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Propensity to Click on Suspicious Links: Impact of Gender, of Age, and of Personality Traits

FRANTISEK SUDZINA & ANTONIN PAVLICEK

Abstract There already exists a certain, not huge, body of knowledge about impact of personality traits on susceptibility to phishing. But there is a gap when it comes specifically to phishing with links pretending to lead to deal sites. The paper analyzes if gender, age and personality traits influence such behavior. Big Five Inventory traits (extraversion, agreeableness, conscientiousness, neuroticism, openness to experience) and narcissism were used. Impact of openness to experience was significant at 0.05 level, and of narcissism 0.1 level. Significance of remaining independent variables was above 0.1. Openness to experience was linked positively linked to responsible behavior, narcissism was negatively linked.

Keywords: • Suspicious Links • Phishing • Deal Sites • Personality Traits
• Empirical Research •

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1 Introduction

Deal sites, in one form or another, exist for over two decades. They received a lot of publicity before Groupon's initial public offering. According to a recent study cited by Kotler et al. (2017), "digital coupons now outpace printed newspaper coupons 10 to 1". In other words, use of deal sites is reasonably wide-spread for hackers to also link presumably leading to deal sites for infiltration.

To the best of authors' knowledge, nobody investigated impact of personality traits on phishing that is specifically linked to deal sites. (To be more specific, Google Scholar search for the query phishing personality traits deal-sites yielded 5 results, of which none were relevant.) Google Scholar search for phishing personality traits (i.e. without the term deal sites) yielded more than 2000 results, of which (due to quickly decreasing relevance) the first 100 were checked. There were two journal articles and a few conference papers investigating impact of personality traits on phishing in general.

Pattinson et al. (2012) discovered that from Big Five Inventory personality traits, higher extraversion and higher openness to experience led to better dealing with phishing e-mails. They state that the findings are interesting because they appear to be counter-intuitive since both of these personality traits should lead people to be more trusting of others which would mean treating some phishing e-mails as genuine. But they do not cite any source that would support the link between any of the two personality traits and trust. On the contrary, our results (Sudzina, 2016a; Sudzina, 2016b) indicate a link between some of the three remaining personality traits and trust or mistrust; but extraversion and openness to experience were not linked to trust nor to mistrust (this holds not only for Big Five Inventory-10 used in the two papers but also for Big Five Inventory-44 (the instrument used by Pattinson et al. (2012)) - though the findings were not published yet).

A more comprehensive study, in a sense of using more variables than only personality traits, was conducted by Welk et al. (2015). The impact of extraversion was significant but the sign was negative when only five personality traits were included in the model, the sign was positive in the full model, and the extraversion was not significant when only five personality traits and three trust/distrust variables were included. The remaining results are unclear as the terms used to describe personality traits were anxiety, reservation, calmness, and ability to keep emotions under control. The two items measuring neuroticism are "anxious, easily upset" and "calm, emotionally stable"; they seem to cover 3 of 4 remaining personality traits mentioned by Welk et al. (2015). The remaining term - reservation - looks like the second item to measure extraversion - "reserved, quiet" (reversed scale), so even the findings for extraversion mentioned at the beginning of the paragraph possibly do not hold.

There were published a few conference papers on the topic. The most relevant - considering the research design and quality of description of source data, including data collection - is (Alseadoon, I. et al., 2012). They tested impact of Big Five Inventory

personality traits on susceptibility to phishing e-mails in two phases. In the first phase, none of the personality traits was significant. In the second phase, openness to experience was significant and extraversion was borderline significant. But the direction of the impact is not clear from the published figures; they provide S.E. in the Table 2 for these two personality traits, not parameter estimates. Alseadoon, I. et al. (2012) provide this argumentation but they do not refer to test results (parameter estimates) at all:

Openness users are those who are open to new ideas and experience. E-commerce in Saudi Arabia is just developing, which explains why these users become victims. It can be said that these openness users are enthusiastic to try and test new experiences provided on the Internet (risk takers). Extraverted users become victims because they may judge phishing emails based on their positive emotions. According to Forgas et al. (2008) users' emotions impact their ability to detect deception.

The second most relevant conference paper is (Cho, Cam & Oltramari, 2016). Although they do not describe respondents, nor what instrument was used to measure Big Five Inventory personality traits, they state that (according to their Stochastic Petri Nets model) agreeableness and neuroticism influence whether a given information is received as either trusted or distrusted. Moreover, they state that high neuroticism deteriorates decision performance under low openness and conscientiousness.

Other conference papers were theoretical and some of them proposed also a model but they did not collect data nor tested the model.

The research question is whether gender, age, extraversion, agreeableness, conscientiousness, neuroticism, openness to experience, and narcissism influence propensity to what a person would click on suspiciously advantageous offer if it led to a deal site. Big Five Inventory framework is used because it is a prevalent framework for personality traits in information systems literature (and it was the only framework used by the reviewed papers on phishing and personality traits). Adding narcissism to Big Five Inventory personality traits follows the trend in information systems literature where narcissism often proves to significantly influence dependent variables. Gender is considered because in many technology studies, men are higher and/or faster in adopting technology. This could possibly lead better understanding of technology, and possibly also to more responsible use of technology. Age is considered because respondents are university students and there could possibly be a measurable change in responsibility between 19 year old students who just started to study and older students.

The data come from the Czech Republic. Some reputable deal sites in the Czech Republic accidentally sold coupons for non-existing services. Stories about such experiences were published in Czech newspapers. So, results of the analysis could be influenced by the fact that respondents may have heard about such problems and may be more careful because

of it. Therefore, results may not apply to countries without such negatives stories, e.g. Denmark.

The rest of the paper is organized in the following way: In the next section, there is a description of data collection, and how they were analyzed. In the following section, results of the analysis are presented. The last section offers conclusions.

2 Data and Methodology

Data were collected between December 2016 and January 2017 using an on-line questionnaire. Respondents were 264 university students from the Czech Republic, of which 140 respondents indicated that they use deal sites, and 124 do not. (The analysis of use versus non-use of deal sites from this data set was published in (Sudzina & Pavliček, 2017).)

SurveyXact was used for the questionnaire. Unlike Qualtrics, it does not allow to show/hide questions based on previous answers on the same page. Therefore, the questionnaire was split into two pages and questions for deal sites users appeared on the second page. Seven respondents stopped after the first page. So, the effective sample size is 133 (43 men, 90 women; on average 20 years old).

On the second page of the on-line questionnaire, there was a question "Would you click on suspiciously advantageous offer if it led to a deal site?" and respondents were supposed to answer on a 1-5 Likert scale where 1 meant certainly yes and 5 stood certainly not. In other words, a high number corresponds to positive/responsible behavior. (Even though it is clear what behavior (which end of the scale) is more responsible, three of 133 respondents still stated that they would certainly click on the link, while 20 stated that they certainly would not.) This is the dependent variable for the model presented later in the paper.

A generalized linear model (GLM) was used. SPSS software was used for the analysis. A multivariate approach to testing was used. Parameter estimates tables from GLM were provided (instead of ANOVA-style tables) in order to be able to see signs of parameter estimates (not only p-values). The results should be equivalent to a multiple linear regression model estimates in case the dummy variable is set to 1 for male and to 0 for female. R² and R²_{adj} are provided in order to be transparent about how much a model explains though it may be significant.

Personality traits were measured using Rammstedt & John's (2007) Big Five Inventory-10, i.e. a 10-item version of the Big Five Inventory questionnaire developed by John & Srivastava (1999), and translated to Czech by Hřebíčková et al. (2016). The study by (Pattinson et al., 2012) used Big Five Inventory-44 (John & Srivastava, 1999). Alseadoon, I. et al. (2012) and Welk et al. (2015) used a 10-item Big Five Inventory instrument developed by Gosling, Rentfrow & Swann Jr. (2003) which relies more on

adjectives than Big Five Inventory-10 (Rammstedt & John, 2007). The instruction in the questionnaire was to rate "How well do the following statements describe your personality" with statements "I see myself as someone who..."

- ... is reserved,
- ... is generally trusting,
- ... tends to be lazy,
- ... is relaxed, handles stress well,
- ... has few artistic interests,
- ... is outgoing, sociable,
- ... tends to find fault with others,
- ... does a thorough job,
- ... gets nervous easily,
- ... has an active imagination

on a 1-5 Likert scale where 1 meant strongly disagree and 5 stood for strongly agree. Extraversion was calculated as an average of the 1st (reversed-scored) and the 6th answer, agreeableness as an average of the 2nd and the 7th (reversed-scored) answer, conscientiousness as an average of the 3rd (reversed-scored) and the 8th answer, neuroticism as an average of the 4th (reversed-scored) and the 9th answer, and openness to experience as an average of the 5th (reversed-scored) and the 10th answer.

Authors are aware of the new version of Big Five Inventory - Big Five Inventory-2 with 60 items (Soto & John, in press a), and of 30-item short and 15-item extra short versions (Soto & John, in press b) but there is no validated translation available yet.

Narcissism was measured right after Big Five Inventory-10 using the same instruction, with the statement

- ... is of narcissistic nature (note: narcissistic means egotistical, self-focused, vain)

The statement was adapted from The Single Item Narcissism Scale (SINS) developed and validated by Konrath, Meier & Bushman (2014). They recommend SINS for online studies.

The questionnaire contained additional questions which were not used in the analysis presented in this paper.

3 Results

The research question is if gender, age, extraversion, agreeableness, conscientiousness, neuroticism, openness to experience, and narcissism influence propensity to what a person would click on suspiciously advantageous offer if it led to a deal site. Parameter

estimates for the full model are provided in Table 1. R2 is 0.089, R2adj is 0.030 and p-value is 0.160.

Table 1: Parameter estimates for the full model

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	4.836	1.008	4.797	.000	2.841	6.831
Age	-.060	.055	1.101	.273	-.168	.048
Extraversion	-.117	.106	1.104	.272	-.328	.093
Agreeableness	-.178	.130	1.375	.172	-.435	.078
Conscientiousness	-.039	.114	-.338	.736	-.265	.188
Neuroticism	-.105	.094	1.118	.266	-.292	.081
Openness to experience	.219	.106	2.064	.041	.009	.430
Narcissism	-.181	.096	1.880	.062	-.372	.010
[Gender=male]	-.165	.220	-.750	.455	-.600	.270

The impact of openness to experience was significant and impact of narcissism was borderline significant. The former had positive effect, the latter negative. But the model as a whole is not significant. Carlson and Wu (2012) suggest to exclude independent variables that are not significant. Parameter estimates for the reduced model are provided in Table 2. R2 is 0.051, R2adj is 0.036 and p-value is 0.034. Keeping only openness to experience in the model would worsen p-value to 0.085. A model with narcissism only would have a p-value of 0.093.

Table 2: Parameter estimates for the streamlined model

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	3.002	.399	7.524	.000	2.212	3.791
Openness to experience	.201	.100	2.000	.048	.002	.400
Narcissism	-.167	.085	1.962	.052	-.336	.001

Signs of significant estimates stayed the same when insignificant independent variables were removed. This means that people open to experience are more likely to avoid clicking on suspiciously advantageous offers leading the deal sites, while more narcissistic people are more likely to click on suspiciously advantageous offers.

Openness to experience had also a significant and positive impact in (Pattinson et al., 2012); moreover, the same impact had also extraversion in their study. Higgins et al. (2007) linked openness to experience to IQ in students. This could possibly explain why they are less likely to click on suspiciously advantageous offers.

4 Conclusion

The aim of the research was to investigate if gender, age, extraversion, agreeableness, conscientiousness, neuroticism, openness to experience, and narcissism influence propensity to what a person would click on suspiciously advantageous offer if it led to a deal site. The findings are that people open to experience are more likely to avoid clicking on suspiciously advantageous offers leading the deal sites, while more narcissistic people are more likely to click on suspiciously advantageous offers. Impact of the remaining personality traits, gender, and age was not found to be significant.

Openness to experience was found to be linked to IQ in students (Higgins et al., 2007). This could explain more responsible behavior. In addition to that, it may be relevant to consider the extent of use deal sites. It may be possible that people open to experience visit them more or purchase from them more, i.e. they get involved with them more; therefore, they have a better understanding of them, i.e. they are more ("street"-)smart, and this could explain more responsible behavior.

Now that there is an indication of impact of narcissism on purchasing coupons as gifts, it is justifiable in future research to use more items to measure narcissism, such as Narcissistic Personality Inventory (Raskin & Terry, 1988) which is probably the most widely used measure of the narcissism and contains 40 forced-choice items, Hypersensitive Narcissism Scale (Hendin & Cheek, 1997) with 10 items or Pathological Narcissism Inventory (Pincus et al., 2009) with has 52 items. If a longer instrument is to be chosen, such as Five-Factor Narcissism Inventory (Glover et al., 2012), which contains 148 items, it may be advisable to select only certain factors.

The study was conducted in the Czech Republic where there were fraud cases - coupons for services of non-existent companies were sold on regular deal sites. So, findings are generalizable possibly only for markets with similar negative experience. Further research should establish whether the same findings hold also on markets with no reported fraud cases.

Moreover, university students as respondents are possibly more IT literate and tech savvy than the general population. Therefore, it is possible that they are more responsible when it comes to on-line behavior. It is not clear whether it brings any limitation the findings presented or not - if the current signal-to-noise ratio uncovers relationships hard to spot in the whole population (i.e. p-values are lower than they would be in a probabilistic sample), or if having more irresponsible respondents would lead to lower p-values,

possibly identifying relationships not found in the research, or if the findings would be the same.

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