al.*, 2003). When research conditions dictate that a short measure be used, the ten-item Personality Inventory can stand as a reasonable proxy for longer Big-Five instruments (Gosling *et al.*, 2003). The personality dimensions included in this study are extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience. Each dimension is captured by two items. For each item, participants reported their level of agreement with personality traits on a 1-5 scale that best describe them. Extraversion is determined by adding two items: extraverted-enthusiastic and reserved-quiet (reversed; $r = 0.29$, $p < 0.01$, $M = 6.50$, SD = 1.53). Agreeableness is constructed by summing two items: sympathetic-warm and critical-quarrelsome (reversed; $r = 0.28$, $p < 0.01$, $M = 6.38$, SD = 1.41). Conscientiousness is measured by adding the following two items: dependable-self-disciplined and disorganized-careless (reversed; $r = 0.54$, $p < 0.01$, $M = 6.50$, SD = 1.81). Emotional stability is the sum of two items: calm-emotionally stable and anxious-easily upset (reversed; $r = 0.29$, $p < 0.01$,

Measure	Frequency	%
Search for information		
Yes	6,013	63.4
No	3,466	36.6
Read news		
Yes	5,706	60.2
No	3,773	39.8
Browse products		
Yes	7,079	74.7
No	2,400	25.3
Use e-mail		
Yes	4,958	52.3
No	4,521	47.7
Use blogs		
Yes	667	7.0
No	8,812	93.0
Use social network sites		
Yes	1,982	20.9
No	7,497	79.1
Use forums		
Yes	2,075	21.9
No	7,404	78.1
Use cloud service		
Yes	389	4.1
No	9090	95.9
Number of functions used		
0	1,487	15.7
1	1,070	11.3
2	1,331	14.0
3	1,249	13.2
4	1,912	20.2
5	1,310	13.8
6	746	7.9
7	276	2.9
8	98	1.0

Note: $n = 9{,}479$

Table II. Internet use summary

$M = 6.17$, SD = 1.48). Openness to new experience is captured by two summed items: openness to new experiences-complex and conventional-uncreative (reversed; $r = 0.58$, $p < 0.01$, $M = 5.53$, SD = 1.84).

2.2.3 Socio-demographics. Analyses included gender (1 = male, 0 = female), age (actual age), completed education level (1 = elementary school, 2 = middle school, 3 = high school, 4 = undergraduate, 5 = graduate), income (1 = < \$6,000, 2 = \$6,000-12,000, 3 = \$12,000-24,000, 4 = \$24,000-36,000, 5 = \$36,000-48,000, 6 = \$48,000-60,000, 7 = > \$60,000), and residency (1 = urban, 0 = rural). Gender, age, and education are categorized into two distinct classes to examine the relationship between personality traits and multiple internet use. To perform the tests, gender is classified as either male

or female. Previous results indicate that the effects of personality traits on internet use differ by gender (Correa *et al.*, 2010). Age is categorized according to Prensky's (2001) definition, with those born in or after 1980 are classified as "digital natives" whereas those born before are classified as "digital immigrants." The "digital native" generation grew up with digital technology and has sophisticated skills in using it, but they have also developed new cognitive capacities and learning styles due to exposure to these technologies (Prensky, 2001). Hence, participants of age 33 and above form one group, whereas those of ages below 33 form the other group. Education is also categorized based on empirical support by Aerschot and Rodousakis (2008) by classifying those who have completed college degrees or above compared with those who have completed high school or below.

2.3 Statistical analyses

To examine the association of socio-demographics, personality, and using multiple internet functions, Poisson's regression is applied. Poisson's regression is a type of regression analysis applied to model count data. For this study, we count the number of internet functions used by an individual. The distribution of count variables for using multiple internet functions has a right skew and follows a Poisson's distribution. Because the variance is larger than the mean, the Poisson model is adjusted by dividing the residual deviance by the number of degrees of freedom to correct for over-dispersion. In each analysis, socio-demographic factors are included as the first block, followed by a second block involving the personality traits. A significant relationship between socio-demographic and personality factors and using multiple internet functions is defined as $p < 0.01$. This threshold was set to accommodate the large sample size and to decrease the probability of committing a Type I error. All statistical analyses were performed with SAS Version 9.2 (SAS Inc., Cary, NC).

3. Results

The frequency and percentage of types of internet functions used, along with the number of internet functions used, are presented in Table II. According to the summary, Koreans use the internet to browse products (74.7 percent) more frequently than for other internet functions. This is followed by searching for information (63.4 percent), reading news (60.2 percent), using e-mail (52.3 percent), using forums (21.9 percent), using SNS (20.9 percent), using blogs (7.0 percent), and using cloud services (4.1 percent). The number of internet functions used indicates that the largest proportion of internet users tend to use four functions (20.2 percent), followed those who use zero (15.7 percent), two (14.0 percent), five (13.8 percent), three (13.2 percent), one (11.3 percent), six (7.9 percent), seven (2.9 percent), and eight (1.0 percent) functions.

Table III presents the zero-order correlations among the dependent, independent, and control variables. The correlation values for personality traits are in accordance with literature (Gosling *et al.*, 2003). All personality traits display significant relationships to each other. Notably high correlation values exist between openness to experience and conscientiousness ($r = -0.51$, $p < 0.001$) and between emotional stability and agreeableness ($r = 0.58$, $p < 0.001$). In general, conscientious individuals tend to be thorough, careful, and vigilant with their decision making and display signs that are contrasting to openness to experience. In addition, users with high agreeableness are more likely to be emotionally stable by managing and controlling their emotions in a variety of situations (Jensen-Campbell and Graziano, 2001).

Table III.
Correlations among study variables

		1	2	3	4	5	6	7	8	9	10	11
1	Gender	1										
2	Age	−0.063**	1									
3	Education	0.16**	−0.57**	1								
4	Income	0.46**	0.032**	0.34**	1							
5	Residency	0.00	−0.19**	0.28**	0.057**	1						
6	Openness to experience	0.070**	−0.29**	0.23**	0.046**	0.14**	1					
7	Conscientiousness	−0.031**	0.20**	−0.089**	0.037**	−0.069**	−0.51**	1				
8	Extraversion	0.021*	−0.11**	0.088**	0.027**	0.048**	0.29**	−0.12**	1			
9	Emotional stability	0.045**	0.025*	0.016	0.034**	−0.002	0.11**	−0.053**	0.24**	1		
10	Agreeableness	0.017	0.005	0.007	−0.006	−0.007	0.098**	−0.033**	0.28**	0.578**	1	
11	Number of functions used	0.10**	−0.69**	0.67**	0.18**	0.22**	0.28**	−0.12**	0.11**	−0.049**	−0.027**	1

Notes: *,**Significant at 5 and 1 percent levels, respectively

Model 1 predicts using multiple internet functions with only the socio-demographic factors, whereas Model 2 adds personality traits as the second block. Both models use Poisson's regression models to account for the number of internet functions, which approximately follow a Poisson's distribution. Table IV presents the parameter estimates, their standard errors, and the goodness-of-fit for both models.

Both models indicate that socio-demographic factors have a significant relationship with using multiple internet functions. On average, females use more internet functions than males ($\beta = -0.052$, $p < 0.001$). As age increases, users tend to use fewer internet functions ($\beta = -0.022$, $p < 0.001$). Education and income display positive relationships with using a number of internet functions ($\beta = 0.29$, $p < 0.001$ and $\beta = -0.052$, $p < 0.001$). The coefficient for the residency dummy variable is positive, indicating that individuals from the urban area use more internet functions ($\beta = 0.083$, $p < 0.001$). Among socio-demographic factors, education has a relatively strong relationship with using a number of internet functions.

In Model 2, including the personality traits while controlling for the socio-demographic factors, openness to experience is positively associated with using more internet functions ($\beta = 0.029$, $p < 0.001$). Individuals who scored higher on the trait of conscientiousness illustrate a propensity to use a number of internet functions ($\beta = 0.014$, $p < 0.001$). Model 2 also demonstrates that individuals who are more emotionally stable use a smaller number of internet functions ($\beta = -0.020$, $p < 0.001$). In contrast to the three personality traits that significantly relate to using multiple internet functions, extraversion, and agreeableness are unrelated.

3.1 Gender difference

For the second research question, which considered whether the relationship between personality factors and using multiple internet functions differed by gender, the results do not indicate any difference (see Table V). This finding is in contrast with previous empirical studies on internet use, which suggested that males and females display different personality traits in relation to using the internet (Amichai-Hamburger and Vinitzky, 2010; Tosun and Lajunen, 2010). For both genders, results indicate that the

	Model 1		Model 2	
	β	SE	β	SE
Intercept	0.69**	0.037	0.56**	0.055
Gender	−0.052**	0.012	−0.052**	0.012
Age	−0.022**	0.000	−0.022**	0.000
Education	0.29**	0.007	0.29**	0.007
Income	0.045**	0.003	0.045**	0.003
Residency	0.083**	0.017	0.075**	0.017
Openness to experience			0.029**	0.004
Conscientiousness			0.014**	0.003
Extraversion			0.005	0.004
Emotional stability			−0.020**	0.004
Agreeableness			−0.006	0.005
Pseudo R^2	0.54		0.56	
AIC	39,920.80		40,274.62	

Notes: $n = 9{,}479$. Poisson's regression predicts counts in log metric. *,**Significant at the 1 and 0.1 percent levels, respectively

Table IV.
Poisson's regression model on using multiple internet functions

	Male ($n = 4,280$)				Female ($n = 5,199$)			
	Model 1		Model 2		Model 1		Model 2	
	β	SE	β	SE	β	SE	β	SE
Intercept	0.71**	0.050	0.56**	0.075	0.68**	0.053	0.58**	0.080
Age	−0.022**	0.000	−0.021**	0.001	−0.023**	0.000	−0.023**	0.001
Education	0.26**	0.010	0.26**	0.010	0.30**	0.001	0.30**	0.001
Income	0.059**	0.004	0.057**	0.004	0.027**	0.005	0.027**	0.005
Residency	0.054	0.023	0.048	0.023	0.11**	0.025	0.099**	0.025
Openness to experience			0.030**	0.005			0.029**	0.005
Conscientiousness			0.012*	0.004			0.014*	0.005
Extraversion			0.007	0.005			0.003	0.005
Emotional stability			−0.018*	0.006			−0.021**	0.006
Agreeableness			−0.005	0.006			−0.008	0.007
Pseudo R^2	0.52		0.53		0.57		0.57	
AIC	20,051.27		20,247.22		20,278.08		20,433.40	

Notes: Poisson's regression predicts counts in log metric. *,**Significant at 1 and 0.1 percent levels, respectively

Table V. Poisson's regression model on using multiple internet functions by gender

strength and directions are consistent with the output produced by Table III. Openness to experience is positively related to using multiple internet functions for males ($\beta = 0.030, p < 0.001$) and females ($\beta = 0.029, p < 0.001$). Conscientiousness has similar coefficients for males ($\beta = 0.012$, $p < 0.01$) and females ($\beta = 0.014$, $p < 0.01$). Likewise, emotional stability produces negative relationships for males ($\beta = -0.018$, $p < 0.001$) and females ($\beta = -0.021, p < 0.001$). However, for both genders, extraversion and agreeableness do not exhibit a significant effect on using multiple internet functions.

3.2 Age difference

The third research question analyzed the influence of personality traits on using multiple internet functions when age is classified according to users who are "digital natives" or "digital immigrants" (see Table VI). The results suggest differences

	33 or above ($n = 7,046$)				Below 33 ($n = 2,433$)			
	Model 1		Model 2		Model 1		Model 2	
	β	SE	β	SE	β	SE	β	SE
Intercept	−1.27**	0.037	−1.35**	0.069	1.00**	0.040	0.92**	0.063
Gender	−0.11**	0.020	−0.11**	0.019	−0.044**	0.013	−0.037**	0.013
Education	0.51**	0.009	0.49**	0.009	0.11**	0.009	0.11**	0.009
Income	0.042**	0.005	0.039**	0.005	−0.002	0.004	−0.001	0.004
Residency	0.072*	0.024	0.059*	0.024	0.080**	0.021	0.073**	0.021
Openness to experience			0.049**	0.005			0.014**	0.004
Conscientiousness			0.008	0.005			0.012*	0.002
Extraversion			0.005	0.005			0.015**	0.005
Emotional stability			−0.021*	0.006			−0.026**	0.005
Agreeableness			−0.013	0.007			−0.004	0.005
Pseudo R^2	0.44		0.46		0.09		0.12	
AIC	22,647.03		22,939.29		20,919.06		21,419.81	

Notes: Poisson's regression predicts counts in log metric. *,**Significant at the 1 and 0.1 percent levels, respectively

Table VI. Poisson regression on using multiple internet functions by age

between the two age groups. For ages 33 or above, using more internet functions is predicted positively by openness to experience ($\beta = 0.049$, $p < 0.001$) and negatively by emotional stability ($\beta = -0.021$, $p < 0.01$). The results indicate that, for this age group, conscientiousness, extraversion, and agreeableness has no relationship with using multiple internet functions.

For the age cohort below 33, four of the five personality traits is found to have a significant effect on using multiple internet functions. Openness to experience ($\beta = 0.014$, $p < 0.001$), conscientiousness ($\beta = 0.012$, $p < 0.01$), and extraversion ($\beta = 0.015$, $p < 0.001$) is positively related to usage of more internet functions, whereas emotional stability ($\beta = -0.026$, $p < 0.001$) is negatively related. As with previous results, agreeableness does not have a significant effect. In both Poisson's regression models, income is not related to using multiple internet functions before or after introducing personality factors. This outcome implies that the personality traits of conscientiousness and extraversion are important predictors of using multiple internet functions for this age group.

3.3 Education difference

To explore the fourth research question, the relationship between personality traits and using multiple internet functions was examined by differentiating two education levels: individuals who have completed at a university level or above and individuals who have completed high school or below (see Table VII). For individuals who have completed at a university level or above, higher levels of openness to experience ($\beta = 0.018$, $p < 0.001$) and conscientiousness ($\beta = 0.020$, $p < 0.001$) are associated with using more internet functions. The results also demonstrated that emotional stability has a negative influence on using multiple internet functions ($\beta = -0.015$, $p < 0.001$). Regarding extraversion and agreeableness, a non-significant relationship is found.

For the group who completed high school or below, openness to experience ($\beta = 0.045$, $p < 0.001$) has a positive effect and emotional stability ($\beta = -0.024$, $p < 0.001$) has a negative effect on using a number of internet functions. Similarly, extraversion and agreeableness do not have a significant relationship for using

	Completed college or above ($n = 3{,}097$)				Complete up until high school ($n = 6{,}382$)			
	Model 1		Model 2		Model 1		Model 2	
	β	SE	β	SE	β	SE	β	SE
Intercept	1.89**	0.028	1.67**	0.053	1.83**	0.031	1.69**	0.076
Gender	−0.033	0.013	−0.031	0.013	−0.12	0.018	−0.12	0.018
Age	−0.012**	0.001	−0.012**	0.001	−0.031**	0.001	−0.029**	0.001
Income	0.024**	0.003	0.024**	0.003	0.11**	0.005	0.11**	0.005
Residency	0.012	0.022	0.013	0.021	0.19	0.024	0.17	0.024
Openness to experience			0.018**	0.004			0.045**	0.006
Conscientiousness			0.020**	0.003			0.008	0.006
Extraversion			0.008	0.004			0.005	0.006
Emotional stability			−0.015**	0.005			−0.024**	0.007
Agreeableness			0.002	0.005			−0.012	0.007
Pseudo R^2	0.14		0.15		0.45		0.45	
AIC	26,089.61		26,528.44		19,952.04		20,152.78	

Notes: Poisson's regression predicts counts in log metric. *,**Significant at the 1 and 0.1 percent levels, respectively

Table VII.
Poisson's regression on using multiple internet functions by education

a variety of internet functions. In addition, no significant effect is found for conscientiousness, contrary to the positive significant effect found in the education group that completed at a university level or above.

4. Discussion

The purpose of the exploratory study is to examine the influence of personality factors on using multiple internet functions. The analysis involved using data from a Korea survey that measured overall media behavior. The data differs from past studies in that the setting is not western, and it captures a sample frame that is representative of the population.

Among socio-demographics, using more internet functions is likely to be associated with being female, younger age, higher education, higher income, and living in urban area. For personality traits, after controlling for socio-demographic factors, individuals characterized by openness to experience, conscientiousness, and neuroticism indicate the tendency to use multiple internet functions. Extraversion only becomes significantly associated when the analysis is conducted by moderating the age groups. In all analysis stages, agreeableness is consistently not related.

The interpretation of the findings can be demonstrated by Uses and Gratification theory, which holds that users are responsible for choosing internet functions to meet their desires and needs to achieve gratification (McQuail, 2010). It is not surprising that the results indicated that openness to experience is positively related to using more internet functions. This is in corroboration with previous internet studies revealing a positive relationship (Butt and Phillips, 2008; Correa *et al.*, 2010). Because individuals who are high on the trait of openness to experience are more likely be artistic, curious, imaginative, and amenable to experiences (Costa and McCrae, 1992), they would attempt to engage with numerous internet functions to pursue their interests.

This research indicated a positive relationship between conscientiousness and using more internet functions. The findings contradict prior studies, which have demonstrated a negative association between conscientiousness and internet use (Ross *et al.*, 2009). The underlying logic by Ross *et al.* (2009) suggest that those who are high on the trait of conscientiousness are likely to avoid internet functions that may serve as procrastination or distraction tools from their daily tasks. Perhaps these papers found a negative relationship because internet use was geared toward measuring leisure functions on the web. When users have a clear purpose on the internet (e.g. information seeking), empirical evidence suggests a positive association (Landers and Lounsbury, 2006). For that reason, it could be argued that users are goal-oriented in their internet activities, which leads them to use multiple functions to achieve their purpose.

This study found evidence that emotional stability is negatively related to using multiple internet functions. Stated differently, higher levels of neuroticism are more likely to result in a user engaging in a number of internet functions. This finding is congruent with prior studies, which demonstrated that higher degrees of neuroticism were associated with overall internet use (Amiel and Sargent, 2004), blog use (Guadagno *et al.*, 2008), and social media use (Correa *et al.*, 2010). A possible explanation is that individuals with higher levels of neuroticism tend to be lonely and shy, which increases the urge to engage with multiple internet functions to feel a sense of "belonging" and be informed (Amiel and Sargent, 2004). Butt and Philips (2008) noted in their mobile phone study that higher levels of neuroticism were associated with controlling shared information. Because using numerous internet functions involves

sharing information inadvertently, it poses a risk factor, especially for individuals with high levels of neuroticism.

Prior research has indicated that personality traits reflected differently on internet use when the study design involved differentiation by gender (Amichai-Hamburger and Ben-Artzi, 2003; Correa *et al.*, 2010; Guadagno *et al.*, 2008). However, the present study does not find any difference by gender when predicting multiple internet functions. However, a more likely case is that there are gender differences when observing individual internet functions (e.g. blogging, social networking).

However, when the analysis includes categorization by age, the findings present differences. While being conscientious and extraverted is found to have no significant relationship with using multiple internet function for the digital immigrants (older age group), it has a significant relationship for the digital natives (young age group). The digital natives are more likely to be conscientious with using a number of internet functions. Perhaps because the digital natives are innately able to use the internet after growing up with the technology (Prensky, 2001), they are able to actively plan, organize, and carry out tasks on the web, which are indications of conscientious individuals. In addition, this study includes a sizeable body of students, and being conscientious tends to have a positive association with internet use when the activity is academically related (Landers and Lounsbury, 2006). Along with the trait of conscientiousness, the extraverted digital natives relies on using more internet functions. As a possible reason, the digital natives need to interact and communicate on the internet (Prensky, 2001), and these motives tend to be associated with extraversion (Correa *et al.*, 2010).

The findings also indicated that different education levels produces differences among personality traits. Users who completed college or above with higher degrees of conscientiousness are more likely to engage with multiple internet functions. No significant relationship is found for the cohort who completed high school or below. Because conscientious individuals are typically associated with being efficient, organized, neat, and systematic (Thompson, 2008), they would choose their internet functions carefully to maximize their task performance. In addition, Hargittai and Hinnant (2008) demonstrated that individuals with higher education use the web for news, work, travel arrangement, product information, career opportunities, and health services. This evidence implies that highly educated individuals tend to displays traits of conscientiousness and use multiple internet functions to satisfy their needs.

One of the main limitations of this paper is its application of the shortened version of the Big-Five model. As noted by Gosling *et al.* (2003, p. 523), despite the inventory having adequate levels of convergent and discriminant validity, test-retest reliability, and external correlates, this instrument has its "psychometric cost," which makes the scale less reliable and correlate less strongly with other variables. In addition, the bounded usage of this inventory does not allow the possibility of testing for other individual difference factors to predict using multiple internet functions, which may have more predictive power. For that matter, future research should consider including other individual difference factors such as computer anxiety, computer self-efficacy (Saadé and Kira, 2009), trust (Hoffman *et al.*, 1999), and locus of control (Chak and Leung, 2004). Another limitation of this research is that internet behavioral data was self-reported; then, there is potential for common-method bias (Podsakoff *et al.*, 2003).

Future research might also include examining the patterns of internet use for an extended period of time. An individual who was previously not a user of a particular

internet function might become a user in the future. Moreover, a previous user might decide to not use a function for some reason. As indicated in one longitudinal internet study, once users interacted with instant messenger services and chat rooms, they became compulsive users of these internet functions within the next six months at the expense of other internet activities (van den Eijnden *et al.*, 2008).

This research provides evidence that theories that integrate individual differences – socio-demographics and personality – have a strong role to play in internet research. Still, it is still important to further our understanding of the influence of individual difference factors on the use of multiple internet functions. This type of exploratory research is particularly applicable in today's setting where users are increasingly becoming engaged with the internet.

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