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What's in a Name? Cultural Observations on Nationally Named Hacking Groups

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Abstract: Culture's role in cognition has long been established, but understanding national culture's role in cyber events currently remains an understudied research area. Michael Minkov observed that culture influences thought; even when people think they are in control, cultural biases are actually controlling their thoughts. Cultural values endure, and because they do, these cultural values leave artifacts can be revealed in thought patterns. This philosophy serves as a foundation for further work in progress on name choices by hackers. In this study, we examined 10 years' worth of Zone-H archives where hacker names that identified with national identities were analysed using Hofstede's cultural framework to determine whether culture may play a role in hacker name and name choices. The findings revealed cultural preferences in several of the six cultural dimensions. In addition, trending the results showed significant findings in two cultural dimensions: (1) masculinity versus femininity and (2) uncertainty avoidance. The results suggest that assumptions about the anonymous nature of the Internet influencing behaviours may not be universally applicable, and that culture should also be considered when evaluating cyber actor behaviours.

Keywords: Hofstede, culture, online names, cultural dimensions

1. Introduction

Geert Hofstede said, "Culture is everything" (2010). Hofstede's statement supported Minkov's observation that even when people think that they are making free choices, those choices are actually being influenced by cultural values (2013). Culture impacts the behaviour of individuals and groups, shaping the social environment (e.g., traditions) (Rozin, 2003). Morgan, Cross, and Rendell (2015) observed the influence of culture when setting behavioural norms in learning tasks. Meanwhile, Nisbett (2010) noted culture's influence on linguistics and, more generally, how humans process information (holistic versus analytic cognition).

Nisbett (2010) also observed that, culturally speaking; the world is literally viewed differently by people based on their national country of origin and corresponding environmental factors and social norms. Support of these different views comes from many sources including the following: Guess 2004; Guss and Dorner, 2011; Henrich, Hein and Norenzayan 2010; and Nisbett 2010. Evidence for culture's role in thoughts, choices, and behaviours allows for the study of all aspects of cyber behaviours and choices and their underlying motivations. Choices and motivations range from attack vectors, messaging, and even the attacker name or name handle. We hypothesize that these decisions are, in part, shaped by culture. To investigate this hypothesis, we examined the relationships amongst a framework for cultural values and a list of hacker groups. In particular, we assessed the frequency of occurrence where hacker group names included a reference to their home country with the hacker's cultural values.

2. Literature review

Elmasry, Auter, and Peuchaud (2014) used Hofstede's framework to compare Arab and East Asian cultures for evidence of cultural preferences when constructing online Facebook identities. Elmasry et al. (2014) noted high uncertainty avoidance (UAI), masculine, and collectivist preferences. Sample and Karamanian (2014) also used Hofstede's framework to identify user cultural preferences associated with Facebook, LinkedIn, and Twitter users. Sample and Karamanian (2015) noticed different adoption rates based on egalitarian values, collectivism, masculinity, and indulgence.

Sample and Karamanian (2015) also examined patriotic and political website defacements where they noted strong authoritarian, collectivist, and restrained values associated with political and patriotic defacements. Furthermore, Sample (2015) correlated authoritarianism, masculinity, and restraint with defacements as a political, patriotic, or revenge response to physical or kinetic events in the geopolitical realm. Because social media usage varies by culture (Sample and Karamanian, 2014), and online identity construction in social media shows cultural preferences (Elmasry et al., 2014), a reasonable assumption might be that cultural markers may be present in defacer handles or names.

Hofstede's cultural framework, while widely adopted, has been criticized in the past (McSweeney, 2002, Baskerville, 2003; Baskerville-Morley, 2005). Some criticisms (McSweeney, 2002) have claimed that the use of national cutlures as a framework is too broad. Other criticisms noted that the original survey focused on engineers; thus, did not represent a cross-section of the larger society that comprises a nation (McSweeney, 2002). These criticisims may merit further examination, but they do not detract from the resaerchers goal of using a cultural framework for exploring patterns of cyber behaviors (Sample, Cowley, Watson & Maple, 2016). Explanations of behaviors rely on a mix of anthropologic resources. Finally, no single cultural framework has been adopted by anthropologists. The values identified in Hofstede's cultural framework are consistent with values found in other cultural frameworks, thus; Hofstede's framework is well-suited for the purpose of this study.

Hofstede's framework defines national culture for six dimensions; power distance index (PDI), individualism versus collectivism (IvC), masculinity versus femininity (MvF), UAI, long-term orientation versus short-term orientation (LvS), and indulgence versus restraint (IvR). Country values are scored on a scale of 0 to 100. A brief explanation of the dimensions follows.

2.1 Power Distance Index

PDI measures the level to which society members feel comfortable with an unequal distribution of power (Hofstede et al., 2010). Countries with low PDI scores tend to be egalitarian. Countries with high PDI scores tend to be authoritarian.

2.2 Individualism versus Collectivism

IvC measures the role of the community and family in the decision-making process (Hofstede et al., 2010). Low IvC countries are collectivist and decisions are made based on their impact to the community. High IvC countries are individualist and decisions are made based on what is best for the individual or may extend to the family.

2.3 Masculinity versus Femininity

MvF measures gender roles and the response to aggression versus nurturing. Countries with low MvF scores are feminine and consider nurturing the citizens, and these countries typically prefer negotiation to confrontation when dealing with aggressive behaviours (Hofstede et al., 2010). Countries with high MvF scores deal forcefully with aggressive behaviours and gender roles are clearly defined.

2.4 Uncertainty Avoidance

UAI measures the societal comfort with the new or unknown (Hofstede et al., 2010). Many, if not most, cultures are uncomfortable or even fearful of the unknown, and this level of fear constitutes the high end of the UAI measures. Low UAI societies view the unknown as a curiosity and seek to understand the unknown.

2.5 Long-Term orientation versus Short-Term orientation

LvS measures the outlook of societal members in terms of instant or delayed gratification (Hofstede et al., 2010). Short-term oriented societies comprise the low end of the dimensional pole, and these societies are known for making decision based on immediate impact. Long-term oriented societies make up the high end of the dimension, and decisions are made based on the long-term outcome. In a long-term oriented society, initial losses are tolerated because eventually the long-term outcome will far exceed the initial losses. Holism is associated with long-term orientation (Hofstede et al., 2010).

2.6 Indulgence versus Restraint

IvR measures how open or tolerant a society is (Hofstede et al., 2010). Restrained societies are oftentimes referred to as closed societies, and these societies comprise the low end of the dimensional pole. Indulgent or open societies make up the high end of the dimensional pole.

This study focused on hacker names that include either the country name or the name used to define citizens (e.g., France, French). This study also represents the early findings of a larger work in progress, which will examine cultural values with names and motivations. The brief nature of this paper requires a more limited scope, which may serve as a foundation for the larger work in progress.

3. Methods

Minkov (2013) indicated that culture can be independently studied; thus, cultural values and behaviours can be studied separately from the individual. Furthermore, when studying culture, Van der Vijver and Leung (1997) noted the difficulty in separating out cultural biases in studies. Morgan et al., (2015) said that the behaviour of the group or community affects the behaviour of the individual. Thus, cultural influences can occur simultaneously with subjects, analysts, and researchers; therefore, controls for bias must be applied to all actors. The role of the researcher's cultural biases must be identified and mitigated because cultural biases of the researcher have the potential to appear when evaluating others (Fiske and Taylor, 2013; Almeshahd and Spafford, 2014). The quantitative nature of this study serves as a guard to mitigate or reduce biases, partially due to the objective nature of quantitative analysis (Van der Vijver and Leung, 1997). The researchers acknowledge that no solution is perfect and the potential exists for some biases to remain.

The Zone-H (www.zone-h.org) archive of website defacements provided the raw, unbiased observation data used for the study. The 10-year analysis was performed by comparing median values for actors for individual years and then the combined 10-year period. The sampling frame was Hofstede's cultural values for the 100 evaluated countries. The countries that were represented by hackers using a reference to the country in their name were compared against the remaining countries from Hofstede's list of 100. This division creates two distinct groups for comparison: one group of countries that uses national terms in their name, and a second unrelated group that is taken from the same sampling frame that have an Internet presence but no evidence of groups using nationally themed names when defacing websites.

The Mann-Whitney-Wilcoxon (MWW) test was used to compare two unrelated groups, the defacers versus the non-defacers, to determine if the groups that are being compared are statistically similar or different (Hollander, Wolfe, and Chicken, 2013).t. If a single hacker culture exists, then, cultrually speaking, there should be no difference between the self-named hackers and the non-hackers. The test will be run for each of the six cultural dimensions, and the findings will be used to determine whether the two groups are similar or different (Ibid). The results are measured in the probability of randomly obtaining the findings and are evaluated using the 5% rule (Ibid). The MWW test was chosen due to the non-parametric nature of the data distribution (Ibid).

The findings for each of the years of data show individual moments in time. The combination of the data from all of the years produces a very broad output that may result in certain changes or trends being missed. Therefore, a trend analysis will be performed over the 10-year interval. The trend analysis will rely on median values of the attacker group over each of the six dimensions tracked over the 10-year period, and a trend analysis was performed using a Spearman correlation (Hauke and Kossowki, 2011).

The testing was performed assuming the null hypothesis, and although each hypothesis decomposed into sub-tests for each of the six dimensions, the entire 10-year interval was also examined. The trend test was performed to determine whether longer term patterns might exist. Therefore, yearly MWW tests and the Spearman correlation (Hollander et al, 2013) tests were done. The null hypothesis stated that each group was statistically the same, meaning that their distributions are the same. This can be represented as H0: H2 F(t) = G(t).

$$G(t) = F(t-\Delta)$$

The location shift model will represent the alternative hypothesis, H_1, H_3 (Hollander et al, 2013). Computing the MWW relies on ordering the values from least to greatest (Ibid), then summing the values. S_1 is the rank of the Y_1 and S_n is the rank of Y, thus the following equation applies.

$$W = \sum_{j=1}^{n} S_j$$

H_N: There exists no statistical relationship between culture and hacker names that indicate national origin over the combined 10-year interval.

$H_{01...06}$: There exists no statistical relationship between (PDI, IvC, MvF, UAI, LvS, or IvR) values and hacker names that indicate national origin over the combined 10-year interval.

H_1: There exists a statistical relationship between culture and hacker names that indicate national origin over the combined 10-year interval.

$H_{11...16}$: There exists a statistical relationship between (PDI, IvC, MvF, UAI, LvS, or IvR) values and hacker names that indicate national origin over the combined 10-year interval.

Rejection of the H_0 requires one or more dimensions being statistically different measured to the 5% rule. The second set of hypotheses tests rely on examination of the individual years. This test was performed to determine whether any potentially observable findings were random one-time events or whether the findings occurred more frequently, which would be suggestive of persistent cultural values. Rejection of H_2 would require that any dimension show statistical differences measured to the 5% rule for 3 or more years. Three or more years were chosen to deal with the dynamic nature of the growth of the Internet. These analyses were exploratory, with a focus on effect sizes, so no adjustment was made for multiple comparisons.

H_2: There exists no statistical relationship between culture and hacker names that indicate national origin over the 10-year interval.

$H_{21...26}$: There exits no statistical relationship between (PDI, IvC, MvF, UAI, LvS, or IvR) values and hacker names that indicate national origin over the 10-year interval.

H_3: There exits a statistical relationship between culture and hacker names that indicate national origin over the 10-year interval.

$H_{31...36}$: There exits a statistical relationship between (PDI, IvR, MvF, UAI, LvS, or IvR) values and hacker names that indicate national origin over the combined 10-year interval.

The third set of hypotheses tests uses the Spearman correlation. This is the non-parametric equivalent to the Pearson correlation (Hollander et al., 2013). The Spearman correlation is calculated as follows:

$$r_s = (r_s - E_0(r_s))/\{var_0(r_s)\}^{1/2}$$

H_4: There are no statistical trends by culture with hacker names over the 10-year interval.

$H_{41...46}$: There are no statistical trends by (PDI, IvR, MvF, UAI, LvS, or IvR) values with hacker names that indicate national origin over the 10-year interval.

H_5: There are statistical trends by culture with hacker names that indicate national origin over the 10-year interval.

$H_{51..56}$: There are statistical trends by (PDI, IvR, MvF, UAI, LvS, or IvR) values with hacker names that indicate national origin over the combined 10-year interval.

The yearly results will be evaluated, and a simple majority in any dimension results in a rejction of the null hypothesis. However, for this initial foray, a less stringent threshold will be considered or three or more years of significant findings. This relaxed standard is considered because the research is exploratory and due to Cohen's (1988) observation of type II errors when evaluating humans. In recognition of the growth patterns of Internet adoption rates over the past decade, this initial study does not account for the changing growth dynamics. Furthermore, there were no adjustments to p-values after multiple comparisons because this work is investigative and we focused on effect sizes for significant associations.

4. Results

The combined list of actors who used their country name or referenced the term for citizens in their handle consisted of 45 countries over the 10-year period. A complete list of all of the countries values can be found at Hofstede's website (http://geerthofstede.nl/dimension-data-matrix). Table 1 contains the list of countries and their dimensional scores.

Table 1: Hofstede values for countries with national named attackers

Country	PDI	IvC	MvF	UAI	LvS	IvR
Albania	90	20	80	70	61	15
Bangladesh	80	20	55	60	47	20
Brazil	69	38	49	76	44	59
Bulgaria	70	30	40	85	69	16
Chile	63	23	28	86	31	68
Colombia	67	13	64	80	13	83
Croatia	73	33	40	80	58	33
Denmark	18	74	16	23	35	70
Country	PDI	IvC	MvF	UAI	LvS	IvR
Ecuador	78	8	63	67	NA	NA
Egypt	70	25	45	80	7	4
France	68	71	43	86	63	48
Germany	35	67	66	65	83	40
Greece	60	35	57	100	45	50
India	77	48	56	40	51	26
Indonesia	78	14	46	48	62	38
Iran	58	41	43	59	14	40
Iraq	95	30	70	85	25	17
Israel	13	54	47	81	38	NA
Italy	50	76	70	75	61	30
Jordan	70	30	45	65	16	43
Kuwait	90	25	40	80	NA	NA
Libya	80	38	52	68	23	34
Malaysia	100	26	50	36	41	57
Mexico	81	30	69	82	24	97
Morocco	70	46	53	68	14	25
Netherlands	38	80	14	53	67	68
Nigeria	80	30	60	55	13	84
Pakistan	55	14	50	70	50	0
Peru	64	16	42	87	25	46
Philippines	94	32	64	44	27	42
Poland	68	60	64	93	38	29
Russia	93	39	36	95	81	20
Saudi Arabia	95	25	60	80	36	52
Serbia	86	25	43	92	52	28
Spain	57	51	42	86	48	44
Sri Lanka	80	35	10	45	45	NA
Switzerland	34	68	70	58	74	78
Syria	80	35	52	60	30	NA
Turkey	66	37	45	85	49	49
UK	35	89	66	35	51	69
Venezuela	81	12	73	76	16	100

Table 2 contains the results of the 10-year comparison between the national named attackers countries and the countries that did not have national named attackers. Tests for statistically significant differences at the 5% (0.05) value or less are considered successful for difference, and the results are displayed in **bold**. Test results that are between 5% and 10% are displayed in *italic*. The 5% to 10% values are determined to be of interest because (1) human behaviour is being measured and (2) Cohen (1988) observed an increase in the type II error when testing human behaviour to the 5% rule. As the work progresses, these areas of interest will be further examined.

Table 2: Comparison between national named attackers and other countries without national named attackers (H_0, H_1)

Dimension	PDI	IvC	MvF	UAI	LvS	IvR
p value	0.18	0.89	**0.04**	**0.04**	0.73	0.41

The findings for the H_0 and H_1 hypothesis/alternative hypothesis test showed statistical significance for 2 of the 6 dimensions: MvF and UAI. The results of the test would lead to rejection of H_{03} and H_{04} and acceptance of the

alternative hypothesis H_{13} and H_{14}. Hypotheses H_{01}, H_{02}, H_{05}, and H_{06} should be accepted. Overall, H_0 will be rejected and H_1 accepted.

Table 3: Yearly comparisons between national named attackers and other countries without national named attackers (H_2, H_3): p values are rounded to the 2nd decimal place

Dimension/ Year	PDI	IvC	MvF	UAI	LvS	IvR	N
2005	**0.02**	0.75	0.11	**0.07**	0.72	0.18	15
2006	0.28	0.31	0.13	**0.00***	0.63	0.13	17
2007	0.39	0.37	0.14	**0.00 ****	0.79	0.34	15
2008	0.34	0.85	**0.03**	*0.07*	0.18	0.92	12
2009	**0.03**	0.29	0.17	**0.02**	0.14	0.10	15
2010	**0.02**	0.66	0.18	*0.08*	0.64	0.36	16
2011	0.16	0.88	0.79	0.16	0.57	*0.08*	20
2012	**0.04**	0.62	**0.00 *****	0.29	0.13	0.75	24
2013	**0.00 ********	0.32	**0.01**	0.42	0.12	0.13	23
2014	**0.00 *********	0.38	**0.01**	0.34	0.55	*0.09*	25

The results in Table 3 showed differences in 3 of 6 dimensions: PDI, MvF, and UAI. These differences would lead to rejection of H_{21}, H_{23}, and H_{24} resulting in the acceptance of H_{31}, H_{33}, and H_{34}. Ultimately, H_2 is rejected and H_3 is accepted. An interesting observation is the MvF activity of the group, which becomes increasingly masculine in the later years, and the high UAI results in the early years.

Table 4 shows the results of the Spearman's correlations over 10 years. Median scores were entered for each dimension during the 10-year period; the year was the x-variable and the cultural dimension score represented the y-variable. Results were evaluated using Cohen's effects size (1988). Cohen's effects size is used for evaluating human behaviours and resulted from high incidence of type 2 errors when evaluating human behaviour to the 5% rule. Cohen (Ibid) set the following ranges for evaluating *r*: 0.1–0.3 indicates a weak correlation, 0.3–0.5 indicates a moderate correlation, and ≥0.5 indicates a strong correlation (Ibid). For this study, moderate and strong correlations are consistent with rejction of the null hypothesis H_4 and acceptance of the alternative hypothesis H_5.

Table 4: Ten-Year trends in national named attackers

Dimension	PDI	IvC	MvF	UAI	LvS	IvR
R	0.24	**−0.62**	−0.27	**−0.81**	*−0.34*	**−0.54**
Evaluation	Weak	**Strong**	Weak	**Strong**	*Moderate*	**Strong**

The findings in Table 4 showed strong negative correlations for IvC, UAI, and IvR. Thus, over time, the national named countries were increasingly more collectivist in nature, lower in UAI, and increasingly restrained. The moderate correlation between short-term orientation and national names countries is also noted. H_{42}, H_{44}, and H_{46} are rejected, whereas H_{52}, H_{54}, and H_{56} are accepted. Therefore, H_4 is rejected and H_5 is accepted.

5. Discussion

The findings from the three groups of tests were in somewhat anticipated based on earlier study results. The slightly high power distance and high masculinity seen in the MvF dimension were anticipated, and in other cases, such as the high UAI findings, the results were unanticipated. The link with patriotism and defacing was initially established by Sample (2013) and reinforced by Sample (2015), so the association with authoritarianism is not surprising, particularly when considering the national pride associated with the name selection. The masculinity is also of interest because of the direct and aggressive behaviour, suggesting that violence against the victim is also a masculine trait. This pattern emerged as the number of participating countries began a strong increase starting in 2009. In general, the number of attacks also increased during that same time period as more countries continued to establish their online presence.

The first test relied on collecting all of the names used over the 10-year interval. There were 44 countries represented over the 10-year interval. The group of 44 countries was compared to the remaining group of 55 countries. The results showed that the national named actors were more masculine and higher in UAI than their

unnamed counterparts. The masculine finding is not surprising because some of the behaviours associated with masculinity are boastfulness, confidence, and aggression—a sort of chest pounding. In addition, these findings expand on Sample's (2015) earlier findings that associated masculine behaviour with attacker defacements in conjunction with kinetic events in the real world. Moreover, the self-identification aspect of the behaviour indicates aggression and bragging, both masculine traits (Hofstede et al., 2010), and no fear of retaliation (Hofstede et al., 2010; Sample, 2013).

The unanticipated finding of higher UAI is interesting in that low UAI or lack of fear would seem to translate to a lack of concern about attribution. However, the high UAI values may indicate the attackers' desire to ensure that the victim has no doubt about the source of the attack. The selection of a name with a national theme by high UAI groups would suggest a potential overlap with high PDI where nationalistic, patriotic behaviour is rewarded

Another possibility might be the assumption by the attackers that they would certainly want to be known, and not confused with another entity. The most interesting aspect of this finding is that the high UAI years (2006–2009) occurs outside of the high PDI years (2010, 2013–2014). One possible explanation may lie in the lower UAI value findings, could reflect an attitude of not caring about being discovered. In the cases where the values were high UAI, the attackers might be daring the victims to respond. Of note, Hofstede et al., (2010) had observed the existence of a relationship between high PDI and high UAI values. However, since the high UAI values do not occur at the same time as the high PDI values. In fact, the trend showed a weak increase in PDI and a strong decrease in UAI values, thus, suggesting the decrease may indeed reflect the attacker not caring about being discovered.

The strong negative correlation with low UAI reflects the low UAI in the early years (2005–2009) and the movement toward the centre in the later years (2010–2014). The early adopters being low UAI was consistent with Sanchez-Franco et al. (2008), and may reflect a sense of adventurism by the early self-identified hackers. The moderating trend toward lower UAI values, may also reflect the fact that web defacements are widely considered a less prestigious target, when compared to mail servers, databases and embedded devices (CITE).

The other reason the researchers found this finding surprising was based on the lack of findings in the UAI dimension in previous shorter duration studies (Sample, 2013, 2015; Sample and Karamanian, 2014, 2015). The trend analysis findings in some dimensions showed a moderation of the attackers. The weak positive PDI correlation was not surprising because these types of attackers tend toward high PDI (Sample, 2013, 2015; Sample and Karamanian, 2014).

Moreover, the lack of creativity in name selection suggests possible creativity issues in other areas. The lack of creativity in the name choice is not surprising because Hofstede associates creativity with curiosity found in low UAI and individualism. Countries with low UAI values along with individualist societies tend to associate with higher creativity values (Hofstede et al., 2010). This may be due to the fact that low UAI societies teach students that more than problems can have more than one correct answer, while high UAI societies, teach students that only one correct answer can appear for a problem. Thus, when naming themselves after the country, a group of attackers (or a single attacker) from a high UAI country may perceive that name choices are limited and must follow a certain script, a behaviour that associates with both high UAI and high PDI values.

Hofstede et al. (2010) suggested the existence of a moderating effect on creativity by collectivist groups. Other studies have indeed shown an inverse relationship or a moderating effect of collectivism on creativity (Niu and Sternberg, 2001; Bornstein, Kugler, and Zieglemeyer, 2003; Yu and Yang, 2009).

The IvR movement toward more restrained or closed societies echoes the findings by the Sample (2015) study. The trend suggests that political, patriotic defacement is an acceptable form of expression in closed societies as is self-identification for the country. In this case, the names may have less to do with creativity than identification as being in conformance. By identifying with the country, the attackers are not singling themselves out for glory; any spoils are given to the society or country. Although this behaviour is typically associated with high power distance and collectivism, the association with restraint suggests that the name choice may allow the group to display both conformance and "in-group" behaviour.

The strong correlation with collectivism is of interest because this suggests "in-group" self-identification. Naming oneself after the country of origin is not a very creative act. However, naming may serve as a social signal providing insight into attacker motivation and goals, both of which are tied to cultural values. Commitment to a goal, motivation, is among the most important factors for successfully completing a high effort task. However, a multitude of goal theories do not explicitly incorporate cultural values (Locke and Latham, 2002; Rozin, 2003). A better understanding of the cultural and non-cultural factors for attacks may aid in reducing the effectiveness of the attackers.

6. Conclusion

All of these findings infer that the relationship between culture and cyber behaviours and choices is considerably stronger than previous studies have considered. This supports the findings by Henrich et al. (2012) along with the Nisbett (2010), Minkov (2013), and Hofstede et al. (2010) observations that cognition in general is influenced by culture. Cognition in cyberspace, much like in the physical world, also seems to be culturally influenced. This current study adds to the growing body of knowledge (Sample, 2013, 2015; Sample and Karamanian, 2014, 2015) by showing an evolution of sorts from the early work by Woo, Kim, and Dominick (2004).

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