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An Assessment of People's Personality Traits and their Technology Skills

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Abstract

This paper explores the possible relationship between people's personality traits and their technology skills. Further, the researcher merges two separate surveys adapted to assess: a) personality traits, and b) technology skills, through a sample of convenience, that was available for this research project, in order to satisfy the prime goal of investigating possible relationships, while observing several practical constraints such as: covid-19 local restrictions and access to a pool of participants. Finally, in this paper, there are some interesting findings associated to specific self-report items because they suggest relationships between personality traits and technology skills. However, these findings are not conclusive due to several research limitations.

Keywords: *Personality skill assessment, Technical skill assessment.*

1. INTRODUCTION

The human side of cybersecurity is now under study (i.e. human-centered cybersecurity) from different academic perspectives, ranging from psychology and economics (e.g., Fineberg, 2016; Batteau, 2011) to sociology and cultural studies (e.g., Shires, 2020; Turner & Turner, 2017) . However, all academic disciplines seem unable to capture in its entirely the very essence of human behavior in regards to security (Walt, 1991). What's more, the lines of inquiry in this subject continue to grow overtime (Cavelty, 2014), since it is very interesting to do research about the different behaviors that users incur while conducting their doings online. Further, decision-making about security issues continues to claim center stage in the continued study of all human interactions in cyberspace (Fischer, 2014). However, the vast number of perspectives and approaches to the study of human interactions in cyberspace are adding up to the complexity of behavior analysis, while prompting future cyberSec research into subdividing cybersecurity according to environments/issues along with specific interactions of users (Pervin, 1994).

2. LITERATURE REVIEW

In recent years, the study of human personality has become notably important in psychology research (Ozer & Benet-Martinez, 2006), and even more in cybersecurity (McBride, et al., 2012; Freed, 2014). Further, McCrae & Costa (1995) pointed out that 'personality traits describe differences in typical cognitive and affective experience that have implications for human behavior' (Curtis, et al., 2015. p.1-3). For example, Komarraju, et al., (2009) concluded that personality may influence academic achievement. Neal, et al., (2012) stated that personality traits affect work performance in different roles in organizations, while Wang (2013) asserted that personality traits influence online behavior, as evidenced through sharing and self-disclosure on Facebook.

The definition of personality traits varies across the literature. For instance, Allport (1961) stated that 'personality is the dynamic organization within the individual of those psychophysical systems that determine his characteristics behavior and thought' (p. 28), while Weinberg & Gould (1999) pointed out that personality refers to 'the characteristics or blend of characteristics that make a person unique'. These definitions grant special attention to the uniqueness of each individual. Therefore, 'each person has a unique psychological structure and with its own personality traits' (Allport, 1961. p. 28). Furthermore, although trait theories of personality imply that researchers can explain better personality by referring to the psychological perspective, Bandura (1977) emphasized the critical role of the environment in influencing the development of personality traits, as noted in his work of social learning theory, while Freud (1920) affirmed in his psychodynamic theory of personality that there are interactions between instincts and influences.

Over the years, there has been several models and theories to describe personality traits (e.g., humanistic, social cognition, cultural, economics, etc.). However, the five-factor (or Big 5 as commonly known) model, composed of openness to new experiences, conscientiousness, extraversion, agreeableness, and neuroticism (McCrae and Costa, 1987, McCrae and John, 1992) has become widely applicable and acceptable to numerous research studies of human personality and its influence on different human endeavors (e.g., Bhawuk, 2003; Bandura, 1999; Davis & Panksepp, 2011).

The Five Factors of Personality Traits (The Big Five)

John & Srivastava (1999) stated that the study of personality is conceptualized from a number of different theoretical perspectives, and only the latest construct of the "Big Five", has been successful in defining clear domains, while facilitating the grouping of variables, which has led to a consensus in the definition of basic factors of personality traits (Widiger & Trull, 1997). In addition, the table below shows five personality traits and their description.

Factors	Description
Conscientiousness (efficient/organized vs. extravagant/careless)	Impulse control behaviors that help with goal and task completion, such as planning, organizing, and delaying gratification
Openness (inventive/curious vs. consistent/cautious)	The extent to which an individual's mind and experiences are complex and original
Agreeableness (friendly/compassionate vs. challenging/callous)	Pro-social attitudes toward others, including traits such as trust and tender mindedness
Neuroticism (sensitive/nervous vs. resilient/confident)	The contrast on emotional stability, includes feelings like anxiety and sadness
Extraversion (outgoing/energetic vs. solitary/reserved)	Sociability and an energetic approach to the world

Table 1: Description of the Big Five Factors of Personality Traits (John & Srivastava, 1999)

The Big Five model has been extensively tested in different fields of study, such as: organizational psychology (Hogan, et al., 1994), health psychology (Smith & Williams, 1992), aging (Costa & McCrae, 1992), psychopathology (Trull & Sher, 1994; Widiger & Trull, 1992), computer behavior (Rogers, et al., 2006), etc. What's more, The Big Five model uses a self-reporting inventory, which captures subjective data about personality traits of people. In addition, Perry (1992) pointed out that researchers should exercise caution in the interpretation of self-inventory data, since people are susceptible to mood-state effects (Zimmerman, 1994). Further, people who exhibit different emotional states, such as: depression, anxiety, anger, or any other alterations may not provide accurate self- descriptions (i.e., self-reporting bias).

However, in most cases, 'people offer responses that are consistent to self-description and to their underlying personality traits' (Jang, et al., 1996. p. 577). Finally, self-report data are a critical part of all social sciences. Consequently, the validity of self-report data has been studied extensively. Rosenman, et al., (2011) stated that 'there are two critical issues to examine when assessing the validity of self-report data: cognitive issues and situational issues. Cognitive issues focus on the understanding of questions and their meaning to the respondents, so they can recollect knowledge or memory to answer them accurately, whereas situational issues include the influence of the immediate environment where the survey is administered at the time' (p. 320-321).

Technology Skills Assessment

Lee, et al., (1995) pointed out that information systems will continue to grow over time. Hence, it is necessary to update the user's technology skills in tandem with the development of new technologies in our daily lives (Kim & Keith, 1994). Furthermore, De Grip & Van Loo (2002) stated that current technology skills become obsolete fast due to rapid technological developments, and it is difficult for end-users to acquire the new technology skills without the proper training and education. Even so, research in technology skills continues to emphasize the need to develop specific computer skills (Gist, et al., 1988). What's more, Tallon, et al., (2000) acknowledged that investments in computers and computer skills in advance manufacturing processes has become a catalyst for organizational change. However, in light manufacturing companies, computer skills are used for marketing practices and administrative duties, and not for security reasons (Lankshear, 1997).

Weinberg (2002) stated that skill obsolescence is a serious problem generated by imperfect skills and knowledge transfers, and through outdated knowledge and experience. However, the pace of obsolescence is increasing due to changes in the marketplace. What's more, end-users with appropriate technology skills and information literacy may adopt new technologies easily (Bolter, 1991) However, end-users may also experience unexpected hardship with new technologies, and they may decide to adopt the role of a passive end-user of technology (Jurison, 2000).

Elnaga & Imran (2013) pointed out that end-users who receive appropriate training at the workplace will become more efficient and will be able to accomplish the necessary task regardless of the nuances of new technologies in the workplace. Conversely, McGrath, (1990) pointed out that deficits in technology skills will affect how users interact with equipment and how they perform their tasks on a regular basis (Czaja, 1996). Seemingly, Winter, et al., (1998) suggested that computer literate workers possess both, concrete and abstract knowledge of computers and other similar technologies (Andersen, 1990). Consequently, the application of knowledge to problem solving and decision-making becomes less frustrating. What's more, Branchean & Wetherbe (1987) noted that, work organization, the work itself, and the organizational design influence the attitude of workers towards adoption of new technologies.

Technology skills are first acquired in schools and through different academic experiences (Winter, et al., 1997). However, workers depend more on job training and practical experience at the workplace to update their skills and knowledge (Smith, 2001), and to meet the demand for modern technology skills that their jobs impose on them. In addition, the National Research Council. (2012) pointed out that only those learning experiences that improve specific technology skills in a particular context (e.g., problem solving, decision-making) are likely to have a positive effect on the user's performance. Hence, the workplace is becoming responsible for the development of the necessary technology skills (Karsten & Roth, 1998). Finally, technology skills are important in a number of settings; personal and professional. Shaw, et al., (2018) pointed out that self-reported technology skills reveal differences in attitude towards accepting and adopting new technologies in the workplace, while also exhibiting different effects of personality and feelings towards technology (Ying-chen, et al., 2000).

Other studies

Crossler et al., (2013) pointed out that human behavior influences people's interactions online, and how they express their concerns about security in cyberspace. Further, Best et al., (2010) stated that in cybersecurity, situation awareness demands that people develop the ability to assess data, evaluate options, and make decisions in a timely manner. However, Shappie et al., (2019) stated that people often behave in ways that are discordant with their intentions, and not bound for consistency between singular intentions and subsequent behavior, since intention is a cognitive process, whereas behavior is more closely associated to natural impulses in the moment, and to human personality (Wansink & Sobal, 2007).

Halevi et al., (2016) studied how behaviour, self-efficacy and privacy attitude are affected by culture in comparison to other variables such as gender and computer expertise. Further, their findings revealed that there was a relationship between conscientiousness and how people engage in secure online behavior. In addition, other studies have paid special attention to the influence of human personality traits on information awareness (McCormac, et al., 2017), information privacy (Bansal, 2011), policy compliance (McBride, et al., 2012), computer self-efficacy (Saleem, et al., 2011), etc. Finally, recent literature covers aspects of technology adoption associated to personality traits (Williamson, et al., 2013) (Ali, et al., 2020), systems thinking skills preferences (Nagahi, et al., 2020) and the development of other skills, such as soft skills (Bancino & Zevalkink, 2007), critical thinking skills (Clifford, et al., 2004), and non-cognitive skills (Brunello & Schlotter, 2011).

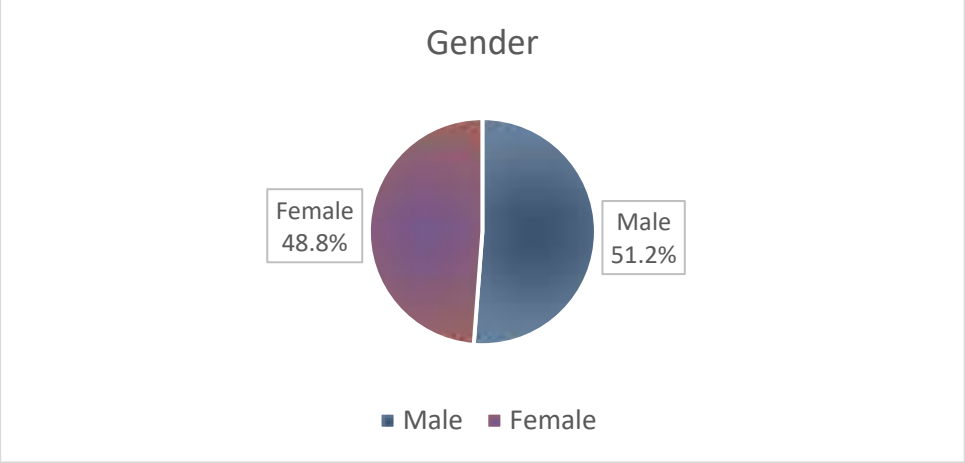
3. METHODOLOGY

This research project uses two self-inventory surveys (on a 5 points Likert's scale) administered online to a sample of convenience due to several practical limitations such as: a) access to participants, and b) the current pandemic (social distancing required). What's more, Henry (1990) highlighted the advantages of using a sample of convenience, since the method is extremely speedy, readily available, and cost effective, causing it to be an attractive option to most researchers; while Sim & Wright (2000) pointed out that a sample of convenience is also useful when researchers need to conduct pilot data collection, and/or to develop hypotheses for future research. The Tables and Graphs below show the sample composition (demographics).

Sample composition (*n*=41)

Gender					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Male**	21.0	51.2	51.2	51.2
	Female	20.0	48.8	48.8	100.0
	Total	41.0	100.0	100.0	

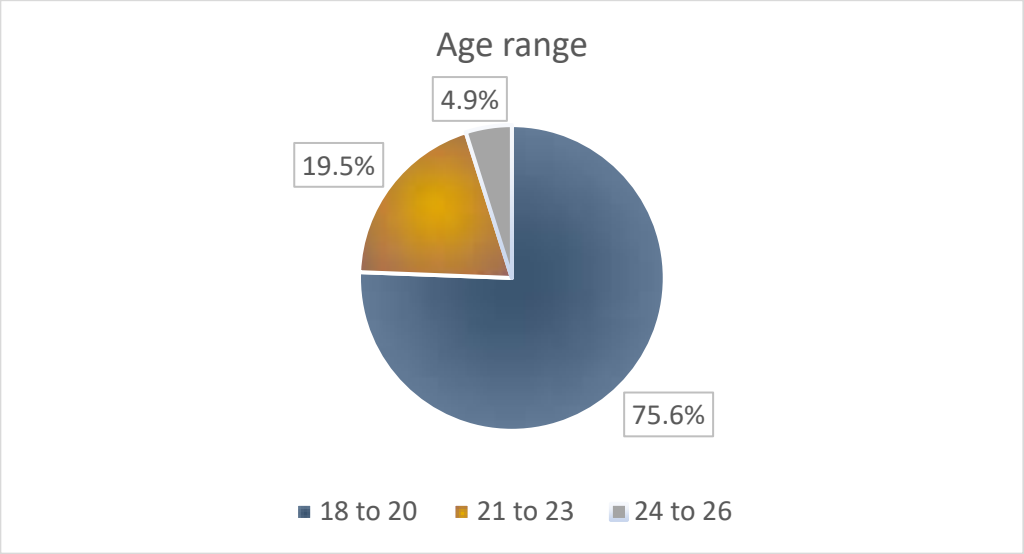
Table 2: Gender Composition



Graph 1: Gender Composition

Age range					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**18 to 20 years old**	31.0	75.6	75.6	75.6
	21 to 23 years old	8.0	19.5	19.5	95.1
	24 to 26 years old	2.0	4.9	4.9	100.0
	Total	41	100.0	100.0	

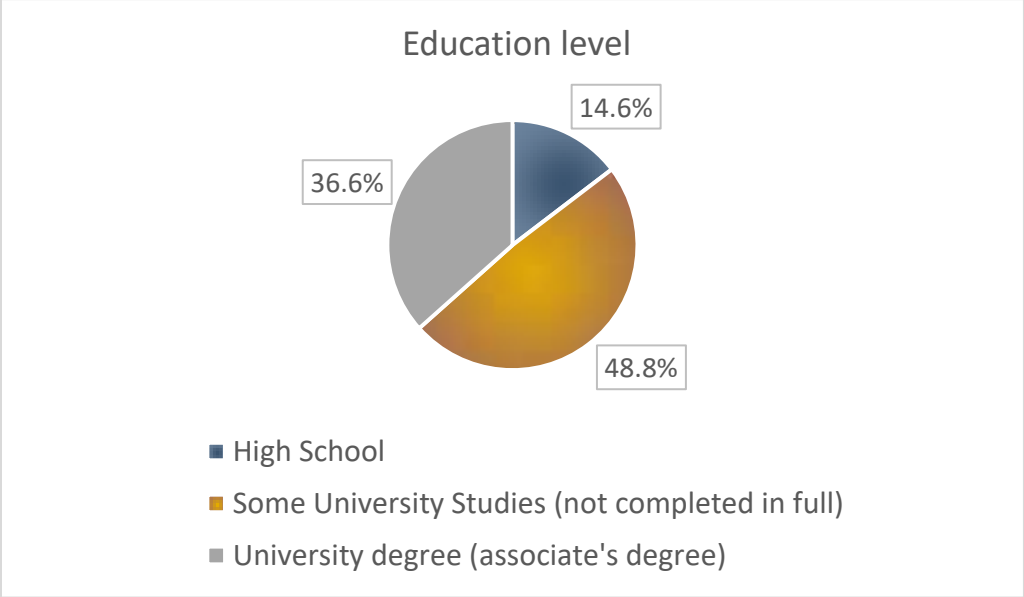
Table 3: Age range Composition



Graph 2: Age range Composition

Education level					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**High School**	6.0	14.6	14.6	14.6
	Some University Studies (not completed in full)	20.0	48.8	48.8	63.4
	University degree (associate's degree)	15.0	36.6	36.6	100.0
	Total	41.0	100.0	100.0	

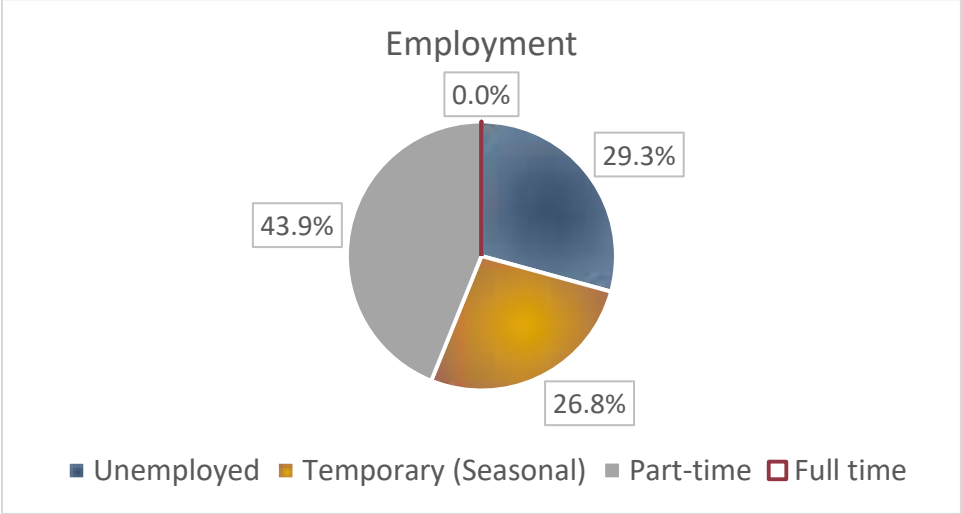
Table 4: Education Level Composition



Graph 3: Education Level Composition

Employment					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Unemployed**	12.0	29.3	29.3	29.3
	Temporary (Seasonal)	11.0	26.8	26.8	56.1
	Part-time	18.0	43.9	43.9	100.0
	Full time	0.0	0.0	0.0	100.0

Table 5: Employment Level Composition



Graph 4: Employment Level Composition

Hypothesis

The primary goal of this research project is to explore possible relationships, if any, between people's personality traits and their technology skills. Therefore, the null hypothesis is:

H_0 = There is no relationship between people's personality traits and their technology skills. Alternatively,
H_1 = There is a relationship between people's personality traits and their technology skills.

Statistical Test

Kendall's Tau-b (τb) correlation coefficient is the statistical test applied to this project. It is a non parametric measure of the strength and direction of association that exists between two variables measured on at least an ordinal scale. SPSS mentions two assumptions that the data needs to satisfy: Assumption #1: the two variables should be measured on an ordinal or continuous scale. Assumption #2: Kendall's tau-b determines whether there is a monotonic relationship between the two variables. Furthermore, The Tau-b statistic makes adjustments for ties, and values of Tau-b range from −1 (100% negative association, or perfect inversion) to +1 (100% positive association, or perfect agreement). A value of zero indicates the absence of association (Agresti, 2010). The Kendall Tau-b coefficient is defined as:

$$\tau_B = \frac{n_c - n_d}{\sqrt{(n_0 - n_1)(n_0 - n_2)}}$$

Where

$$n_0 = n(n-1)/2$$

$$n_1 = \sum_i t_i(t_i - 1)/2$$

$$n_2 = \sum_j u_j(u_j - 1)/2$$

n_c = Number of concordant pairs

n_d = Number of discordant pairs

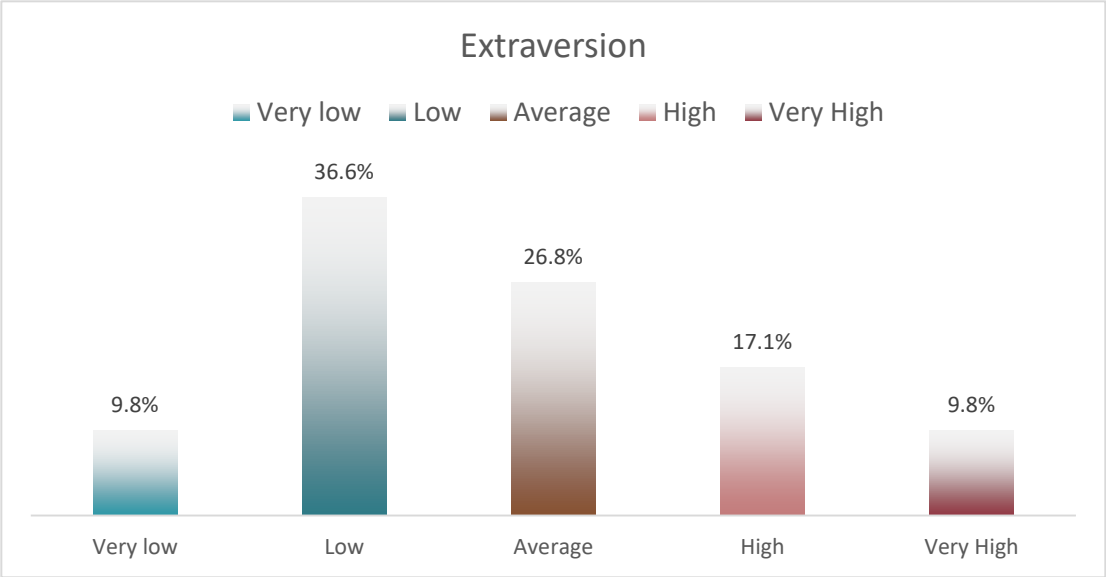
t_i = Number of tied values in the i^{th} group of ties for the first quantity

u_j = Number of tied values in the j^{th} group of ties for the second quantity

4. RESULTS

Extraversion					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Very low**	4.0	9.8	9.8	9.8
	Low	15.0	36.6	36.6	46.3
	Average	11.0	26.8	26.8	73.2
	High	7.0	17.1	17.1	90.2
	Very High	4.0	9.8	9.8	100.0
	Total	41.0	100.0	100.0	

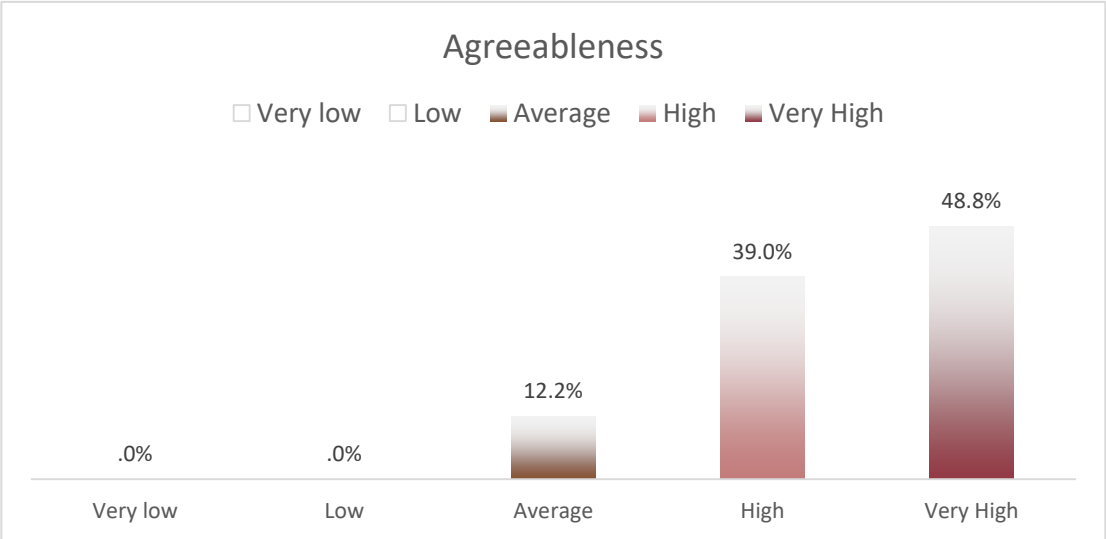
Table 6: Extraversion Answers



Graph 5: Extraversion Answers

Agreeableness					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Very low**	0.0	0.0	0.0	0.0
	Low	0.0	0.0	0.0	0.0
	Average	5.0	12.2	12.2	12.2
	High	16.0	39.0	39.0	51.2
	Very High	20.0	48.8	48.8	100.0
	Total	41.0	100.0	100.0	

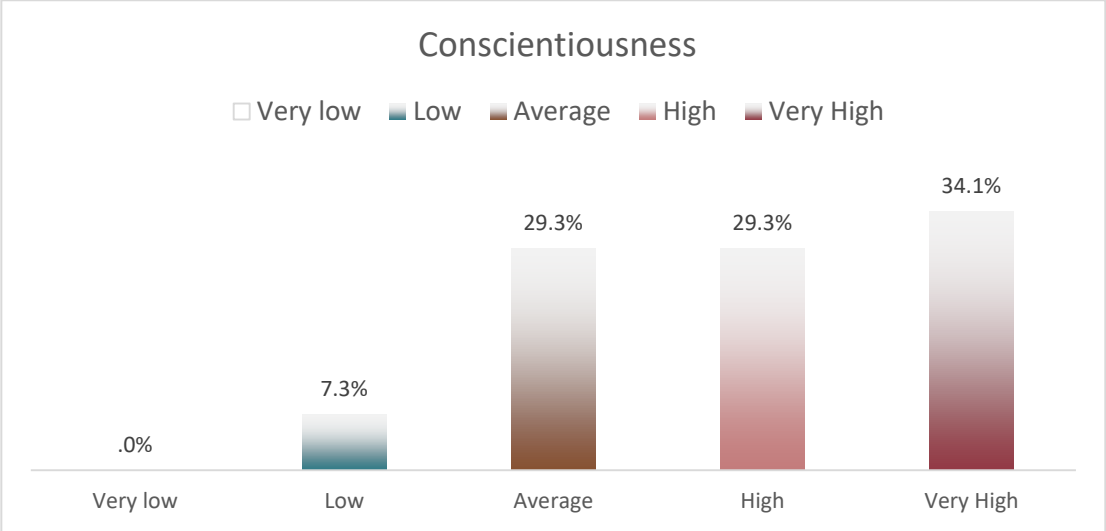
Table 7: Agreeableness Answers



Graph 6: Agreeableness Answers

Conscientiousness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	0.0	0.0	0.0	0.0
	Low	3.0	7.3	7.3	7.3
	Average	12.0	29.3	29.3	36.6
	High	12.0	29.3	29.3	65.9
	Very High	14.0	34.1	34.1	100.0
	Total	41.0	100.0	100.0	

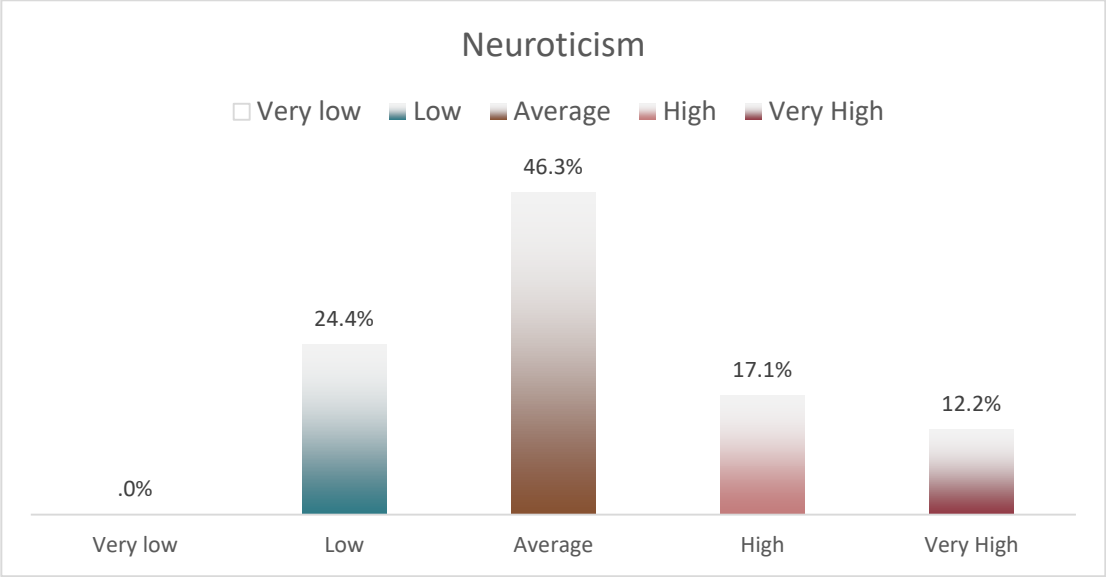
Table 8: Conscientiousness Answers



Graph 7: Conscientiousness Answers

Neuroticism					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	0.0	0.0	0.0	0.0
	Low	10.0	24.4	24.4	24.4
	Average	19.0	46.3	46.3	70.7
	High	7.0	17.1	17.1	87.8
	Very High	5.0	12.2	12.2	100.0
	Total	41.0	100.0	100.0	

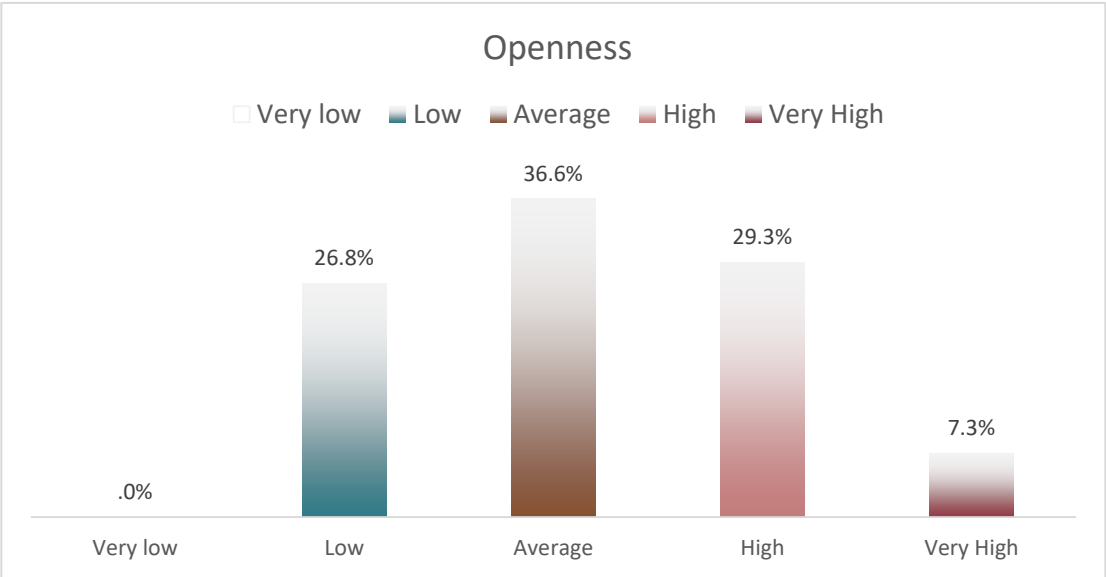
Table 9: Neuroticism Answers



Graph 8: Neuroticism Answers

Openness					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Very low**	0.0	0.0	0.0	0.0
	Low	11.0	26.8	26.8	26.8
	Average	15.0	36.6	36.6	63.4
	High	12.0	29.3	29.3	92.7
	Very High	3.0	7.3	7.3	100.0
	Total	41.0	100.0	100.0	

Table 10: Openness Answers

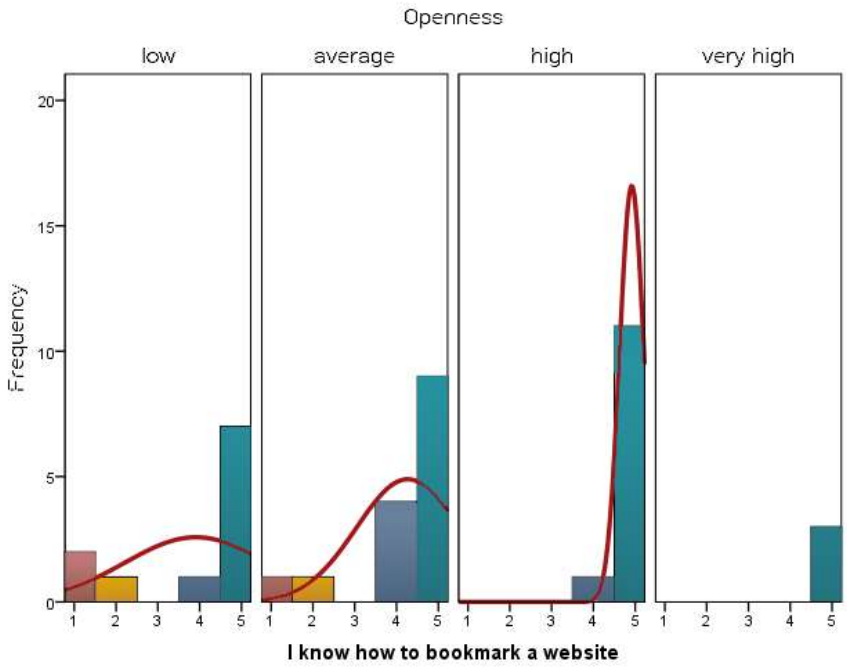


Graph 9: Openness Answers

Correlation Results

Correlations				
			I know how to bookmark a website	**Openness**
Kendall's tau_b	I know how to bookmark a website	**Correlation Coefficient**	1.000	.295*
		Sig. (2-tailed)		**0.037**
		N	41	41
	Openness	**Correlation Coefficient**	.295*	1.000
		Sig. (2-tailed)	**0.037**	
		N	41	41

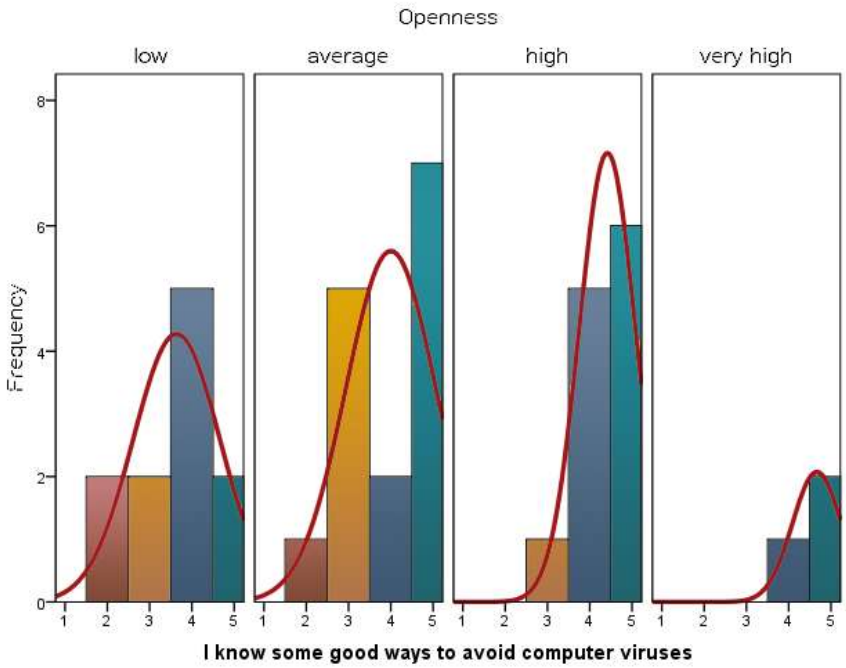
Table 11: Correlation, *Openness and I know how to bookmark a website.*



Graph 10: Correlation, *Openness and I know how to bookmark a website.*

Correlations				
			I know some good ways to avoid computer viruses	**Openness**
Kendall's tau_b	I know some good ways to avoid computer viruses	**Correlation Coefficient**	1.000	.290*
		Sig. (2-tailed)		**0.034**
		N	41	41
	Openness	**Correlation Coefficient**	.290*	1.000
		Sig. (2-tailed)	**0.034**	
		N	41	41

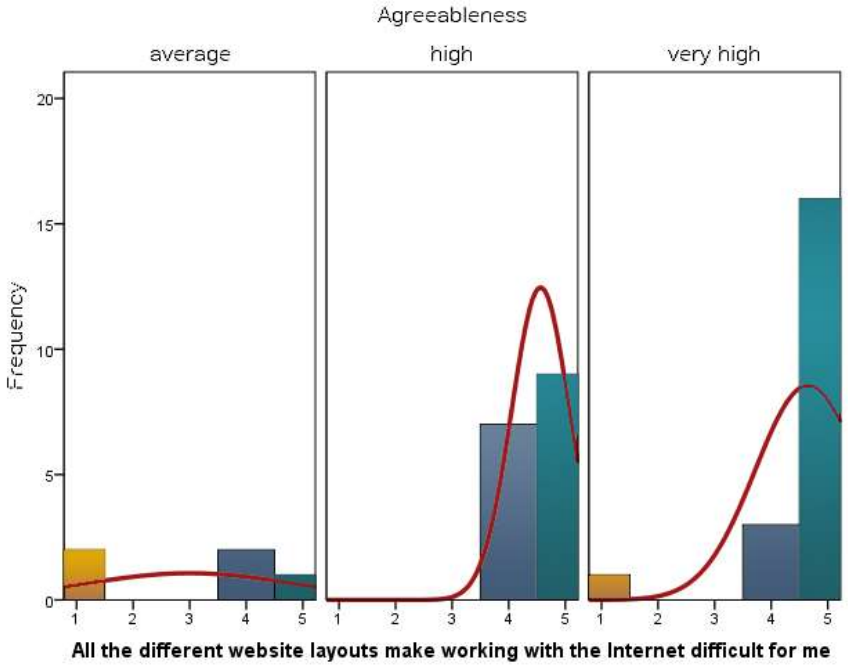
Table 12: Correlation, *Openness and I know some good ways to avoid computer viruses*



Graph 11: Correlation, *Openness and I know some good ways to avoid computer viruses*

Correlations				
			All the different website layouts make working with the Internet difficult for me	**Agreeableness**
Kendall's tau_b	All the different website layouts make working with the Internet difficult for me	**Correlation Coefficient**	1.000	.381**
		Sig. (2-tailed)		**0.010**
		N	41	41
	Agreeableness	**Correlation Coefficient**	.381**	1.000
		Sig. (2-tailed)	**0.010**	
		N	41	41

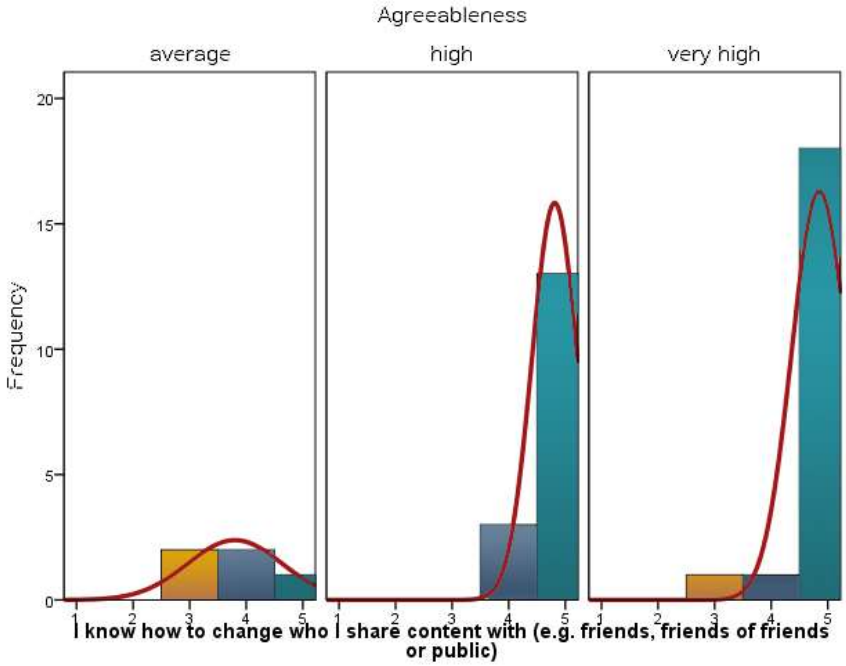
Table 13: Correlation, *Agreeableness and All the different website layouts make working with the internet…*



Graph 12: Correlation, *Agreeableness and All the different website layouts make working with the internet…*

Correlations				
			I know how to change who I share content with (e.g. friends, friends of friends or public)	**Agreeableness**
Kendall's tau_b	I know how to change who I share content with (e.g. friends, friends of friends or public)	**Correlation Coefficient**	1.000	.383**
		Sig. (2-tailed)		**0.010**
		N	41	41
	Agreeableness	**Correlation Coefficient**	.383**	1.000
		Sig. (2-tailed)	**0.010**	
		N	41	41

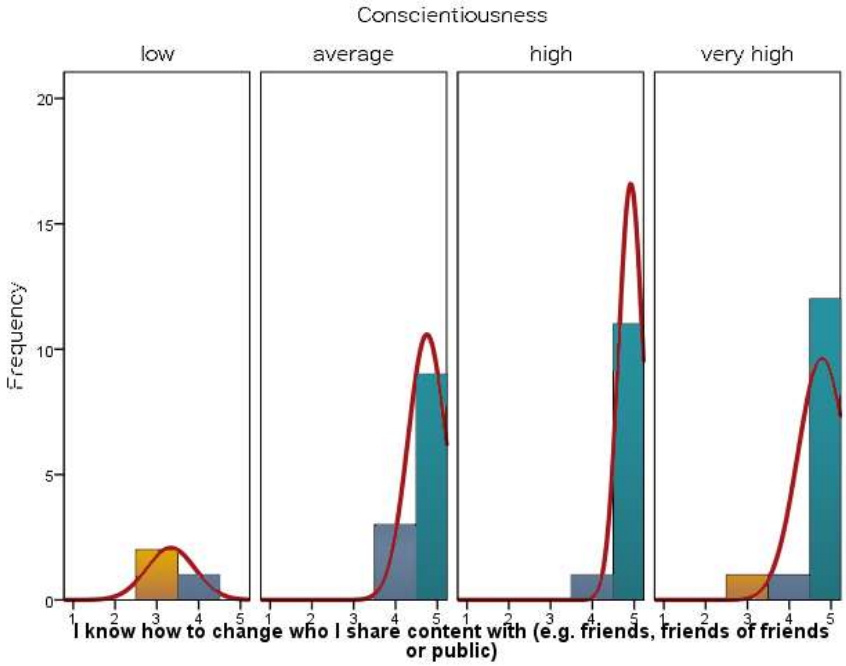
Table 14: Correlation, *Agreeableness and I know how to change who I share content with*



Graph 13: Correlation, *Agreeableness and I know how to change who I share content with*

Correlations				
			I know how to change who I share content with (e.g. friends, friends of friends or public)	Conscientiousness
Kendall's tau_b	I know how to change who I share content with (e.g. friends, friends of friends or public)	Correlation Coefficient	1.000	.312*
		Sig. (2-tailed)		**0.029**
		N	41	41
	Conscientiousness	Correlation Coefficient	.312*	1.000
		Sig. (2-tailed)	**0.029**	
		N	41	41

Table 15: Correlation, *Conscientiousness and I know how to change who I share content with*



Graph 14: Correlation, *Conscientiousness and I know how to change who I share content with*

Discussion of Results

The results from this research project show an interesting mix of personality traits in the sample. Further, for extraversion, the vast majority of participants self-identified as low (36.6 %) and average (26.8%), while as for agreeableness, the vast majority of participants self-identified as high (39%) and very high (48.8%). Further, Conscientiousness seems more equally distributed among average (29.3%), high (29.3%), and very high (34.1%) values. Neuroticism self-reports indicate that participants are mainly average (46.3%) and low (24.4%). Finally, openness self-reports also seems very close in percentages with a low at 26.8%, average at 36.6%, and high at 29.3%.

Tau b correlations show a relationship (reject the Null Hypothesis) between the following personality traits and the technology skills of the participants: 'Openness' and 'I know how to bookmark a website' (Table 11), 'Openness' and 'I know some good ways to avoid computer viruses' (Table 12), 'Agreeableness' and 'All the different website layouts make working with the internet difficult for me' (Table 13), 'Agreeableness' and 'I know how to change who I share content with' (Table 14), 'Conscientiousness' and 'I know how to change who I share content with' (Table 15). Other items from the technology skills self-inventory did not meet the criteria (i.e. reject the Null Hypothesis). Consequently, there are no relationships found between personality traits and the rest of the technology skills self-inventory items.

5. CONCLUSION

The findings of this project suggest that some personality traits have a relationship to technology skills. For instance, Openness, Agreeableness, and Conscientiousness have a relationship to how individuals bookmark a website, avoid computer viruses, experience difficulties with website layouts, and know how to share/or not content with others. In addition, these findings are not conclusive and/or suggestive that such relationships actually exist due to several limitations of this research project, such as: sample size and composition. Further, Conner & Abraham (2001) pointed out that personality is how we better explain the relatedness between intention and actual behavior. In addition, Hadlington & Murphy (2018) reported similar findings to the ones reported in this project regarding the relationship of Agreeableness and Conscientiousness to security best practices (i.e., avoid computer viruses in our case), and Halevi, et al., (2016) concluded that Openness is also positively associated to security self-efficacy.

Overall, participants in this project scored high (39%) and very high (48.8%) in agreeableness. High in agreeableness can be described as soft-hearted, trusting, and well-liked (John & Srivastava, 1999). This personality trait indicates that people are sensitive to the needs of others, and positively predicts subjective well-being. What's more, agreeable people are more cooperative with others in their daily lives, while being emotionally self-regulated (Moskowitz, 2010). Gross (1998) pointed out that emotion regulation could operate at one of the five successive temporal stages, ranging from situation selection, situation modification, attentional deployment, cognitive change, to response modulation (Gross & Thompson, 2007). The latter two stages are subject of study for interface priming, since priming is a phenomenon whereby exposure to one stimulus influences a response to a subsequent stimulus, without conscious guidance or intention (Weingarten, et al., 2016). Moreover, when taken into account from the beginning of the UX process, priming can act as a hidden factor of influence in users' decisions. It can guide them to take the best possible path inside a flow and help them save time and reduce frustration (Gothelf, 2013).

Agreeableness is also advantageous when new technologies and/or processes need to be deployed, and successful users' interactions depend on how easy it is for them to adopt or reject changes. Moreover, in automation of tasks, this personality trait is ideal to the adoption of technology, but it could also be counterproductive if the trusting nature of the person (with high agreeableness) is mishandled and/or exploited (e.g., in security). Meier, et al., (2006) suggested that agreeable people can modify their interpretations of hostile situations to be less hostile (i.e., cognitive change), and Bresin, et al., (2012) showed that agreeable people retained better motor control in hostile contexts (i.e., response modulation), this response is advantageous in cybersecurity. Lastly, people who scores higher in agreeableness usually exhibits more trusting behaviors to the automated aid (Lee & See, 2004), and they are less likely to commit wrong doings and/or misuse automation. Conversely, people with low agreeableness exhibits low reliability, and are likely to mistrust the automated aid (rejection), while becoming more susceptible to disuse (Rotter, 1980).

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