Software Engineering Institute
Carnegie Mellon University

Cyber + Culture Early Warning Study

Char Sample

November 2015

SPECIAL REPORT
CMU/SEI-2015-SR-025

CERT Division

http://www.sei.cmu.edu

This material is based upon work funded and supported by the Intelligence Advanced Research Projects Activity (IARPA), in the Office of the Director of National Intelligence (ODNI) under Contract No. FA8721-05-C-0003 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center sponsored by the United States Department of Defense.

This report was prepared for the
SEI Administrative Agent
AFLCMC/PZM
20 Schilling Circle, Bldg 1305, 3rd floor
Hanscom AFB, MA 01731-2125

DM-0002989

Table of Contents

List of Figures

List of Tables

Executive Summary

The emergence of the cyber domain as the newest battlefront of war suggests the need to examine this unique domain along with the various interfaces to this environment. The interface to the cyber domain occurs through technology and the humans that use the technology. Human cyber behaviors have many influences including kinetic (physical world) events as well as the interpretation of those events. Historically, actors responded to a kinetic event with a kinetic response (including actions such as policy changes). Now, actors have the option and will respond to a kinetic event with a cyber response. This study is structured to allow for the examination of actors involved in cyber events (specifically web defacements) where those events relate to kinetic activities, by using culture as the framework in which the events are discussed. This study was designed to profile cyber actors, and to examine the time interval between cyber and kinetic events in order to gain greater insights into nation-state cyber responses to kinetic events.

The linkage between culture and cyber behaviors represents a new area of cross-discipline research that combines the disciplines of anthropology, cybersecurity, and statistics. Additionally, the cyber domain, with its low cost of entry and other unique characteristics, may benefit from new and creative ways to characterize and understand events taken by actors. These events can be placed into a coherent and understandable framework that allows analysts to examine and ultimately predict how an adversary will be inclined to behave in the cyber domain.

This study was focused specifically on examining the relationship between cyber and kinetic events through the lens of Hofstede's cultural dimensions, over a 10-year span of data that began on January 1, 2004, and completed on December 31, 2013. Due to the relative newness of the cyber environment, a five-year interval was also examined for the cyber behavior. This was due primarily to the significant increase in cyber activity beginning at year 2010.

The actors were divided into groups based on the activity and their role in the activity. The two event activities were kinetic and cyber. The actors were identified as being "source," "target," "both-ST," and "unpaired." Both-ST actors are actors who were both source and target actors during a year; the intersection of the source and target actors. Unpaired actors are those source actors in a cyber-event who do not have a notable kinetic relationship with the cyber target.

The following findings are supported by the study's analysis:

- Source actors tend to come from authoritative, restrained societies that deal aggressively with conflict, but tend to behave in ways that follow the norms of their society.
- Target countries also tend to deal aggressively with conflict but are authority neutral. That is, when the situation demands, these actors will act on their own and not necessarily seek permission for their actions.
- Unpaired actors had similar cultural profiles to the source actors.
- Indulgence (acceptance of individual behavior that deviates from norms) strongly correlates to a longer time interval between cyber and kinetic events.

While the cyber data analyzed here is limited to website defacements, and many of the cyber actors use other attack vectors, the results do reveal statistical differences by national cultural values. These differences will ultimately require further exploration to gain a more complete understanding of cyber behaviors and the role that culture plays in influencing those behaviors.

Abstract

This study examines the relationship between cyber and kinetic events through the lens of Hofstede's cultural dimensions, over a 10-year span of data that began on January 1, 2004, and completed on December 31, 2013. Due to the relative newness of the cyber environment, a five-year interval was also examined for the cyber behavior. This was due primarily to the significant increase in cyber activity beginning at year 2010.

This study is structured to allow for the examination of actors involved in cyber events (specifically web defacements) where those events relate to kinetic activities, by using culture as the framework in which the events are discussed. This study was designed to profile cyber actors, and to examine the time interval between cyber and kinetic events in order to gain greater insights into nation-state cyber responses to kinetic events.

The study results present findings about the relationships of cultural values and the cyber and kinetic actions that have been observed and recorded.

1 Introduction

This report is based on a seedling study that examined the relationship between national culture and cyber behaviors as these factors relate to physical or kinetic events (actions in the real world, including things like policy changes). The goal was to determine if a statistical relationship exists between culture and the time between cyber and kinetic events. This required specific definitions for these terms—culture, cyber events, and kinetic events. Additionally, the ability to characterize various actor groups was also necessary; therefore, four different types of actors were characterized in this study.

The study of the relationship between culture and cyber behaviors represents a new area of cross-discipline research that combines the disciplines of anthropology, statistics, and cybersecurity. By combining these disciplines, a new dimension may be added to threat intelligence that allows for a different perspective that may provide new insights into adversary thought patterns. Furthermore, the statistical component allows for extrapolation of results that may be used to address new ways to characterize and anticipate action by an adversary through an understanding of national culture.

The short nature of this study leaves open many potential follow-on studies that can further examine many aspects that are not addressed here, such as the nature of the cyber events, escalation patterns, retaliation patterns, tool choices, and any other interesting battle front behaviors in the cyber domain.

1.1 Objectives

The overall objective of this study is to understand and document the relationship between specific cyber behaviors (website defacements) that are related to kinetic events and cultural values that have been quantitatively defined by Hofstede, Hofstede, and Minkov in *Cultures and Organizations* [Hofstede 2010]. Specifically, this study is being performed to determine if a statistical relationship exists between culture and the time between cyber and kinetic events. If statistical correlations exist between cyber and kinetic events, then a possible early warning system may be established that could be informed by the results of this study.

Understanding how the national values of populations relate to specific cyber behaviors offers the unique potential to understand and engage nations in the cyber domain. Understanding the national culture or what Hofstede et al. refer to as the "mental programming" of a population provides unique insights when dealing in conflict areas [Hofstede 2010]. These insights may be used to ultimately forecast or anticipate what events will lead to a tipping point and when those events are likely to occur.

2 Structure of this Report

2.1 Background

Beidleman observed, "cyberspace has emerged as a setting for war on par with land, sea, air and space" [Beidleman 2009]. The virtual nature of the cyber domain automatically implies that, unlike the physical domains of land and sea where physical strength is a critical component, the cyber domain requires mental strength and agility. The mental processing that takes place in the cyber domain far exceeds the cognitive norm of 40-60 bits per second [Dijksterhuis 2004]; thus, operators in this domain will likely rely on automatic (unconscious) thought processes. The automatic thought processing system has been shown repeatedly in research to be culturally biased [Bargh 2008, Baumeister 2010, Evans 2008, Guess 2004, Guss 2010].

Thus, even though the hardware is universal and much of the software is also universal, the usage patterns will vary. Hofstede et al. said, "This dominance of technology over culture is an illusion. The software of the machines may be globalized, but the software of the minds that use them is not" [Hofstede 2010, p. 391].

Hofstede's cultural dimensions framework is a quantitative framework for defining national cultural values. Hofstede's framework is universally recognized, and while this framework does have critics, the widespread adoption of this framework by both public and private sectors indicates that the framework does have merit. One of the most common complaints about Hofstede's cultural dimensions framework centers on the fact that the participants did not reflect an economic cross-section of the society; instead, most participants were engineers. While this could be a problem in some studies, the vast majority of hackers have a background that can be defined as engineering or an engineering-related discipline.

Each of these six cultural dimensions associates with specific behaviors. A full explanation is contained in Hofstede's work (see Hofstede et al. or the Country Comparison page on the Geert-Hofstede website for more details) [Hofstede 2013].

Hofstede's six dimensions of culture are:

1. Power distance (PDI) – deals with the source of power in a society. In low power distance countries, power comes from the citizens and is conferred upon the leaders—these countries are considered egalitarian. In high power distance countries, power originates at the leadership level and is passed down to the citizens.
2. Individualism versus collectivism (IVC) – deals with the considerations an individual uses when making decisions. In the collectivist society, the individual considers the impact of his or her decisions on the larger group before making a decision. In the individualist society, the individual makes decisions based on his or her needs or the needs of his or her family, but not the greater society.
3. Masculine/feminine (M/F) – deals with the conflict and competition. The masculine culture deals directly with conflict and tends toward aggressive behavior. The feminine culture is more nurturing and prefers to negotiate conflicts.

4. Uncertainty avoidance (UAI) – deals with how the society deals with the new or unknown. Low UAI societies treat the unknown as a curiosity that should be explored. High UAI societies fear the unknown, which results in attempts to remove or neutralize the unknown.
5. Long-term orientation versus short-term orientation (LvS) – deals with the outlook and effort of a society. The long-term-oriented society is patient and takes a holistic approach to problem solving. The short-term-oriented society is characterized by short timelines and direct approaches to problem solving.
6. Indulgence versus restraint (IVR) – deals with how accepting the society is about behavior that deviates from the norm.

The relative youth of this cross-discipline research area has made collection of accurate raw data challenging. Valeriano and Maness (2014) collected a comprehensive set of data on cyber conflicts, and they also noted the difficulty in collecting unbiased or ground truth data (GTD) [Valeriano 2014]. This lack of primary data, or raw data, introduces problems when attempting to measure and evaluate events, since the news reports are secondary data and not necessarily GTD.

One early example of a quantitative study on cyber behaviors originated with Woo [Woo 2003]. Woo relied on a source of GTD that has been widely used in academia, the Zone-H dataset of website defacements. Woo divided website defacements into two general types, merry pranksters and patriotic hackers. Of this second group of hackers, patriotic, Woo speculated, "defacing the 'out-groups' Web sites with aggressive messages or violent threats may strengthen the feelings of identification or self-esteem the hackers have with their own group" [Woo 2004, p. 68]. The recognition of "in group" and "out group" treatment is a term that Hofstede et al. uses to define behaviors that associate with high power distance (PDI) and individualism versus collectivism (IVC) [Hofstede 2010].

Woo's study helped to inform Sample's study [Sample 2013]. An artifact of Woo's 2004 study is the data now found at the Zone-H website (http://www.zone-h.org). Subsequently, Sample used Hofstede's cultural dimensions to statistically link the relationship between nationalistic, patriotic-themed website defacements (NPTWDs) and high PDI. Follow-on studies by Sample and Karamanian reinforced the 2013 findings and linked other online behaviors with dimensional values defined by Hofstede [Sample 2014].

2.1.1 Definitions

"Both-ST" Actors – actors who are both source and target actors; the intersection of the source and target actors

Cohen's Coefficient – Cohen's coefficient is the standard interpretation used to determine the nature of statistical relationships (mild, moderate, or strong) for human behavior [Cohen 1988]. Cohen defined a range of |0.1 – 0.3| as a weak correlation between variables, a range of |0.3 – 0.5| as a moderate correlation between variables, and |>=0.5| as a strong correlation between variables.

Country Pairs – yearly list of source and target countries involved with kinetic conflict activities

Culture – "The collective mental programming that distinguishes one group of people from another" [Hofstede 2010, p, 6]. This study focuses on national culture only.

Cyber Event – website defacement (as limited for the purposes of this study)

Event Pairs – list of nearest pair dates between cyber and kinetic events

Kinetic Event – physical action or event including verbal exchanges and policy changes between source and target actors

Mann-Whitney U-test – a non-parametric comparison test that compares median values and rank orders values from two groups, resulting in a z-score that can be translated into a probability value (p-value) that is used to evaluate statistical significance of findings. This test is used for group comparisons.

Source Actors – actors involved in a cyber or kinetic conflict pair who perform an attributed attack on the target of the pairing

Spearman Correlation – a non-parametric test that measures the dependency relationship between two variables, provided by the r-value. This test will be used to evaluate trends and timing intervals.

Statistical Significance – refers to the probability of randomly attaining the same results, typically values of less than 0.05 or 5%

Target Actors – actors involved in a cyber or kinetic conflict pair who are the victim of an attack attributed to the source of the pairing

Unpaired Actors – actors who perform a cyber-attack against a target host, but are not involved in a kinetic conflict pair with that target

2.2 Approach and Data

This study has several key components that must be joined together to provide relevant results:

- the actual kinetic events as listed in Integrated Crisis Early Warning System (ICEWS)
- the specified cyber events that have been extracted from Zone-H archives
- the cultural values overlay provided by Hofstede
- the quantitative component, the statistical tools

The process of determining the group pairings and event pairings is an iterative process, as explained when the filtering process is described later in this document.

The ICEWS dataset provides the kinetic event data for this study. The ICEWS dataset is public and freely available and contains all of the global news stories used in this study. At the time of data collection, the ICEWS data resided at the Teamforge website (https://teamforge.atl.external.lmco.com/) managed by Lockheed Martin; subsequently the ICEWS data may now be found at https://dataverse.harvard.edu/dataverse/icews.

The event intensity values are defined in the Conflict and Mediation Event Observations (CAMEO), and Actor Codebook contains the actor description fields along with the event intensity scoring. The event intensity scoring relies on the Goldstein scale. The Goldstein scale was created in 1992 by Joshua Goldstein, and is used by ICEWS to describe the intensity of conflict or cooperation found in various international events [Goldstein 1992]. This study will rely on the conflict events and will ignore the cooperative events.

As noted, the cyber data was collected from the Zone-H archives. The website http://www.zone-h.org makes freely available a list of defacements of the last 60 days. However, the entire archive is commercially available, and was purchased for this study. This archive contains the links to the mirror sites that are created for each website defacement. Access to the entire archive mirror site was purchased for this project.

The final group of data required for this study was the cultural values data. Hofstede's cultural values data is made freely available to researchers from his website, http://www.geerthofstede.eu/dimension-data-matrix. Hofstede's data is limited to nations; only 100 nations are scored.

Building on this knowledge, the cyber early warning study will examine cyber behaviors in terms of Hofstede's cultural dimensions framework. The approach is part quasi-experiment for group comparisons, part correlational analysis, and part trend analysis. This approach of using both group comparisons and correlational analysis is done to determine if a statistically relevant relationship can be inferred, and if so, to what degree this relationship can be measured. The first part of the analysis, the comparison of defacement participation against the global country distribution, is a simple quasi-experiment. This approach is chosen because the group of countries being examined is not random; rather, the countries have passed criteria of both being found in Hofstede's framework and have event intensity values between -5 and -10.

The correlational analysis relies on a sufficient number of dependent variable entries (countries) and corresponding cyber characteristics, such as the time between events. This study relies on public data collected on both cyber and kinetic events in conflict regions. The dates of kinetic and cyber events provide the inputs that result in the (time) "delta" between events. The delta values are examined against Hofstede's cultural values.

The reliance on quantitative analysis is chosen to reduce the risk of cultural and personal bias injection by the researcher. This research focuses on both cyber and kinetic events between country pairs that have been identified as being in conflict with each other through ICEWS data. The list of country pairs informs the cyber search parameters. Explanations for behaviors are provided once the quantitative analysis has been performed.

2.3 Scope and Limitations

The short nature of this study, combined with the requirement for GTD, limits the data to well-known sources of good data. Thus, the use of ICEWS and Zone-H datasets provides the necessary good, academically acceptable GTD. Unfortunately, though, the Zone-H data is limited to defacements only. This results in a subset of overall cyber activities, excluding intrusions, denial of service (DoS) attacks, malware, phishing schemes, infrastructure attacks, and other attacks. Many of these attack vectors are currently being used by various nation-state groups and would undoubtedly provide fascinating data, but due to time and quality constraints could not be included for this study.

2.4 Method

This study examines cultural behaviors based on national culture, due to the reliance on Hofstede's framework. The study examines data from January 1, 2004 through December 31, 2013.

Additionally this study is scoped to examine events between countries only. The research method will be discussed below in terms of two distinct areas: data collection and data processing.

2.4.1 Data Collection

Data collection relies on the use of two large sets of event data, the ICEWS listing of kinetic events and the Zone-H defacement archives, along with the smaller set of Hofstede data. ICEWS stored event data in one-year increments and Zone-H stores data in monthly file increments for each year. The years 2004–2013 are being studied, representing 10 years of activity. Initial data collection relies on the intersection of these different groups of data. The first intersection relies on the intersection of Hofstede's 100 countries and the entire ICEWS database for each of the 10 years.

2.4.2 ICEWS Data Collection and Filtering

The ICEWS data is grouped by yearly increments and is sorted by the GTD value, which is chronologically assigned, based on the date of the news story. The pre-filters for the ICEWS data require three cases:

- The conflict event must occur between two different countries. This rule is in place to prevent internal conflicts from a nation (such as a coup, riots, protests, etc.) from being processed as an international event.
- Both source and target countries must be found in Hofstede's list of 100 countries. This rule is in place because Hofstede provides the cultural scoring data that is required for statistical processing.
- The event intensity score must be $-10 \leq x \leq -5$. The values are represented as real numbers; thus, some values contain decimal values. These events represent active hostile kinetic events. A list of some example events and intensity follows.

  -10: Conduct suicide, car, or other non-military bombing; fight with small arms or weapons

  -9: Torture; use unconventional violence

  -8: Impose embargo, boycott, or sanctions

  -7: Give ultimatum; protest violently, riots

  -6: Demonstrate or rally (-6.5)

  -5: Demand; arrest, detain, or charge with legal action

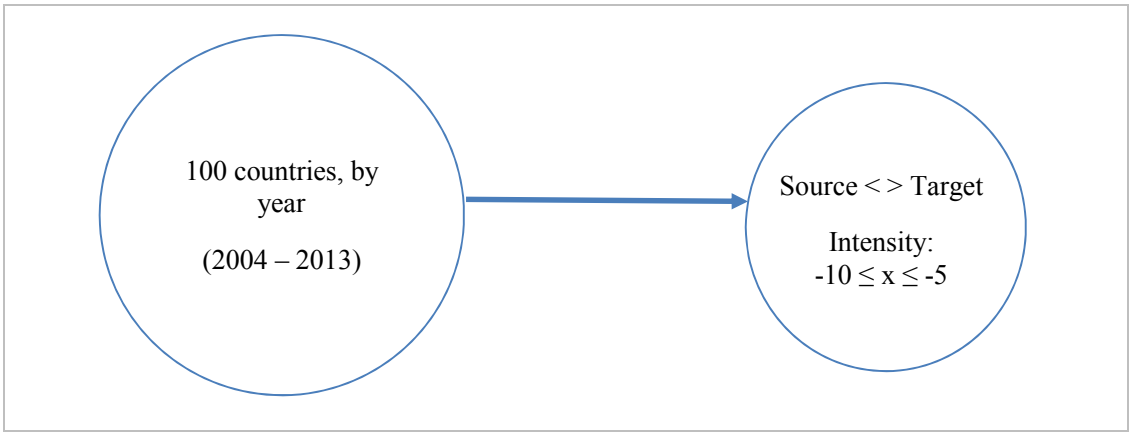

Figure 1: Pre-Filtering Illustration for ICEWS Data

Upon completion of the pre-filtering rules for ICEWS data, the initial yearly file of kinetic events was significantly reduced. Table 1 provides the total number of events per year before pre-filtering (All Kinetic Events) and the number of records resulting from applying the pre-filtering rules (Pre-Filtered Kinetic Events).

Table 1: ICEWS Pre-Filtering Data Reduction Results

Year	All Kinetic Events	Pre-Filtered Kinetic Events
2004	1,318,319	62,594
2005	1,310,096	46,885
2006	1,426,290	71,464
2007	1,440,251	52,929
2008	1,438,869	56,771
2009	1,354,533	50,607
2010	1,252,587	46,936
2011	1,227,643	45,215
2012	1,325,988	48,064
2013	1,334,332	46,268

A quick inspection of this data shows the peak activity year for the "pre-filtered" events file was 2006. Over time the number of kinetic events between nations decreased. Of note: 2007 had the most kinetic events. However, after the pre-filtering, 2006 was the most active year. This may suggest that 2007 had certain countries that may have had significant internal activity. Another possible explanation could be that, in the examined conflicts, either the source or target could not be found in Hofstede's data. As time increased, the correlation between time and the number of kinetic events showed a strong negative correlation.[1]

[1] While data was being statistically analyzed, the correlation was run to examine year and number of kinetic event trends. The analysis revealed a significant negative correlation (r = -0.6), so as time moves forward, the number of kinetic events decreases.

2.4.3 Pre-Filtering Rules for Zone-H Data

The Zone-H data is grouped by months. Most attackers self-report, using their online identity, and provide the attack motive along with other relevant information. There are seven different attack motives from which to choose; only the three in **bold** type were applied as pre-filter rules for this study since they appeared to have a political, patriotic, or related motive that could associate with the ICEWS kinetic events.

- Hey…just for fun.
- **Revenge against that website**
- **Political reasons**
- As a challenge
- I just want to be the best defacer
- **Patriotism**
- Not available

The monthly defacement data was aggregated into years. Then the data was pre-filtered to only include the three motives described above. Table 2 provides the original number of all defacement events for each year as well as the number of events resulting from applying the pre-filtering of the motives.

Table 2: Zone-H Data Initial Filtering Results

Year	All Defacement Events	Pre-Filtered Defacement Events
2004	392,460	113,699
2005	493,721	132,170
2006	752,036	120,145
2007	480,623	69,550
2008	517,405	102,121
2009	544,097	136,696
2010	1,419,382	161,483
2011	1,608,922	290,523
2012	1,079,739	208,795
2013	1,398,291	158,490

A quick inspection of this data shows the peak activity year for pre-filtered defacement events was 2011. However, when the number of pre-filtered, or state-related defacements are considered as a proportion of the total number of defacements, the most active years were 2004 (29%), 2005 (27%), and 2009 (25%), respectively. As time increased, the correlation between time and the proportion of state defacement showed a strong negative correlation.[2] This could possibly suggest

[2] While data was being statistically analyzed the correlation was run to examine year and percent motivated defacement trend. The analysis revealed a significant negative correlation (r = -0.6), so as time increases, the percent of defacements for a cause decreases.

that web defacements for a cause became a relatively less popular attack vector over time as attackers grew in knowledge and sophistication.

2.4.4 ICEWS Filtering

The filtering of the ICEWS data was an iterative process that took three rounds. In each case, the filters were based on meta-fields that allowed for the elimination of classes of events based on either the actor or the activity; this was done to avoid time-intensive manual review of news stories. In eliminating manual reviews of the news stories, operator error and researcher biases should be decreased if not eliminated. The filters were performed on the "Source Sector," "Target Sector," and "Event Text" meta-fields.

2.4.5 Filter 1

The first filter deals with the unknown or unattributed actors and passive events. Filter 1 filtered out "NULL" and "Unidentified" source and target sectors—this reflects the inability to associate those actors to a nation. The event text filter for the first round was "Deny responsibility." This filter was chosen due to the passive or non-active role of the behavior—denying responsibility for an action could simply be due to an incorrect attribution or an incorrect charge. Regardless, denying responsibility would not reflect the initiation of a kinetic event between a source and target country. Upon application of the first filters, the events files were significantly reduced. Table 3 details the reductions per year upon completion of the first filter.

Table 3: ICEWS Reductions from First Filter Set

Year	Pre-Filtered Kinetic Events	Post-Filter-1 Kinetic Events
2004	62,594	12,154
2005	46,885	9,776
2006	71,464	12,159
2007	52,929	9,193
2008	56,771	7,417
2009	50,607	6,531
2010	46,936	6,962
2011	45,215	7,416
2012	48,064	8,146
2013	46,268	8,449

2.4.6 Filter 2

The second group of kinetic filters for source and target sectors dealt with non-governmental organizations, human rights groups, criminals, religious groups, the media, and medical groups. Non-governmental groups and religious groups operate outside the authority of a national government. While some countries do have a close relationship between an approved religion and that religion may influence laws (i.e., the Catholic Church and Ireland, Shiite Muslims and Iran), the religion seeks to influence the nation, not the inverse, and the religion crosses international borders. Table 4 contains the list of sector filters and the justification for their implementation.

Table 4: Filters on Actors Used for Second Set of Filters

Sector Filter Type	Justification for Removal
Nongovernmental Organization (NGO)	These groups are not under the control of any national government.
Media	These groups may report stories but typically do not initiate an action that can be considered an act of aggression. Additionally, in many countries a free press is considered necessary, and as such they are widely viewed as not political.
Medical	Medical groups such as the Red Cross provide relief in natural disasters, or relief to refugees in camps. These groups do not initiate hostile actions on behalf of their government.
Criminal	Criminals are everywhere and operate outside the laws of their given country. Criminal acts such as robbery may cross borders but do not typically cause international incidents.
Terrorist	Terrorists operate outside of the government.
Sexual Assault	While rape is often a weapon of war, the sexual assaults found in the event data was of the criminal nature not as a weapon of war.
Afro-Caribbean	This deals with a multi-national group, outside of the control of any specific national government.
Agricultural, Social	Agricultural actor stories have typically dealt with farming issues. While these could lead to escalation the events observed covered health related issues (e.g., bird flu).
Banned Parties	Banned political parties.
Business, Social; Consulting	Businesses and consulting groups, not transacting with governments, basic commerce issues.
Chechen	Chechen rebels are not under the direction of a national government found in Hofstede's list of countries. They may launch attacks from other countries but the government does not endorse nor support the attacks.
Coptic	A religious sect.
Druze	A middle east religious sect.
Drugs	Criminal drug groups.
Exiles	A group of people removed from their home country. The new host country is not responsible for their actions.
Far Left, Social, Ideological, Print, News, Media	Leftist propaganda.
Food Ministry	These stories had more to do with contaminated food (bird flu, mad cow, Fukishima).
Fulani, Fulbe, International Ethnic	An ethnic group of people in west Africa.
International Government Organizations (IGO)	Groups that operate as international cooperative agencies. They are not under the direction of any one government.
Health Ministry	Government group charged with maintaining the health of the citizens. This agency is not associated with acts of aggression but they have international involvement typically when treating victims. Also may provide information to other groups in government that may lead to a kinetic event, but the group is not responsible for the events.
Dissident, Criminals	Dissidents who engage in criminal activities.
International Dissident	Dissidents who engage in criminal activities in various countries.

Sector Filter Type	Justification for Removal
International Ethnic	Groups of people who may reside in one nation but are not fully integrated into that nation; these groups are not typically supported by the government.
International Religious: Jewish, Muslim, Christian	Muslims, Christians, Jews and other groups. These groups operate both in and outside national borders; they are independent of a national government.
Labor NGOs	Non-governmental labor organizations, concerned with workers' rights.
Labor, Social	Groups concerned with workers' rights, unions, and trade associations.
Organized Violent Criminals	Organized criminals that are not part of the military.
Radicals	Not under the control of the national government.
Refugees	Not citizens of the country where they are located.
Regional Diplomatic (IGO)	Not representative of a specific government (e.g., NATO).
Religious Diplomatic (IGO)	Not representative of a specific government (e.g., Pope).
Religious Minority	Operates outside the authority of the national government.
Separatists	Splinter group that does not recognize the national government.
Shia/Ideological	Muslim group that may indirectly influence the national government but does not take responsibility for that government. They also operate outside the authority of the national government.
Social* (as defined by ICEWS) * Agricultural, Business, Chechen, Dissident Far Left, Far Right, General Population, Ideological, International Ethnic, Labor, Media, Muslim, Shia, Sunni	Individuals or small groups that are citizens of a nation but are acting independently.
South American Indigenous, International Ethnic	Refers to tribes that are international and are often times independent of the government.
Women	Gender identification of perpetrator or victim in criminal activity.
Children	Usually children killed or injured during an event. Their status as minors means they cannot initiate government actions.
Welfare	Agency to ensure the well-being of citizens.

The filtered event texts for this group of filters were "Sexually Assault," "Physically Assault," "Defy Norms," "Demand Humanitarian Aid," "Expel or Deport Individuals," and "Threaten Non-Force." These actions are discussed in Table 5.

Table 5: Filters on Event Types for Second Set of Filters

Event Text Filter	Justification for Removal
Sexually Assault	The stories examined were criminal in nature, and were carried out by individuals.
Physically Assault	Assaults that take place during a crime, person-on-person violence.
Defy Norms	Protestors refusing to leave a protest site, defying a blockade, denouncing an act such as sanctions.
Demand Humanitarian Aid	Typically done in response to either a natural disaster or a blockade.
Expel or Deport Individuals	Extradition of convicted criminals, dissidents, refugees, or war criminals.
Threaten Non-Force	Threaten to sue.

After performing this set of reductions, the number of events data records was significantly reduced. Table 6 shows the reductions for kinetic activity for years 2004–2013 after applying filter 2 compared to before applying it.

Table 6: ICEWS Reductions from Second Filter Set

Year	Post-Filter-1 Kinetic Events	Post-Filter-2 Kinetic Events
2004	12,154	8,098
2005	9,776	5,696
2006	12,159	5,981
2007	9,193	5,810
2008	7,417	4,734
2009	6,531	4,184
2010	6,962	4,628
2011	7,416	4,734
2012	8,146	5,048
2013	8,449	2,164

2.4.7 Filter 3

The third filter set removed additional non-state actors. These actors included Armed Rebels, Armed Separatists, Armed Extremists, Combatants, Militia Groups, Guerrillas, Rebel Groups, and Religious Separatists and Dissidents. All of these groups operate outside of the support of the national government, much like the groups in filter 2; however, unlike the groups in filter 2 these groups tend to be better armed and committed to using violence to achieve their goals.

The event texts filtered in the third filter group were "demand settling a dispute," and "demand de-escalation of military engagement." These filters were selected because they represent actions taken to defuse a kinetic escalation.

Table 7 shows the reduction rates for kinetic activity for years 2004–2013 after applying filter 3.

Table 7: ICEWS Reductions from Third Filter Set

Year	Post-Filter-2 Kinetic Events	Post-Filter-3 Kinetic Events
2004	8,098	1,592
2005	5,696	1,673
2006	5,981	1,903
2007	5,810	2,094
2008	4,734	1,469
2009	4,184	1,399
2010	4,628	1,561
2011	4,734	1,726
2012	5,048	1,526

Year	Post-Filter-2 Kinetic Events	Post-Filter-3 Kinetic Events
2013	2,164	1,674

2.4.8 Processing

On completion of the third set of filters, the ICEWS data was stripped down to the source and target countries. A kinetic pairings (Actor: Country A, Target: Country B) list was formed for each year. The list was organized according to the target countries. This was done because the Zone-H look-ups would rely on target country data. For example, 2012 has 376 unique pairings. These pairings contain the source and target countries and the date of the kinetic event. These fields are used for the search criteria and are the basis of the data found in Appendix D. In order to facilitate the search process the records were initially grouped by target actors.

2.4.9 Kinetic Actors

The kinetic actors were examined as source countries and target countries. For each year the number of source country actors ranged from 70-80; the target country actors also shared the same range. This group of actors did not statistically differ from the overall Hofstede distribution. Since the numbers were so close to the total number of countries that Hofstede scored, group comparisons against the Hofstede population showed no statistical difference between the kinetic source actors and Hofstede's global population. Table 8 shows the results of the group comparison.

Table 8: Group Comparison Between Kinetic Actors and Hofstede's Population

Dimension	z-score	p-value	U value	Different?
PDI	-0.16	0.4364	3448.5	No
IVC	0.67	0.2514	3711.5	No
M/F	0.65	0.2578	3704.5	No
UAI	-0.56	0.2877	3677.0	No
LvS	1.20	0.1151	2908.0	No
IVR	-0.58	0.2810	2233.0	No

A correlational analysis was performed using the number of kinetic events as the dependent variable and dimensional scores of the participating countries as the independent variable and no relevant statistical correlations were found. Table 9 lists the findings across the six dimensions.

Table 9: Correlations Between Cultural Values and Number of Kinetic Events

Dimension	t-value	r-value	N	DF	Type
PDI	-1.49	-0.1778	70	68	Weak
IVC	1.28	0.1537	70	68	Weak
M/F	1.72	0.2038	70	68	Weak
UAI	-0.51	-0.0616	70	68	None
LvS	0.15	0.0190	62	60	None
IVR	-1.08	-0.1402	60	58	Weak

These findings were not surprising since the kinetic actors comprise a large subset (70 percent) of Hofstede's total country population. This study is designed to provide insight into those kinetic actors that have added cyber capabilities. Thus, the sameness between kinetic actors and Hofstede's population is anticipated. Should the cyber actors differ culturally from the overall population, this would suggest a potential cultural linkage to those countries that have adopted the cyber domain. An examination of the rate of adoption amongst the cyber actors might additionally be of interest.

Table 10 contains the number of kinetic country pairs for years 2004–2013.

Table 10: Kinetic Pairs List

Year	# Of Kinetic Pairs
2004	355
2005	354
2006	412
2007	377
2008	354
2009	406
2010	336
2011	372
2012	376
2013	390

The kinetic pairs inform the cyber search. The kinetic pairs consist of source actor, target actor, and event date. The cyber search relies on the target actor of the pair. This is because the corresponding cyber data identifies the target sites through the top-level domain country code (TLDcc) and because the cyber data contains only the name of the hacker group. Therefore, searching the cyber data on the kinetic pair information requires additional steps to identify the source identity.

The collection of cyber data takes place on government and military domains that are delegated from the TLDcc. An example would be of the country Argentina. The TLDcc for Argentina is AR. The Zone-H lookup would look for *.gov.ar and *.mil.ar. This was done for each target country in the list for the year, and the results were entered into a file that matched the name of the country.

The data at Zone-H also lists the entity that reported the attack; in most cases the entity is the attacker. A look up to the mirror site was performed, and the site, in most cases, had some information that made it possible to discern the attacker's country. For example, the country flag or a message identifying the country was used as proof of the country of origin. When the information was not readily available, a search using Google often times provided a news event or other data that made possible the ability to match the attacker to the country. If insufficient information could be found on the hacker, the record was assigned a source country value of "Unknown." The final number of Zone-H entries that were evaluated is displayed in Table 11.

Table 11: Zone-H Data Reductions

Year	Pre-Filtered Defacement Events	Post-Filtered Defacement Events	Attributed	Unknowns
2004	113,699	1503	1286	217
2005	132,170	2005	1921	84
2006	120,145	2503	2394	109
2007	69,550	1000	951	49
2008	102,121	1395	1334	61
2009	136,696	2265	2062	203
2010	161,483	2507	2010	497
2011	290,523	4512	4401	111
2012	208,795	2617	2496	120
2013	158,490	1429	1334	95

Events tend to cluster. This is true of both kinetic and cyber events. The nearest dates between cyber and kinetic data events form an event pair. Multiple occurrences of the same event pairs in the same year will be averaged. In this case, group comparisons will rely on Mann-Whitney U-tests to determine statistical significance of the cyber actors as they relate to the overall Hofstede distribution.[3] A discussion of the processing of the actor group comparisons and evaluation criteria is in the data processing section of this document.

2.4.10 Data Processing

Four groups of actors were examined in the cyber data that was collected and processed based on the kinetic pairs.

- source actors
- target actors
- both-ST actors
- unpaired actors

Each actor group was compared against the Hofstede distribution of all countries using the Mann-Whitney U-test. This test is a rank order test used to compare groups of non-parametric data. The median scores for the control group (Hofstede distribution) and the actor group are compared and the standard deviation off the median value provides the Z-score, which allows for the look-up of the probability value (p-value). A probability value ≤ 0.05 indicates statistical significance. Statistical significance, in this case, means that the probability of randomly obtaining the results of the test group is equal to the probability value. Thus, the 5% ($p = 0.05$) threshold is reasonable, especially in the realm of human behaviors. The 10% threshold is acceptable in some areas, but will only be considered for further analysis in this study. Probability values that are less than 10%, but

[3] An additional group comparison between the cyber actors and the kinetic group could be added in an extension of the original study here.

greater than 5% will be examined with the partner set of a different interval size—an explanation will be rendered along with a recommendation to either accept or reject the null hypothesis.

The median values for each year were also saved, and trend analysis for the actors was performed for a five-year and a 10-year interval. The 10-year interval naturally provided the most data; however, the real increase in cyber activity occurred in the last four years of the collected data. The trend analysis relies on the use of the Spearman correlation [Gauthier 2001]. The Spearman correlation will be used for both correlation and trend analysis due to the non-parametric nature of the data. The Pearson correlation is the better-known analysis tool; however, the Pearson correlation assumes a normal distribution of the data being evaluated [Hollander 2013]. The data used in this study is lumped and non-parametric; therefore, the selected tools are appropriate.

Time interval analysis, the delta between cyber and kinetic events, will be examined within the context of overall median values per year, and median values for individual countries for each year. All correlational tests will be evaluated using Cohen's coefficient.

There are several overall research questions for this study. The first set of questions asks,

1. Do cyber actors have unique cultural characteristics?
2. Do statistical trends exist for cyber actors?
3. "Does a relationship exist between culture and cyber/kinetic events?"

   The existence or non-existence of this relationship will be tested through hypothesis testing against participation or actors and the time interval. The null hypothesis will be tested and the results will be evaluated against those findings.

   H_0: There is no statistical relationship between culture and cyber actors.

   H_1: A statistical relationship exists between culture and cyber actors.

   H_2: There are no statistical trends between culture and cyber actors.

   H_3: Statistical trends exist between culture and cyber actors.

   H_4: There are no statistical correlations between culture and cyber kinetic time intervals.

   H_5: A statistical correlation exists between culture and cyber kinetic time intervals.

The hypothesis tests will decompose into multiple hypothesis tests for each of the six cultural dimensions. When examining actors the analysis will also decompose for each group of actors (source, target, both-ST, and unpaired actors); thus, the true number of hypothesis tests will be conducted against 48 pairs (thus evaluating 96 hypotheses). Twenty-four tests were run for the group comparisons across six dimensions for the source, target, unpaired, and both-ST groups. Eighteen tests were run for trend analysis of three groups (source, target, and unpaired) across six dimensions. Finally, six tests were run for time interval trend analysis of three groups (source, target, and unpaired).

2.5 Actor Characteristics

Actor characteristics were examined for each individual year and collectively across the 10-year and five-year intervals. Appendix B contains the raw findings.

2.5.1 H_{0s}, H_{1s}: Source Actors

H_{0s0}: There is no statistical relationship between PDI and the source cyber actors.

H_{1s1}: A statistical relationship exists between PDI and the source cyber actors.

H_{0s2}: There is no statistical relationship between IVC and the source cyber actors.

H_{1s3}: A statistical relationship exists between IVC and the source cyber actors.

H_{0s4}: There is no statistical relationship between M/F and the source cyber actors.

H_{1s5}: A statistical relationship exists between M/F and the source cyber actors.

H_{0s6}: There is no statistical relationship between UAI and the source cyber actors.

H_{1s7}: A statistical relationship exists between UAI and the source cyber actors.

H_{0s8}: There is no statistical relationship between LvS and the source cyber actors.

H_{1s9}: A statistical relationship exists between LvS and the source cyber actors.

H_{0s10}: There is no statistical relationship between IVR and the source cyber actors.

H_{1s11}: A statistical relationship exists between IVR and the source cyber actors.

2.5.2 H_{0t}, H_{1t}: Target Actors

H_{0t0}: There is no statistical relationship between PDI and the target cyber actors.

H_{1t1}: A statistical relationship exists between PDI and the target cyber actors.

H_{0t2}: There is no statistical relationship between IVC and the target cyber actors.

H_{1t3}: A statistical relationship exists between IVC and the target cyber actors.

H_{0t4}: There is no statistical relationship between M/F and the target cyber actors.

H_{1t5}: A statistical relationship exists between M/F and the target cyber actors.

H_{0t6}: There is no statistical relationship between UAI and the target cyber actors.

H_{1t7}: A statistical relationship exists between UAI and the target cyber actors.

H_{0t8}: There is no statistical relationship between LvS and the target cyber actors.

H_{1t9}: A statistical relationship exists between LvS and the target cyber actors.

H_{0t10}: There is no statistical relationship between IVR and the target cyber actors.

H_{1t11}: A statistical relationship exists between IVR and the target cyber actors.

2.5.3 H_{0u}, H_{1u}: Unpaired Actors

H_{0u0}: There is no statistical relationship between PDI and the unpaired cyber actors.

H_{1u1}: A statistical relationship exists between PDI and the unpaired cyber actors.

H_{0u2}: There is no statistical relationship between IVC and the unpaired cyber actors.

H_{1u3}: A statistical relationship exists between IVC and the unpaired cyber actors.

H_{0u4}: There is no statistical relationship between M/F and the unpaired cyber actors.

H_{1u5}: A statistical relationship exists between M/F and the unpaired cyber actors.

H_{0u6}: There is no statistical relationship between UAI and the unpaired cyber actors.

H_{1u7}: A statistical relationship exists between UAI and the unpaired cyber actors.

H_{0u8}: There is no statistical relationship between LvS and the unpaired cyber actors.

H_{1u9}: A statistical relationship exists between LvS and the unpaired cyber actors.

H_{0u10}: There is no statistical relationship between IVR and the unpaired cyber actors.

H_{1u11}: A statistical relationship exists between IVR and the unpaired cyber actors.

2.5.4 H_{0b}, H_{1b}: Both-ST Actors

H_{0b0}: There is no statistical relationship between PDI and the both-ST actors.

H_{1b1}: A statistical relationship exists between PDI and the both-ST actors.

H_{0b2}: There is no statistical relationship between IVC and the both-ST actors.

H_{1b3}: A statistical relationship exists between IVC and the both-ST actors.

H_{0b4}: There is no statistical relationship between M/F and the both-ST actors.

H_{1b5}: A statistical relationship exists between M/F and the both-ST actors.

H_{0b6}: There is no statistical relationship between UAI and the both-ST actors.

H_{1b7}: A statistical relationship exists between UAI and the both-ST actors.

H_{0b8}: There is no statistical relationship between LvS and the both-ST actors.

H_{1b9}: A statistical relationship exists between LvS and the both-ST actors.

H_{0b10}: There is no statistical relationship between IVR and the both-ST actors.

H_{1b11}: A statistical relationship exists between IVR and the both-ST actors.

2.6 Actor Trends

Behavioral trends were examined for each individual year and collectively across the 10-year and five-year intervals. Appendix C contains the raw findings of the group actor trends.

2.6.1 H_{2s}, H_{3s}: Source Actors

H_{2s0}: There is no statistical correlation between PDI and the source cyber actors.

H_{3s1}: A statistical correlation exists between PDI and the source cyber actors.

H_{2s2}: There is no statistical correlation between IVC and the source cyber actors.

H_{3s3}: A statistical correlation exists between IVC and the source cyber actors.

H_{2s4}: There is no statistical correlation between M/F and the source cyber actors.

H_{3s5}: A statistical correlation exists between M/F and the source cyber actors.

H_{2s6}: There is no statistical correlation between UAI and the source cyber actors.

H_{3s7}: A statistical correlation exists between UAI and the source cyber actors.

H_{2s8}: There is no statistical correlation between LvS and the source cyber actors.

H_{3s9}: A statistical correlation exists between LvS and the source cyber actors.

H_{2s10}: There is no statistical correlation between IVR and the source cyber actors.

H_{3s11}: A statistical correlation exists between IVR and the source cyber actors.

2.6.2 H_{2t}, H_{3t}: Target Actors

H_{2t0}: There is no statistical correlation between PDI and the target cyber actors.

H_{3t1}: A statistical correlation exists between PDI and the target cyber actors.

H_{2t2}: There is no statistical correlation between IVC and the target cyber actors.

H_{3t3}: A statistical correlation exists between IVC and the target cyber actors.

H_{2t4}: There is no statistical correlation between M/F and the target cyber actors.

H_{3t5}: A statistical correlation exists between M/F and the target cyber actors.

H_{2t6}: There is no statistical correlation between UAI and the target cyber actors.

H_{3t7}: A statistical correlation exists between UAI and the target cyber actors.

H_{2t8}: There is no statistical correlation between LvS and the target cyber actors.

H_{3t9}: A statistical correlation exists between LvS and the target cyber actors.

H_{2t10}: There is no statistical correlation between IVR and the target cyber actors.

H_{3t11}: A statistical correlation exists between IVR and the target cyber actors.

2.6.3 H_{2u}, H_{3u}: Unpaired Actors

H_{2u0}: There is no statistical correlation between PDI and the unpaired cyber actors.

H_{3u1}: A statistical correlation exists between PDI and the unpaired cyber actors.

H_{2u0}: There is no statistical correlation between IVC and the unpaired cyber actors.

H_{3u3}: A statistical correlation exists between IVC and the unpaired cyber actors.

H_{2u4}: There is no statistical correlation between M/F and the unpaired cyber actors.

H_{3u5}: A statistical correlation exists between M/F and the unpaired cyber actors.

H_{2u6}: There is no statistical correlation between UAI and the unpaired cyber actors.

H_{3u7}: A statistical correlation exists between UAI and the unpaired cyber actors.

H_{2u8}: There is no statistical correlation between LvS and the unpaired cyber actors.

H_{3u9}: A statistical correlation exists between LvS and the unpaired cyber actors.

H_{2u0}: There is no statistical correlation between IVR and the unpaired cyber actors.

H_{3u11}: A statistical correlation exists between IVR and the unpaired cyber actors.

2.7 Cyber-Kinetic Time Intervals

This set of hypotheses is designed to test the existence of a statistical correlation to the time interval between the cyber and kinetic events. Pairs that have more than one interval per year will have the intervals averaged in order to avoid skewing the results. Mild correlations will be noted but will be scored the same as no correlation. Appendix C contains the raw findings.

2.7.1 H_4, H_5: Cyber-Kinetic Time Interval Tests

H_{41}: There is no statistical correlation between PDI and the cyber-kinetic time interval.

H_{51}: A statistical correlation exists between PDI and the cyber-kinetic time interval.

H_{42}: There is no statistical correlation between IVC and the cyber-kinetic time interval.

H_{52}: A statistical correlation exists between IVC and the cyber-kinetic time interval.

H_{43}: There is no statistical correlation between M/F and the cyber-kinetic time interval.

H_{53}: A statistical correlation exists between M/F and the cyber-kinetic time interval.

H_{44}: There is no statistical correlation between UAI and the cyber-kinetic time interval.

H_{54}: A statistical correlation exists between UAI and the cyber-kinetic time interval.

H_{45}: There is no statistical correlation between LvS and the cyber-kinetic time interval.

H_{55}: A statistical correlation exists between LvS and the cyber-kinetic time interval.

H_{46}: There is no statistical correlation between IVR and the cyber-kinetic time interval.

H_{56}: A statistical correlation exists between IVR and the cyber-kinetic time interval.

The second and third test sets, should sufficient data be collected, will rely on correlational analysis, the Spearman correlation [Hauke 2011]. The evaluation criteria for this data will be Cohen's coefficient that is used to evaluate human behaviors. The trend analysis will measure actor trends and timing trends. This evaluation will be best performed assuming there are sufficient instances of cyber and kinetic event pairings. The nature of the data determines which tools will be used for evaluation [Hauke 2011]. The non-parametric nature of Hofstede's data provides sufficient cause to evaluate the data using non-parametric data tools.

In some cases cyber events may precede kinetic events and in other cases kinetic may precede cyber. Since the evaluation is measuring the interval the absolute value will be used but the direction will be preserved and discussed.

3 Findings and Discussion

This section contains all of the findings for the various hypothesis tests. Results that are statistically insignificant are written in black. Findings with a strong statistical significance are written in red. Finally, findings with a moderate statistical significance are written in blue.

3.1 H_0, H_1: Actor Characterizations

The hypotheses tested for a statistical relationship between culture and cyber actors. The tests were performed for four groups of actors across six cultural dimensions. The overall view accounted for the 10-year and five-year findings. Appendix B contains the results of the yearly breakdown. Table 12 contains the 10-year and five-year findings for source actors, Table 13 contains the 10-year and five-year findings for target actors, Table 14 contains the 10-year and five-year findings for unpaired actors, and Table 15 contains the findings for the four-year both-ST actors. Due to the relatively young nature of the cyber domain, 10-year data and five-year data on actors that were active as both source and target actors in the same year were not sufficient until 2010.

3.1.1 H_{0s}, H_{1s}: Source Actors

The source actors were those hacker groups from countries that claimed responsibility for the attack. The source actors were compared against the general population and the results are listed below in Table 12.

Table 12: Cyber Source Actors

Year-Dimension	Z- Score	p-value	U	Hypothesis Recommendation
10 year PDI	**1.33**	**0.0918**	**1521.0**	**Consider both: H_{0s0}, H_{0s1}**
5 year PDI	**2.20**	**0.0139**	**1313.5**	**Consider both H_{0s0}, H_{0s1}**
10 year IVC	-0.29	-0.3859	1252.0	Accept H_{0s2} Reject H_{0s3}
5 year IVC	-0.79	-0.2148	887.5	Accept Null H_{0s2}, Reject H_{0s3}
10 year M/F	**2.30**	**-0.0107**	**1682.5**	**Reject H_{0s4}, Accept H_{0s5}**
5 year M/F	**1.94**	**0.0262**	**1276.0**	**Reject H_{0s04}, Accept H_{0s5}**
10 year UAI	0.55	0.2912	1391.5	Accept H_{0s6}, Reject H_{0s7}
5 year UAI	0.26	0.3974	1038.0	Accept H_{0s6}, Reject H_{0s3}
10 year LvS	-0.38	-0.3520	1037.5	Accept H_{0s8}, Reject H_{0s9}
5 year LvS	-0.85	-0.1977	736.5	Accept H_{0s8},, Reject H_{0s9}
10 year IVR	**-1.32**	**-0.0934**	**814.0**	**Accept H_{0s10}, Reject H_{0s11}**
5 year IVR	**-2.08**	**-0.0188**	**518.0**	**Consider both H_{0s10}, H_{0s11}**

3.1.2 Explanation of Cyber Source Actor Findings

Hacker groups from countries that initiated the defacements were from masculine societies. In both the five-year and 10-year group comparisons, these findings were strong. The masculine societies tend to deal aggressively with conflict, typically by fighting [Hofstede 2010]. Of note, masculinity according to Hofstede[4] also has a competitive component that confers on the "winner" the ability to stand out as "the best.[5]" The defacement of government and military websites would not only be a strong psychological statement against an adversary, but this activity would also be seen as a show of virtual strength or power, which also coincides with the high PDI and masculine findings. In high PDI societies, a show of loyalty to those in power in the "in group" is not only considered acceptable, a show of loyalty is rewarded through protection and ultimately advancement. The most interesting finding was the representation of the restrained end of the IVR dimension. The shift toward more restrained behavior could possibly suggest that this activity may serve as an acceptable expressive outlet in an otherwise restrained life.

Two dimensions received a recommendation to consider both; this is because the first set of values was a moderate finding and the second set of findings was strong. In both cases the second set of values was not only strong, but probability values were below 2%. Considering increased cyber activity within the last five years compared to the first five years, this decision is logical.

3.1.3 H_{0t}, H_{1t}: Target Actors

The target actors were those countries' government and military sites that had been compromised. The target actors were compared against the general population and the results are listed below in Table 13.

Table 13: Cyber Target Actors

Year-Dimension	Z- Score	p-value	U	Hypothesis Recommendation
10 year PDI	0.90	0.1841	1502.5	Accept H_{0t0}, Reject H_{1t1}
5 year PDI	0.98	0.1635	1409.0	Accept H_{0t0}, Reject H_{1t1}
10 year IVC	0.73	0.2327	1475.0	Accept H_{0t2}, Reject H_{1t3}
5 year IVC	0.95	0.1711	1405.0	Accept H_{0t2}, Reject H_{1t3}
10 year M/F	**2.19**	**0.0143**	**1722.5**	**Reject H_{0t4}, Accept H_{1t5}**
5 year M/F	**1.99**	**0.0233**	**1572.5**	**Reject H_{0t4}, Accept H_{1t5}**
10 year UAI	-0.24	0.4052	1309.5	Accept H_{0t6}, Reject H_{1t7}
5 year UAI	-0.69	-0.2451	1137.0	Accept H_{0t6}, Reject H_{1t7}
10 year LvS	-0.67	0.2514	996.5	Accept H_{0t8}, Reject H_{1t9}
5 year LvS	**-1.43**	**-0.0764**	**814.0**	**Accept H_{0t8}, Reject H_{1t9}**
10 year IVR	**-1.42**	**-0.0778**	**765.5**	**Accept** H_{0t10}, Reject H_{1t11}
5 year IVR	-0.98	-0.1635	713.0	Accept H_{0t10}, Reject H_{1t11}

[4] See http://geert-hofstede.com

[5] Ibid

3.1.4 Explanation of Target Actor Findings

This group of actors represents the victims of the defacement activities. The most consistent common cultural characteristic was the masculine nature of this group. Masculine cultures are known for direct and aggressive responses to conflict. The target countries in this study had already been involved with kinetic conflict, and the kinetic pairing informed the cyber search, so the cyber activity against those countries may be viewed as an extension of the kinetic conflicts or controversies.

An interesting finding showed target countries in the five-year interval showed both strong PDI and IVR statistical significance. The high PDI scores of the targets are suggestive that the source actors are attempting to embarrass the leadership of the target countries. The strong restraint showing suggests a possible cultural projection of "helplessness" onto the target country [Hofstede 2010, p. 291]. Many of the messages on the defaced sites remind the site owner that the site has been "owned," a not so subtle reminder of the helplessness of the site and site owner.

3.1.5 H0u, H1u: Unpaired Actors

The unpaired actors were hackers from countries not kinetically involved with the target country yet; these actors attacked the target country's sites. The unpaired actors were compared against the general population and the results are listed below in Table 14.

Table 14: Cyber Unpaired Actors

Year-Dimension	Z- Score	p-value	U	Hypothesis Recommendation
10 year PDI	**1.64**	**0.0505**	**2245.0**	**Consider both H_{0u0}, H_{1u1}**
5 year PDI	**2.62**	**0.0044**	**1914.5**	**Consider both H_{0u0}, H_{1u1}**
10 year IVC	-0.37	-0.3557	1822.0	Accept H_{0u2}, Reject H_{1u3}
5 year IVC	-0.57	-0.2843	1349.0	Accept H_{0u2}, Reject H_{1u3}
10 year M/F	**1.42**	**0.0778**	**2199.0**	**Consider both H_{0u4}, H_{1u5}**
5 year M/F	**1.81**	**0.0351**	**1771.5**	**Consider both H_{0u4}, H_{1u5}**
10 year UAI	1.33	-0.1920	2138.5	Accept H_{0u6}, Reject H_{1u7}
5 year UAI	1.01	0.1562	1629.5	Accept H_{0u6}, Reject H_{1u7}
10 year LvS	-0.12	-0.4522	1449.0	Accept H_{0u8}, Reject H_{1u9}
5 year LvS	-0.10	-0.4602	1077.5	Accept H_{0u8}, Reject H_{1u9}
10 year IVR	-1.22	-0.1112	1147.5	Consider both H_{0u10}, H_{1u11}
5 year IVR	**-2.26**	**-0.0119**	**690.0**	**Consider both H_{0u10}, H_{1u11}.**

3.1.6 Explanation of the Unpaired Actor Findings

This group of actors showed a significantly high PDI and strong restraint, much like the source actors; however this group, while masculine, showed weaker masculine tendencies than did either the source or target actors. This could suggest a need to "remind" the target that they are battling

the kinetic behaviors in a relatively safer environment for expressing their views. The five-year interval findings showed strong restraint scores, and high PDI finding along with the high masculine scores. This coincides with the show of strength and protection associated with high PDI, the threatening behavior of masculinity and the desire to render hopeless the target that associates with low IVR scores. Also of note, these actors have stronger PDI and IVR findings indicative of very repressive authoritarian societies. In short, this group appears to have slightly exaggerated source actor tendencies with a slightly less masculine component. Perhaps the cyber domain appeals to this group over the kinetic domain because this domain allows for aggressive behavior without the physical consequences associated with the kinetic domain.

3.1.7 Both-ST Actors

The both-ST actors were those countries that acted as source actors against a target site and also had government and military sites compromised. The both-ST actors were compared against the general population and the results are listed below in Table 15.

Table 15: Both-ST Actors

Year-Dimension	Z- Score	p-value	U	Hypothesis Recommendation
5 year PDI	**2.28**	**0.0113**	**1025.0**	**Reject H_{0b0}, Accept H_{1b1}**
5 year IVC	-0.24	-0.4052	720.0	Accept H_{0b2}, Reject H_{1b3}
5 year M/F	0.91	0.1814	859.5	Accept H_{0b4}, Reject H_{1b5}
5 year UAI	0.42	0.3372	801.5	Accept H_{0b6}, Reject H_{1b7}
5 year LvS	-1.12	-0.1314	514.5	Accept H_{0b8}, Reject H_{1b9}
5 year IVR	**-2.16**	**-0.0154**	**351.0**	**Reject H_{0b10}, Accept H_{1b11}**

3.1.8 Explanation of Both-ST Actors

These findings are limited to a four-year view due to the relatively recent adoption of the Internet as a platform for political action. This group of actors can be thought of as a subset of the source and target countries. The two most common characteristics these two groups share are high PDI and low IVR.

The scores of this group of actors are interesting because as the intersection of source and target the expectation would normally suggest findings in common areas; however, this group showed stronger PDI and IVR scores than the source actors. The addition of the target actors in this group would normally be considered a moderating influence on these dimensional values. Instead, the opposite was found. This might suggest a need to show dominance and, intolerance for opposition across all domains. The stronger PDI and IVR findings also suggest not only a trend toward the extreme ends of the dimensional poles, but also a possible enduring nature or long-term nature to these findings.

Of course these findings resulted from a small interval, the five-year interval, so these findings must be taken in context. For example, the moderation from the higher masculine findings of the separated source and target actors to a less masculine value, may be explained by the inclusion of

Russia (feminine score 36) in this group. The potential for change in the M/F dimension as this group of actors grows is possible.

3.2 Summary of Actor Group Test

The first testing of actors was performed in order to determine if cyber actors possessed unique cultural qualities that differ from the general population and the kinetic actors. The findings showed that while kinetic actors were statistically consistent with the general population, the cyber actors had unique cultural values that appeared regardless of the actor's role. The most consistently significant cultural finds were with the masculine pole of the M/F dimension. The activity on the high PDI and the low IVR dimensions, especially in the five-year window is noteworthy, since this suggests that the countries that share these values are not only more inclined to use cyber as platform, they also appear to have no desire to hide their activities. The desire to use the public forum of a website appears surprising for restrained cultures, but when taken in context of the high PDI scores the results are consistent. Based on the results, the overall null hypothesis for the cyber actors H_0, which posited that there is no statistical relationship between cultural values and cyber actor roles, must be rejected and the alternative hypothesis H_1 should be accepted.

3.3 H2, H3: Actor Trends

The next analysis examined the trends of the various actor countries (source, target, and unpaired) over the 10-year and five-year interval in order to determine if over time a trend toward actor characteristics of source, target and unpaired actors could be observed. The first set of tests were used to determine the existence of a relationship between culture and cyber actors, the second set of tests begins the task of measuring the cyber-culture relationship. The correlational testing was performed in order to determine if trends existed with any of the cultural dimensions among the three groups of cyber actors. The year was used as the independent variable and the dependent value was the median score for each dimension of each actor group per year. The raw results are in Appendix C. Tables 16-18 will display the results of the Spearman correlations for years both the five-year and 10-year trends.

3.3.1 H_{2s}, H_{3s}: Source Actor Trends

These actors were cyber actors to whom attacks were attributed. The results of the source trend actors are shown in Table 16.

Table 16: Source Actor 10- and 5-year Trends

Interval / Dimension	r	t	Correlation	Hypothesis
10-yr PDI	**0.6361**	**2.33**	**Strong +**	**Reject H_{2s0}, Accept H_{3s1}**
5-yr PDI	**0.8**	**n/a**	**Strong +**	**Reject H_{2s0}, Accept H_{3s1}**
10-yr IVC	-0.2188	-0.63	Weak -	Consider both H_{2s2}, H_{3s3}
5-yr IVC	**-0.7**	**n/a**	**Strong -**	**Consider both H_{2s2}, H_{3s3}**
10-yr M/F	0.1281	0.37	Weak +	Consider both H_{2s4}, H_{3s5}
5-yr M/F	**0.7**	**n/a**	**Strong +**	**Consider both H_{2s4}, H_{3s5}**
10-yr UAI	**-0.6**	**-2.12**	**Strong -**	**Reject H_{2s6}, Accept H_{3s7}**
5-yr UAI	**-0.4**	**n/a**	**Moderate +**	**Reject H_{2s6}, Accept H_{3s7}**
10-yr LvS	-0.2614	-0.77	Weak -	Consider both H_{2s8}, H_{3s9}
5-yr LvS	**-0.7**	**n/a**	**Strong -**	**Consider both H_{2s8}, H_{3s9}**
10-yr IVR	**-0.5601**	**-1.91**	**Strong -**	**Consider both H_{2s10}, H_{3s11}**
5-yr IVR	**0.8721**	**n/a**	**Strong +**	**Consider both H_{2s10}, H_{3s11}**

3.3.2 Explanation of Source Actor Trend Findings

PDI showed strong results for both the five-year and 10-year trend. Over the 10-year trend PDI scores of the source country actors continued to increase; thus, the defacements are not only favored by high PDI countries but also the higher the country's PDI score the more likely the country will engage in the activity. The finding of low UAI correlating over time indicates that the defacement countries are not uncomfortable with attribution since the situation that prompts the action may also justify the cyber act. The remainder of the dimensions required consideration of both hypotheses (null and alternative) and they will be individually addressed.

- IVC showed both a weak and strong negative correlation. The general trend toward collectivism is relevant—not a single score indicated individualism; however, the fluctuation of values made the trend weak even if the behavioral correlation appears strong. **Recommend: Reject null hypothesis**.
- M/F showed a weak and strong positive correlation. Overall the movement of scores is very small and does not warrant rejection of the null hypothesis. **Recommend: Accept null hypothesis.**
- LvS appears to have, at best, a weak trend toward short-term orientation. Scores over a variety of values would suggest short-term orientation. However, when the outlier score is removed from the 10-year pairs the r-value drops dramatically to the point of no correlation. **Recommend: Accept null hypothesis.**
- IVR showed a directional change from a strong negative correlation in the 10-year set to a strong positive correlation in the five-year interval. While one of the scores was strongly on the low end of the indulgence pole, the rest were relatively low. Additional, analysis and testing would likely resolve this, and when taken with other findings source actors and restraint

appear to go together. Quite possibly at this point in time the five-year score is a "blip." **Recommend: Inconclusive.**

3.3.3 H_{2t}, H_{3t}: Target Actor Trends

These actors were nations that were successfully targeted. The results of the target or victim trend actors are shown in Table 17.

Table 17: Target Actor 10- and 5-year Trends

Interval / Dimension	r	t	Correlation	Hypothesis
10-yr PDI	0.2918	0.86	Weak +	Consider H_{2t0}, H_{3t1}
5-yr PDI	**0.3**	**n/a**	**Moderate +**	**Consider H_{2t0}, H_{3t1}**
10-yr IVC	-0.25	-0.73	Weak -	Accept H_{2t2}, Reject H_{3t3}
5-yr IVC	0.1	n/a	None	Accept H_{2t2}, Reject H_{3t3}
10-yr M/F	**-0.3643**	**-1.11**	**Moderate -**	**Consider both H_{2t4}, H_{3t5}**
5-yr M/F	-0.1	n/a	None	Consider both H_{2t4}, H_{3t5}
10-yr UAI	0.2683	0.79	Weak +	Accept H_{2t6}, H_{3t7}
5-yr UAI	0.1	n/a	None	Accept H_{2t6}, H_{3t7}
10-yr LvS	**-0.6322**	**-2.31**	**Strong -**	**Reject H_{2t8}, Accept H_{2t9}**
5-yr LvS	**-0.7**	**n/a**	**Strong -**	**Reject H_{2t8}, Accept H_{2t9}**
10-yr IVR	**-0.5495**	**-1.86**	**Strong -**	**Consider both H_{2t10}, H_{2t11}**
5-yr IVR	-0.2	n/a	None	Consider both H_{2t10}, H_{2t11}

3.3.4 Explanation of Target Actor Trend Findings

The target set of actors appeared to have short-term orientation (STO) in common, suggesting a possible casual approach to securing systems. One possible explanation may be that in a STO society, a system may be considered easily replaceable; thus securing the system may have a low priority. Statistically speaking this group most closely resembles the general population. Three dimensions that warranted further examination were PDI, M/F, and IVR.

- The weak and barely moderate findings of the PDI dimension lead to the recommendation of acceptance of the null hypothesis. **Recommend: acceptance of null hypothesis.**
- The M/F trend downward in the five-year interval is accompanied by a 10-year trend toward a negative correlation. A quick inspection of the set shows the downward trend along with the top half of the pole, so that even though the trend would appear to move toward feminine, the entire set of values are masculine. This finding is noteworthy since an attack on a masculine country would have a good chance of being followed-up with a response. **Recommend: rejection of null hypothesis.**
- The IVR dimension showed a strong negative correlation on the 10-year interval and a weak negative correlation on the five-year interval. The general trend is toward the restrained end

of the pole. The most recent scores support the downward trend. **Recommend: inconclusive finding.**

3.3.5 H_{2u}, H_{3u}: Unpaired Actor Trends

These actors were attributed cyber actors who had no kinetic relationship with the target. The results of the unpaired trend actors are shown in Table 18.

Table 18: Unpaired Actor 5- and 10-Year Trends

Interval / Dimension	r	t	Correlation	Hypothesis
10-yr PDI	**0.4939**	**1.61**	**Moderate +**	**Consider both H_{2u0}, H_{3u1}**
5-yr PDI	**0.9**	**n/a**	**Strong +**	**Consider both H_{2u0}, H_{3u1}**
10-yr IVC	**-0.3399**	**-1.02**	**Moderate -**	**Consider both H_{2u2}, H_{3u3}**
5-yr IVC	-0.2	n/a	Weak -	Consider both H_{2u2}, H_{3u3}
10-yr M/F	-0.1581	-0.45	None	Consider both H_{2u4}, H_{3u5}
5-yr M/F	**-0.7**	**n/a**	**Strong -**	**Consider both H_{2u4}, H_{3u5}**
10-yr UAI	**-0.5416**	**-1.82**	**Strong -**	**Reject H_{2u6}, Accept H_{3u7}**
5-yr UAI	**0.8**	**n/a**	**Strong +**	**Reject H_{2u6}, Accept H_{3u7}**
10-yr LvS	**0.3952**	**1.22**	**Moderate -**	**Reject H_{2u8}, Accept H_{3u9}**
5-yr LvS	**0.7**	**n/a**	**Strong +**	**Reject H_{2u8}, Accept H_{3u9}**
10-yr IVR	**-0.8049**	**-3.84**	**Strong -**	**Consider both H_{2u10}, H_{3u11}**
5-yr IVR	-0.2	n/a	Weak -	Consider both H_{2u10}, H_{3u11}

3.3.6 Explanation of Unpaired Actor Trend Findings

Like the source actors the unpaired actors showed strong positive correlations over time with high PDI scores. This group as a whole is high PDI, collectivist and restrained. Unique to the unpaired actors is a trend over time toward long-term orientation. This is in direct contrast to the victims who trend over time toward short-term orientation. Among other qualities associated with LTO is perseverance.

- The PDI scores were significant for both at moderate and strong, which leads to a recommendation to reject the null hypothesis and accept the alternative. The moderate finding bordered the cut-off for the strong range, and the strong finding was very strong. **Recommend: Reject null hypothesis, accept alternative hypothesis.**
- The IVC scores were moderate and weak on the collectivist end of the pole. All scores were in the collectivist half and overall the values showed little to no movement. **Recommend: Inconclusive finding.**
- The M/F findings were most accurately reflected in the 10-year value, which showed a very weak positive correlation. Overall scores tended to cluster in the middle of the distribution

and a change in direction is usually offset by a follow-on change in the opposite direction. Neither extreme is represented in this dimension. **Recommend: Accept null hypothesis.**

- An interesting finding showed that while inconclusive, this group in general tends toward higher UAI values; this is interesting because high UAI values associate with rigidity in behavior. Countries that are high UAI tend to go to a great deal of effort to control outcomes. **Recommend: Inconclusive finding.**
- The IVR scores also showed a strong negative correlation on the 10-year interval, while the five-year interval showed a weak negative correlation. The scores in the five-year interval are at the lowest third of the distribution; thus, there is not much room to go lower. **Recommend: Reject null, accept alternative.**

3.4 Summary of Actor Trends Test

All of the examined actor groups trended toward high PDI, although target countries showed only a weak correlation. The source actors and the unpaired actors appear to have the support of their respective leadership, which could be government, military, or other powerful sector of society. When high PDI is the norm, communication is indirect and a show of "in group/out group" behavior prevails. Thus, concern for the "out group" is minimized, making abuse acceptable, and approved. All three groups also showed a 10-year trend toward restraint. This suggests that to restrained cultures cyber, as an attack vector, is growing in popularity. Restrained societies tend to be less tolerant of behaviors outside of the cultural norm.

Target actors were closest to the general population with one notable exception: short-term orientation. The STO may suggest the national leadership may view the site as temporary, replaceable, or easily rebuilt. Target countries also differ significantly from the two groups in their masculine nature, while the targets trended away from masculine values; they remained in the masculine half of the group. The difference was most noticeable when comparing source and target groups where source actors were noticeably more feminine than the masculine targets.

3.5 H_4, H_5: Time Intervals

The time intervals were measured and compared against cultural scores. The time interval was based on the nearest cyber and kinetic dates. This was chosen due to the uncertainty in pairing the events. The maximum interval between events was set to 30 days. This value, while not perfect, was chosen as a baseline; in reality most events occurred within 14 days. Appendix E contains the raw findings and the breakdowns. Tests were performed across all six dimensions for 10-year and five-year values in order to test H_4 and H_5. The hypothesis test set the cultural dimension as the independent variable and the time interval as the dependent variable.

3.6 Processing and Pairing Timed Kinetic and Cyber Events

The kinetic event dates were aligned against the cyber event dates. Cyber and kinetic pairs were evaluated by country pairs for each year. A total of 1,270 events were examined and 186 pairs, or 372 entries, were matched. When multiple events between pairs occurred in a year, those events were averaged. Table 19 shows a breakdown of yearly entries and the number of matched events. A complete list of the raw pairings can be found in Appendix E.

Table 19: Cyber-Kinetic Timed Event Pairings per Year

Year	# Of Events	All Pairs	Pairs Matched	Events Matched (Pairs)	Source Actors
2004	82	9	6	15	4
2005	94	19	10	14	6
2006	75	15	7	8	5
2007	85	12	8	10	5
2008	79	11	5	5	4
2009	164	21	14	21	8
2010	135	18	7	19	5
2011	183	25	13	23	5
2012	220	28	18	44	11
2013	232	32	14	28	7

Some countries, such as India, Turkey, Brazil, Iran, and Pakistan had many entries. The reduction of the entries into averages per year was done to avoid having a small number of countries disproportionately influence the findings. This decision also led to the sharp reduction in the amount of events to process in the final cyber-kinetic time intervals. A quick look at Table 19 affirms this observation. The column for all pairs reflects the initial search pairings that had results for evaluation. The pairs matched column indicates a pairing of cyber and kinetic dates, where a defacement occurred from a source country group against a target country government affiliated website within 30 days of a kinetic event. Initially 180 distinct events were paired for the cyber-kinetic pairings; however, certain pairs were more active than others. India and Pakistan were very active over the course of the time measurement period. The relatively small number of source actors supports this observation for each year that a small group of countries are the largest contributors to this behavior.

3.6.1 H_{4t}, H_{5t}: Average Country Time Trends

This grouping combined all of the year's data and can be viewed as a meta-view of the activity. The 10-year pairs were averaged for each source country. The source countries were sorted and values were averaged per country. The 180 discrete events when grouped by country and year reduced to 59 events to analyze. This reduction contains the yearly averages for each of the active source actor pairs. For example, India had active pairings in five of the 10 years. In most cases India had more than one match per year, so the value was averaged per year. Each yearly average was averaged into an overall "average time interval." In India's case, the value of 7.4 is the average of 2.8, 10.8, 9.0, 8.5, and 5.7.

Table 20 contains the names of the countries, number of events per country, and the average time interval.

Table 20: Overall Time Intervals per Country

Country	Number Of Events	Average Time Interval (Days)
Albania	1	29.0
Bangladesh	2	9.9
Brazil	6	13.2
Chile	1	17.0
China	2	12.3
Egypt	1	6.5
Greece	1	18.0
India	5	7.4
Indonesia	7	9.3
Iran	8	15.2
Iraq	1	4.7
Italy	1	5.0
Malaysia	1	6.0
Mexico	2	11.6
Pakistan	6	10.0
Saudi Arabia	2	22.5
Syria	3	12.2
Taiwan	2	13.5
Turkey	7	10.6
Actor Totals of Event Years	**59**	**-**

A Spearman correlation was run for each dimension—first for the entire set, and a second time for the filtered set that removed the single-event entries. The tests were run using the rounded values listed in Table 20. The first set of test findings were inconclusive. The suspicion of outliers having influenced the results led to a second set of tests where single-entry pairs were removed. The seven single-year outliers were removed, and only the multi-year participants were processed. Results of the second test are shown in Table 21.

Table 21: Multi-Event Culture Time Interval Correlations

Data Type/ Dimension	r	t	Type	Hypothesis
PDI	0.0459	0.15	None +	Accept null
IVC	0.1368	0.44	None -	Accept null
M/F	-0.1366	-0.44	None +	Accept null
UAI	0.2592	0.85	Weak +	Accept null
LvS	**-0.3357**	**-1.13**	**Moderate -**	**Reject null**
IVR	**0.5376**	**1.91**	**Strong +**	**Reject null**

3.6.2 Explanation of Findings

The strongest correlation was between indulgence and length of time. The strong positive correlation with IVR may be explained by the tolerance of views and behaviors by high IVR countries. Thus, allowing and considering opposing views into the discussion may slow the response time. The negative correlation between LvS was an unanticipated finding. One possible explanation for this is the LTO society is holistic in thinking and the STO society is more specific; thus, the defacement and response may not be considered a part of the mission requiring immediate responses. The weak UAI finding is noteworthy, since these high UAI countries would likely consider various outcomes before acting in order to guarantee a more certain outcome. Over time this dimension could potentially have a stronger showing. These findings suggest the need for follow-on research.

3.6.3 Other Findings

When the raw data was examined over the 10-year interval both with and without the single entry actors, a positive correlation was observed between IVR and the time interval. This correlation was weak with the entire dataset and moderate bordering on strong with the reduced dataset. This is consistent with the findings of the averaged values dataset. Perhaps one of the more fascinating findings associated with the IVR time interval positive correlation is the fact that this dimension, more than LvS, consistently correlated positively. This consistent finding of indulgent societies correlating positively with event data time intervals makes this dimension the most accurate in determining cyber-kinetic responses. It should be noted that PDI, while not a determinant of activity, is mostly high; there are no low PDI countries in the cyber-kinetic pairings. This may be because many of the low PDI countries (Israel, United States, United Kingdom) have moved onto other attack vectors that were not examined in this study.

4 Country Cultural Profiles

Each country that engaged in web defacements as a form of cyber activity was entered into Hofstede's website that broadly characterizes the country that is entered. Hofstede or the Country Comparison page on the Geert-Hofstede website contains the cultural profiles of the countries used in the time interval pairings [Hofstede 2010, Hofstede 2013].

4.1 Summary of Findings

F1. Source actors tend to be high PDI, restrained and had masculine leanings.

Support for Finding

Table 12, derived from Appendix B data, provides the support of the actor characterization against the general population. Table 16 derived from Appendix C, displayed the behavioral trends of source actors that were consistently high in PDI, masculine, and restrained values.

Possible Implications and Discussion

High PDI countries not only require permission and loyalty of underlings to superiors, but belief that "might makes right" provides cover and justification of the attack [Hofstede 2010]. Masculinity provides the aggression component of the attack. The restraint trait suggests both intolerance for different views and a willingness to punish digressions [Minkov 2013]. All of these combined values provide a justification for a strong response across both cyber and kinetic domains. The positive correlation between high PDI values and increased time between attacks fits with the longer decision-making time associated with high PDI countries [Guess 2004].

F2. Target Countries tend to be masculine.

Support for Finding

In addition to the actor profile data (Table 13 and Appendix B) the trends data (Table 17 and Appendix C) also supports the masculine preference.

Possible Implications and Discussion

Masculine cultures are competitive and direct, especially when dealing with conflict. This behavior may set the target countries in the path of the source and unpaired countries that also share the direct confrontational behaviors.

F3. Unpaired countries were higher in PDI and more restrained than source countries and the masculine leanings were weaker than either source or target countries.

Support for Finding

Table 14, derived from Appendix B data, provides the support of the actor characterization against the general population. Table 18, derived from Appendix C, displays the behavioral trends of source actors that were consistent with high PDI and restraint values.

Possible Implications and Discussion

The stronger restraint finding relates to a strong sense of right and wrong behaviors. The masculine score suggests a need to confront unacceptable behaviors in a less confrontational manner. The defacements offer the opportunity to respond to unacceptable behaviors using an aggressive tone while maintaining the distance of the virtual environment. Also of potential interest: restrained societies encourage deeper learning and indulgent societies encourage superficial learning [Hofstede 2010]. The defacement may provide an opportunity for the attacker to show a certain depth of knowledge while delivering a message of disapproval.

F4. IVR, LvS, and UAI showed the strongest statistical correlations with time intervals.

Support for Finding

Table 21 and Appendix D contain the data in support of the finding. The trends of the multi-year events showed the correlations between the UAI, LvS and IVR dimensions. The IVR correlation was strong, the LvS correlation was moderate and the UAI correlation was weak.

Possible Implications and Discussion

The positive correlation with IVR may be explained by the tolerance for considering multiple analyses or viewpoints that provide various alternative responses. These responses would be fully evaluated before the final action is taken. The LvS finding may reflect the prioritizations associated with STO countries where the people tend to think tactically. In short, the webserver may not be too important in a STO country during times of conflict. The weak UAI finding is noteworthy, due to behaviors associated with uncertainty-avoiding cultures, such as precision and single correct answers. When the UAI behaviors combine with the accommodating nature of indulgence, the delayed response time may reflect views that value effective responses over timely responses.

F5. IVR appeared to be the greatest predictor of behaviors.

Support for Finding

Appendix B, C, and D, along with tables 12-21, shows the findings involving the IVR dimension.

Possible Implications and Discussion

The IVR dimension showed activity and the consistent movement toward a lower value (more restrained) is noteworthy. Even more interesting is the distribution of the IVR general population

data, which is non-parametric, with the most common values in the mid-range. While the source actors were in the low end of the mode the unpaired scores were well below the mode grouping. This suggests that restrained cultures along with their high PDI brethren are the most active and can be counted on to respond to a slight (real or perceived) using both cyber and kinetic responses.

5 Conclusions and Recommendations

Differences were observed between different types of cyber actors and between cyber and kinetic actors. The kinetic group and the targets most closely matched the general population, and the source actors and unpaired actors most closely matched each other. The prevalence of restrained cultures in so many areas was an unanticipated finding.

The data used for the study has the potential for re-use in other studies that can provide greater insight into both cyber and kinetic events. The ability to expand the study to examine frequencies, attack vectors, additional attack data, along with the nature of the attacks provides opportunities for likely follow-on studies. This research direction may proceed to increase breadth and depth of understanding.

There were many different facets to this study and each area represents just the first findings based on this initial research. Furthermore, this research has cross-discipline aspects for which foundational research is limited. This study provides many launching points for building a significant body of knowledge in the area of combining behavioral science with cybersecurity. Because this research is foundational in nature, the tools used to evaluate were inferential statistical tools. As such, correlations or inferences could be drawn, but this is not synonymous with causation.

Also, the findings in this study are limited in scope and this should be considered when abstracting the findings. There is a trade-off between using ground truth data and less reliable but more variable sources that may provide other attack vectors. However, the ability to accurately attribute the variable data sources would inaccurately skew the findings. Thus a logical next step would involve collecting ground truth data on another attack vector such as malware or DoS/DDoS attacks and performing a similar analysis.

Appendix A: Hofstede Data

This appendix contains the Hofstede spreadsheet obtained from his website http://www.geerthofstede.eu/dimension-data-matrix.

Country	PDI	IVC	M/F	UAI	LvS	IVR
Albania	90	20	80	70	61	15
Angola	83	18	20	60	15	83
Argentina	49	46	56	86	20	62
Australia	36	90	61	51	21	71
Austria	11	55	70	70	60	63
Bangladesh	80	20	55	60	47	20
Belgium	65	75	54	94	82	57
Bhutan	94	52	32	28	Null	Null
Brazil	69	38	49	76	44	59
Bulgaria	70	30	40	85	69	16
Burkina Faso	70	15	50	55	27	18
Canada	38	80	52	48	36	68
Cape Verde	75	20	15	40	12	83
Chile	63	23	28	86	31	68
China	80	20	66	30	87	24
Columbia	67	13	64	80	13	83
Costa Rica	35	15	21	86	Null	Null
Croatia	73	33	40	80	58	33
Czech Rep.	57	58	57	74	70	29
Denmark	18	74	16	23	25	70
Dominican Republic	65	30	65	45	13	54
Ecuador	78	8	63	67	Null	Null
Egypt	70	25	45	80	7	4
El Salvador	66	19	40	94	20	89
Estonia	40	60	30	60	82	16
Ethiopia	70	20	65	55	Null	Null
Fiji	78	14	46	48	Null	Null
Finland	33	63	26	59	38	57
France	68	71	43	86	63	48
Germany	35	67	66	65	83	40
Ghana	80	15	40	65	4	72
Greece	60	35	57	100	45	50
Guatemala	95	63	37	99	Null	Null
Honduras	80	20	40	50	Null	Null
Hong Kong	68	25	57	29	61	17
Hungary	46	80	88	82	58	31
Iceland	30	60	10	50	28	67
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
Ireland	28	70	68	35	24	65

Country	PDI	IVC	M/F	UAI	LvS	IVR
Israel	13	54	47	81	38	Null
Italy	50	76	70	75	61	30
Jamaica	45	39	68	14	Null	Null
Japan	54	45	95	92	88	42
Jordan	70	30	45	65	16	43
Kenya	70	25	60	50	Null	Null
Kuwait	90	25	40	80	Null	Null
Latvia	44	70	9	63	69	13
Lebanon	75	40	65	50	14	25
Libya	80	38	52	68	23	34
Lithuania	42	60	19	65	82	16
Luxembourg	40	60	50	70	64	56
Malawi	70	30	40	50	Null	Null
Malaysia	100	26	50	36	41	57
Mexico	81	30	69	82	24	97
Morocco	70	46	53	68	14	25
Mozambique	85	15	38	44	11	80
Namibia	65	30	40	45	35	Null
Nepal	65	30	40	40	Null	Null
Netherlands	38	80	14	53	67	68
New Zealand	22	79	58	49	33	75
Nigeria	80	30	60	55	13	84
Norway	31	69	8	50	35	55
Pakistan	55	14	50	70	50	0
Panama	95	11	44	86	Null	Null
Peru	64	16	42	87	25	46
Philippines	94	32	64	44	27	42
Poland	68	60	64	93	38	29
Portugal	63	27	31	99	28	83
Romania	90	30	42	90	52	20
Russia	93	39	36	95	81	20
Saudi Arabia	95	25	60	80	36	52
Senegal	70	25	45	55	24	Null
Serbia	86	25	43	92	52	28
Sierra Leone	70	20	40	50	Null	Null
Singapore	74	20	48	8	72	46
Slovakia	100	52	100	51	77	28
Slovenia	71	27	19	88	49	48
South Africa	49	65	63	49	34	63
South Korea	60	18	39	85	100	29
Spain	57	51	42	86	48	44
Sri Lanka	80	35	10	45	45	Null
Suriname	85	47	37	92	Null	Null
Sweden	31	71	5	29	53	78
Switzerland	34	68	70	58	74	78
Syria	80	35	52	60	30	Null
Taiwan	58	17	45	69	93	49
Tanzania	70	25	40	50	34	38
Thailand	64	20	34	64	32	45
Trinidad & Tobago	47	16	58	55	13	80

Country	PDI	IVC	M/F	UAI	LvS	IVR
Turkey	66	37	45	85	49	49
UAE	90	25	50	80	Null	Null
UK	35	89	66	35	51	69
USA	40	91	62	46	26	68
Uruguay	61	36	38	99	26	53
Venezuela	81	12	73	76	16	100
Vietnam	70	20	40	30	57	35
Zambia	60	35	40	50	30	42

Appendix B: Data for Statistical Relationship Between Culture and Cyber Actors

This appendix includes the data for the hypothesis tests for a statistical relationship between culture and cyber actors. The tests were performed for four groups of actors (source actors, target actors, unpaired actors, and "both-ST" source/target actors) across six cultural dimensions. The overall view accounted for the 10-year and five-year findings. Due to the relatively young nature of the cyber domain, 10-year data and five-year data on actors that were active as both-ST actors in the same year were not sufficient until 2010.

Results that are statistically insignificant are written in black. Findings with a strong statistical significance are written in red. Finally findings with a moderate statistical significance are written in blue.

Source Actors: Ten years

Country	PDI	IVC	M/F	UAI	LvS	IVR
Albania	90	20	80	70	61	15
Argentina	49	46	56	86	20	62
Bangladesh	80	20	55	60	47	20
Brazil	69	38	49	76	44	59
Chile	63	23	28	86	31	68
China	80	20	66	30	87	24
Egypt	70	25	45	80	7	4
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
Italy	50	76	70	75	61	30
Jordan	70	30	45	65	16	43
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
Pakistan	55	14	50	70	50	0
Philippines	94	32	64	44	27	42
Saudi Arabia	95	25	60	80	36	52
Syria	80	35	52	60	30	null
Taiwan	58	17	45	69	93	49

Turkey	66	37	45	85	49	49
United States	40	91	62	46	26	68
10-year	**z = 1.33**	z = -0.29	**z = 2.30**	z = 0.55	z = -0.38	**z = -1.32**
	p =0.0918	p = -0.3859	**p = -0.0107**	p = 0.2912	p = -0.3520	**p =-0.0934**
	u = 1521.0	u = 1252.0	**u = 1682.5**	u = 1391.5	u = 1037.0	**u = 814.0**

Source Actors: Five years

Country	PDI	IVC	M/F	UAI	LvS	IVR
Albania	90	20	80	70	61	15
Argentina	49	46	56	86	20	62
Bangladesh	80	20	55	60	47	20
Brazil	69	38	49	76	44	59
China	80	20	66	30	87	24
Egypt	70	25	45	80	7	4
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
Jordan	70	30	45	65	16	43
Libya	80	38	52	68	23	34
Malaysia	100	26	50	36	41	57
Morocco	70	46	53	68	14	25
Pakistan	55	14	50	70	50	0
Philippines	94	32	64	44	27	42
Saudi Arabia	95	25	60	80	36	52
Syria	80	35	52	60	30	Null
Turkey	66	37	45	85	49	49
5-year	**z = 2.20**	z= -0.79	**z= 1.94**	z = 0.26	z = -0.85	**z = -2.08**
	p = -0.0139	p = -0.2148	**p = 0.0262**	p = 0.3974	p = -0.1977	**p = -0.0188**
	u = 1313.5	u = 887.5	**u =1276.0**	u = 1038.0	u = 736.5	**u = 518.0**

Target Actors: Ten years

Country	PDI	IVC	M/F	UAI	LvS	IVR
Albania	90	20	80	70	61	15
Argentina	49	46	56	86	20	62
Australia	36	90	61	51	21	71
Bangladesh	80	20	55	60	47	20
Brazil	69	38	49	76	44	59
China	80	20	66	30	87	24
Egypt	70	25	45	80	7	4
India	77	48	56	40	51	26
Iran	58	41	43	59	14	40
Iraq	95	30	70	85	25	17
Israel	13	54	47	81	38	Null
Jordan	70	30	45	65	16	43
Lebanon	75	40	65	50	14	25
Libya	80	38	52	68	23	34
Malaysia	100	26	50	36	41	57
Nepal	65	30	40	40	Null	Null
Pakistan	55	14	50	70	50	0
Philippines	94	32	64	44	27	42
Poland	68	60	64	93	38	29
Russian Federation	93	39	36	95	81	20
Saudi Arabia	95	25	60	80	36	52
South Africa	49	65	63	49	34	63
Syria	80	35	52	60	30	Null
Taiwan	58	17	45	69	93	49
Turkey	66	37	45	85	49	49
United Kingdom	35	89	66	35	51	69
United States	40	91	62	46	26	68
10-year	z = 0.90	z = 0.73	**z = 2.19**	z = -0.24	z= -0.67	**z = -1.42**
	p = 0.1841	p = 0.2327	**p = -0.0143**	p = 0.4052	p = 0.2514	**p = -0.0778**
	u = 1502.5	u = 1475.0	**u = 1722.5**	u = 1309.5	u = 996.5	**u = 765.5**

Target Actors: Five years

Country	PDI	IVC	M/F	UAI	LvS	IVR
Argentina	49	46	56	86	20	62
Australia	36	90	61	51	21	71
Bangladesh	80	20	55	60	47	20
Brazil	69	38	49	76	44	59
China	80	20	66	30	87	24
Egypt	70	25	45	80	7	4
India	77	48	56	40	51	26
Iran	58	41	43	59	14	40
Iraq	95	30	70	85	25	17
Israel	13	54	47	81	38	null
Jordan	70	30	45	65	16	43
Lebanon	75	40	65	50	14	25
Libya	80	38	52	68	23	34
Malaysia	100	26	50	36	41	57
Nepal	65	30	40	40	null	null
Nigeria	80	30	60	55	13	84
Pakistan	55	14	50	70	50	0
Philippines	94	32	64	44	27	42
Russian Federation	93	39	36	95	81	20
Saudi Arabia	95	25	60	80	36	52
South Africa	49	65	63	49	34	63
Syria	80	35	52	60	30	null
Turkey	66	37	45	85	49	49
United Kingdom	35	89	66	35	51	69
United States	40	91	62	46	26	68
5 year	z = 0.98	z = 0.95	**z = 1.99**	z = -0.69	**z = -1.43**	z= -0.98
	p = 0.1635	p = 0.1711	**p = 0.0233**	p = -0.2451	**p = -0.0764**	p = -0.1635
	u = 1409.0	u = 1405.0	**u = 1572.5**	u = 1137.0	**u= 814.0**	u = 713.0

Unpaired Actors: Ten years

Country	PDI	IVC	M/F	UAI	LvS	IVR
Albania	90	20	80	70	61	15
Argentina	49	46	56	86	20	62
Bangladesh	80	20	55	60	47	20
Belgium	65	75	54	94	82	57
Brazil	69	38	49	76	44	59
Bulgaria	70	30	40	85	69	16
Chile	63	23	28	86	31	68
China	80	20	66	30	87	24
Denmark	18	74	16	23	35	70
Ecuador	78	8	63	67	Null	Null
Egypt	70	25	45	80	7	4
Germany	35	67	66	65	83	40
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
Italy	50	76	70	75	61	30
Jordan	70	30	45	65	16	43
Kuwait	90	25	40	80	Null	Null
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
Pakistan	55	14	50	70	50	0
Peru	64	16	42	87	25	46
Philippines	94	32	64	44	27	42
Portugal	63	27	31	99	28	33
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
Syria	80	35	52	60	30	Nu1l
Turkey	66	37	45	85	49	49
UAE	90	25	50	80	Null	Null
UK	*35*	*89*	*66*	*35*	*51*	*69*
US	40	91	62	46	26	68
Venezuela	81	12	73	76	16	100
Vietnam	70	20	40	30	57	35

	z= 1.64	z = -0.37	**z = 1.42**	z = 1.33	z = -0.12	z = -1.22
	p = 0.0505	p = -0.3557	**p = 0.0778**	p = -0.1920	p = -0.4522	p = -0.1112
	u= 2245.0	u = 1822.0	**u = 2199.0**	u = 2138.5	u = 1449.0	u = 1147.5

Unpaired Actors: Five years

Country	PDI	IVC	M/F	UAI	LvS	IVR
Albania	90	20	80	70	61	15
Argentina	49	46	56	86	20	62
Bangladesh	80	20	55	60	47	20
Brazil	69	38	49	76	44	59
Bulgaria	70	30	40	85	69	16
China	80	20	66	30	87	24
Ecuador	78	8	63	67	Null	Null
Egypt	70	25	45	80	7	4
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
Italy	50	76	70	75	61	30
Jordan	70	30	45	65	16	43
Kuwait	90	25	40	80	Null	Null
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
Pakistan	55	14	50	70	50	0
Philippines	94	32	64	44	27	42
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
Syria	80	35	52	60	30	Null
Turkey	66	37	45	85	49	49
UAE	90	25	50	80	Null	Null
UK	35	89	66	35	51	69
	z = 2.62	z = -0.57	**z = 1.81**	z = 1.01	z = -0.10	**z = -2.26**
	p = 0.0044	p = -0.2843	**p = 0.0351**	p =0.1562	p = -0.4602	**p = -0.0119**
	u = 1914.5	u = 1349.0	**u = 1771.5**	u =1629.5	u = 1077.5	**u = 690.0**

Both-ST Actors

Country	PDI	IVC	M/F	UAI	LvS	IVR
Bangladesh	80	20	50	50	47	20
Brazil	69	38	49	76	44	59
Egypt	70	25	45	80	7	4
India	77	48	56	40	51	26
Iran	58	41	43	59	14	40
Iraq	95	30	70	85	25	17
Jordan	70	30	45	65	16	43
Lebanon	75	40	65	50	14	25
Libya	80	38	52	68	23	34
Malaysia	100	26	50	36	41	57
Pakistan	55	14	50	70	50	0
Russian Federation	93	39	36	95	81	20
Saudi Arabia	95	25	60	80	36	52
Syria	80	35	52	60	30	Null
Turkey	66	37	45	85	49	49
	z = 2.28	z = -0.24	z = 0.91	z = 0.42	z = -1.12	**z = -2.16**
	p = 0.0113	p = -0.4052	p = 0.1814	p = 0.3372	p = -0.1314	**p = -0.0154**
	u = 1025.0	u = 720.0	u = 859.5	u = 801.5	u = 514.5	**z = 351.0**

Appendix C: Trend Data

This appendix includes the data for the trends of the various actor countries (source, target, and unpaired) over the 10-year and five-year interval in order to determine if over time a trend toward actor characteristics of source, target and unpaired actors could be observed. The first set of tests were used to determine the existence of a relationship between culture and cyber actors; the second set of tests begins the task of measuring the cyber-culture relationship. The correlational testing was performed in order to determine if trends existed with any of the cultural dimensions among the three groups of cyber actors. The year was used as the independent variable and the dependent value was the median score for each dimension of each actor group per year.

Results that are statistically insignificant are written in black. Findings with a strong statistical significance are written in red. Finally, findings with a moderate statistical significance are written in blue.

PDI Country Trend Data

Source	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Z	n/a	-0.4	n/a	n/a	n/a	0.46	-0.09	**1.63**	**1.32**	**1.62**
P	n/a	0.3446	n/a	n/a	n/a	0.3228	-0.4641	**0.0516**	**0.0934**	**0.0526**
U	n/a	539	n/a	n/a	n/a	544.5	459	**657**	**740.5**	**772.5**
Med	69	69.5	66	66	64	69.5	69	**77**	**73.5**	**77.5**
Target										
Z	n/a	1.13	-0.69	n/a	0.85	0.08	-0.29	0.73	-0.36	1.11
P	n/a	0.1292	-0.2451	n/a	0.1977	0.4681	-0.3859	0.2327	-0.3594	0.1335
U	n/a	609	479.5	n/a	527.5	760	617.5	838.5	706.5	1048.5
Med	62	74.5	58	66	70	69	67	70	65	72.5
Both-ST										
Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**1.43**	**1.46**	**2.06**

P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**0.0764**	**0.0721**	**0.0197**
U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**580**	**525**	**819.5**
Med	n/a	n/a	n/a	n/a	n/a	n/a	63.5	**77**	**78.5**	**78.5**
Unpaired										
Z	**1.77**	0.89	0	0.96	1.07	**1.27**	**1.82**	**2.38**	**2.07**	**2.58**
P	**0.0384**	0.1867	0.5	0.1685	0.1423	**0.102**	**0.0344**	**0.0087**	**0.0192**	**0.0049**
U	**963.5**	641	901	702.5	714	**623**	**1143.5**	**1218.5**	**1411**	**1609**
Med	**78**	70	67.5	69.5	70	**74**	**73.5**	**77.5**	**77.5**	**79**
Source			**Target**			**Both-ST**		**Unpaired**		
2004	69	**Spearman**	**2004**	62	**Spearman**	**2004**		**2004**	78	**Spearman**
2005	69.5	**10 year**	**2005**	74.5	10 year	**2005**		**2005**	70	**10 year**
2006	66	**r = 0.6361**	**2006**	58	r = 0.2918	**2006**		**2006**	67.5	**r = 0.4939**
2007	66	**t = 2.33**	**2007**	66	t = 0.86	**2007**		**2007**	69.5	**t = 1.61**
2008	64		**2008**	70		**2008**		**2008**	70	
2009	69.5	**5 year**	**2009**	69	**5 year**	**2009**		**2009**	74	**5 year**
2010	69	**r = 0.8**	**2010**	67	**r = 0.3**	**2010**	63.5	**2010**	73.5	**r = 0.9**
2011	77		**2011**	70		**2011**	77	**2011**	77.5	
2012	73.5		**2012**	65		**2012**	78.5	**2012**	77.5	
2013	77.5		**2013**	72.5		**2013**	78.5	**2013**	79	

IVC Country Trend Data

Source	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Z	n/a	-0.59	n/a	n/a	n/a	-0.37	-0.67	-0.11	-0.9	-0.87
P	n/a	-0.2776	n/a	n/a	n/a	-0.3557	-0.2514	-0.4562	-0.1841	-0.1922
U	n/a	443	n/a	n/a	n/a	463.5	389	439.5	504	507.5
Med	30	32.5	38	37	38.7	33.5	37	35	30.5	29
Target										
Z	n/a	0.74	**1.82**	n/a	0.95	0.67	1.15	0.56	1.14	0.86
P	n/a	0.2297	**0.0344**	n/a	0.1711	0.2514	-0.1251	0.2877	0.1271	0.1949
U	n/a	572	**0.0344**	n/a	536.5	831.5	778	818	888	1015.5
Med	48.5	35	**41**	38	32	38	36.5	35	40	7.5
Both-ST										
Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-0.11	-0.59	0.3
P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-0.4562	-0.2776	0.3821
U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	439.5	349	568
Med	n/a	n/a	n/a	n/a	n/a	n/a	39.5	35	30.5	36
Unpaired										
Z	-0.67	0.18	0.31	-0.46	-0.33	-0.38	0.52	-1	-0.51	-0.68
P	-0.2514	0.4286	0.3783	-0.3228	-3707	-0.352	0.3015	-0.1587	0.305	-0.2483
U	669	568.5	942	550.5	564	463	829.5	765.5	1023.5	1092.5
Med	30	37	33.5	33.5	31	37.5	30	30	30	31
Source			**Target**			**Both-ST**		**Unpaired**		

2004	30	**Spearman**	**2004**	48.5	**Spearman**	**2004**		**2004**	30	**Spearman**
2005	32.5	10 year	**2005**	35	10 year	**2005**		**2005**	37	**10 year**
2006	38	r = -0.2188	**2006**	41	r = -0.25	**2006**		**2006**	33.5	**r = -0.3399**
2007	37	t = -0.63	**2007**	38	t = -0.73	**2007**		**2007**	33.5	**t = -1.02**
2008	38.7		**2008**	32		**2008**		**2008**	31	
2009	33.5	**5 year**	**2009**	38	**5 year**	**2009**		**2009**	37.5	**5 year**
2010	37	**r = -0.7**	**2010**	36.5	**r = 0.1**	**2010**	39.5	**2010**	30	**r = -0.2**
2011	35		**2011**	35		**2011**	35	**2011**	30	
2012	30.5		**2012**	40		**2012**	30.5	**2012**	30	
2013	29		**2013**	37.5		**2013**	36	**2013**	31	

M/F Country Trend Data

Source	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Z	n/a	**1.89**	n/a	n/a	n/a	0.47	0.45	1.03	0.79	1.02
P	n/a	**682.5**	n/a	n/a	n/a	0.3192	0.3264	0.1515	0.2148	0.1539
U	n/a	**0.0294**	n/a	n/a	n/a	545.5	491	544.5	648	708.5
Med	50	**55**	49	46	43	47.5	49	52	50	51
Target										
Z	n/a	**2.66**	1.15	1.15	**1.63**	**1.31**	**1.66**	**1.66**	**2.01**	**1.39**
P	n/a	**0.0039**	0.1251	0.1251	**0.0516**	**0.0951**	**0.0485**	**0.0485**	**0.022**	**0.0823**
U	n/a	**756.5**	667.5	667.5	**598.5**	**908.5**	**834.5**	**950.5**	**992**	**1086.5**
Med	63	**63**	56	56	**51**	**55**	**52**	**65**	**56**	**52**
Both-ST										

Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.03	0.67	0.62
P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.1515	0.2514	0.2676
U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	544.5	457.5	666.5
Med	n/a	n/a	n/a	n/a	n/a	n/a	49.5	52	50	50
Unpaired										
Z	-0.09	**1.62**	1.17	**1.86**	0.89	**1.42**	**1.43**	0.9	**1.82**	**2.03**
P	-0.4641	**0.0526**	0.121	**0.0314**	0.1867	**0.0778**	**0.0764**	0.1841	**0.0344**	**0.0212**
U	738.5	**714.5**	1056.5	**798.5**	695	**635**	**1091.5**	1020.5	**1374.5**	**1521**
Med	45	**53**	50	**53.5**	47.5	**52.5**	**51**	49.5	**52**	**45**
Source			**Target**			**Both-ST**		**Unpaired**		
2004	50	**Spearman**	**2004**	63	**Spearman**	**2004**		**2004**	45	**Spearman**
2005	55	10 year	**2005**	63	**10 year**	**2005**		**2005**	53	10 year
2006	49	r = 0.1281	**2006**	56	**r = -0.3643**	**2006**		**2006**	50	r = -0.1581
2007	46	t = 0.37	**2007**	56	**t = -1.11**	**2007**		**2007**	53.5	t = -0.45
2008	43		**2008**	51		**2008**		**2008**	**47.5**	
2009	47.5	**5 year**	**2009**	55	5 year	**2009**		**2009**	**52.5**	**5 year**
2010	49	**r = 0.7**	**2010**	52	r = -0.1	**2010**	49.5	**2010**	**51**	**r = -0.7**
2011	52		**2011**	65		**2011**	52	**2011**	**49.5**	
2012	50		**2012**	56		**2012**	50	**2012**	**52**	
2013	51		**2013**	52		**2013**	50	**2013**	**45**	

UAI Country Trend Data

Source	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Z	n/a	0.44	n/a	n/a	n/a	-0.26	0.45	0.49	-0.25	-0.38
P		0.33	n/a	n/a	n/a	-0.3974	0.3264	0.3121	-0.4013	-0.352
U		542.5	n/a	n/a	n/a	474.5	491	547.5	627	559.5
Med	69	68.5	75	76	73	64.5	70	68	65	60
Target										
Z	n/a	0.69	-0.31	n/a	-1.18	-0.64	**-1.57**	0.12	**-1.42**	-0.42
P		0.2451	-3783	n/a	-0.119	-0.2611	**0.0582**	734.5	**-0.0778**	-0.3372
U		433.5	518.5	n/a	342.5	672	**475.5**	0.4522	**579**	844
Med	57.5	58	59	46	46	60	**48.5**	65	**51**	60
Both-ST										
Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.49	-0.55	0.04
P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.3121	-0.2912	0.484
U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	547.5	325.9	604.5
Med	n/a	n/a	n/a	n/a	n/a	n/a	64.5	68	59.5	64
Unpaired										
Z	**1.89**	0.55	0.09	**1.61**	**1.54**	0.46	0.2743	1.21	1.07	0.94
P	**0.0294**	0.2912	0.4641	**0.0537**	**0.0618**	0.3238	0.6	0.1131	0.1423	0.1736
U	**977.5**	606	912	**772**	**764**	544.5	980	1061.5	1261.5	1349.5
Med	**82**	75	70	**76**	**78**	69	69	70	72.5	70
Source			**Target**			**Both-ST**		**Unpaired**		

2004	69	**Spearman**	**2004**	57.5	**Spearman**	**2004**		**2004**	82	**Spearman**
2005	68.5	**10 year**	**2005**	58	10 year	**2005**		**2005**	75	**10 year**
2006	75	**r = -0.6**	**2006**	59	r = 0.2683	**2006**		**2006**	70	**r = -0.5416**
2007	76	**t = -2.12**	**2007**	46	t = 0.79	**2007**		**2007**	76	**t = -1.82**
2008	73		**2008**	46		**2008**		**2008**	78	
2009	64.5	**5 year**	**2009**	60	5 year	**2009**		**2009**	69	**5 year**
2010	70	**r = -0.4**	**2010**	48.5	r = 0.1	**2010**	64.5	**2010**	69	**r = 0.8**
2011	68		**2011**	65		**2011**	68	**2011**	70	
2012	65		**2012**	51		**2012**	59.5	**2012**	72.5	
2013	60		**2013**	60		**2013**	64	**2013**	70	

LvS Country Trend Data

Source	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Z	n/a	1.01	n/a	n/a	n/a	0.37	-0.45	-1	-0.16	-0.73
P	n/a	0.1562	n/a	n/a	n/a	0.3557	-0.3264	-0.1587	-0.4364	-0.2337
U	n/a	502.5	n/a	n/a	n/a	450.5	343	338	489.5	438
Med	44	53	44	31	43	49.5	47	30	44.5	38.5
Target										
Z	n/a	0.18	-0.44	n/a	**-1.37**	0.06	-0.31	**-1.4**	-0.69	**-1.43**
P	n/a	0.4286	-0.33	n/a	**-0.053**	0.4761	-0.3783	**-0.0808**	-2451	**-0.0764**
U	n/a	435.5	423.5	n/a	**272**	594.5	475.5	**486**	520	**593**
Med	60	39.5	44	44	**27**	42.5	41	**30**	35	**33**
Both-ST										

Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-1	0.08	-0.77
P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-0.1587	0.4681	-0.2207
U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	338	330	434
Med	n/a	n/a	n/a	n/a	n/a	n/a	47	30	44	38.5
Unpaired										
Z	-0.49	0.53	0.04	-0.08	-0.29	-0.27	-0.6	-0.58	-0.11	**0.19**
P	-0.3121	0.2981	0.0484	-0.4681	-0.3859	-0.3936	-0.2743	-0.281	-0.4562	**0.4247**
U	539	464	761.5	496	436.5	397.5	647.5	649.5	909	**940.5**
Med	38	46.5	42.5	40	44	40	44	44	45.5	**44**
Source			**Target**			**Both-ST**		**Unpaired**		
2004	44	**Spearman**	**2004**	60	**Spearman**	**2004**		**2004**	38	**Spearman**
2005	53	10 year	**2005**	39.5	**10 year**	**2005**		**2005**	46.5	**10 year**
2006	44	r = -0.2614	**2006**	44	**r = -0.6322**	**2006**		**2006**	42.5	**r = 0.3952**
2007	31	t = -0.77	**2007**	44	**t = -2.31**	**2007**		**2007**	40	**t = 1.22**
2008	43		**2008**	27		**2008**		**2008**	44	
2009	49.5	**5 year**	**2009**	42.5	**5 year**	**2009**		**2009**	40	**5 year**
2010	47	**r = -0.7**	**2010**	41	**r = -0.7**	**2010**	47	**2010**	44	**r = 0.7**
2011	30		**2011**	30		**2011**	30	**2011**	44	
2012	44.5		**2012**	35		**2012**	44	**2012**	45.5	
2013	38.5		**2013**	33		**2013**	38.5	**2013**	44	

IVR Country Trend Data

Source	2005	2006	2007	2008	2009	2010	2011	2012	2013
Z	-0.69	n/a	n/a	n/a	**-1.78**	**-1.57**	**-1.89**	**-1.31**	**-1.43**
P	-0.2451	n/a	n/a	n/a	**-0.0375**	**-0.0582**	**0.0588**	**-0.0951**	**-0.0764**
U	341.5	n/a	n/a	n/a	**257.5**	**241**	**218**	**328**	**318**
Med	40	49	59	44.5	**32**	**38**	**37**	**40**	**40**
Target									
Z	0.06	0	n/a	0.1	-0.71	-0.39	**-1.52**	-0.4	0.6
P	0.4761	0.5	n/a	0.4602	-0.2389	-0.3483	**0.0643**	-0.3446	0.2743
U	400.5	434	n/a	363	450	364.5	**377.5**	477	608.5
Med	54.5	49	59	52	52	40	**40**	49	43
Both-ST									
Z									
P	n/a	n/a	n/a	n/a	n/a	n/a	**-1.89**	-1.21	**-2.22**
U	n/a	n/a	n/a	n/a	n/a	n/a	**0.0588**	0.1131	**-0.0132**
Med	n/a	n/a	n/a	n/a	n/a	n/a	**218**	199.5	**254**
	n/a	n/a	n/a	n/a	n/a	33	**37**	40	**26**
Unpaired									
Z									
P	z= -0.43	-0.65	0.28	**-1.34**	-1.03	**-2.41**	**-2.86**	**-2.24**	**-2.18**
U	p= -0.3336	-0.2578	0.3897	**0.0901**	-0.1515	**0.0008**	**0.0021**	**0.0125**	**0.0146**
Med	u= 361.5	640	498	**325.5**	315	**389.5**	**344**	**564.5**	**604**
	med 40	42	47.5	**40**	39	**30**	**27**	**30**	**32**

Source		Target			Both-ST		Unpaired		
2004	**Spearman**	**2004**	49	**Spearman**	**2004**		**2004**	45	**Spearman**
2005	**10 year**	**2005**	54.5	**10 year**	**2005**		**2005**	40	**10 year**
2006	**r = -0.5601**	**2006**	49	**r = -0.5495**	**2006**		**2006**	42	**r = -0.8049**
2007	**t = -1.91**	**2007**	59	**t = -1.86**	**2007**		**2007**	47.5	**t = -3.84**
2008		**2008**	52		**2008**		**2008**	40	
2009	**5 year**	**2009**	52	5 year	**2009**		**2009**	39	**5 year**
2010	**r = 0.8721**	**2010**	40	r = -0.2	**2010**	33	**2010**	30	**r = -0.2**
2011		**2011**	40		**2011**	37	**2011**	27	
2012		**2012**	49		**2012**	49	**2012**	30	
2013		**2013**	43		**2013**	26	**2013**	32	

Appendix D: Kinetic Post-Filtered Data

This appendix includes the data from the ICEWS data about kinetic events after all filters had been applied, organized by target actor countries.

Results that are statistically insignificant are written in black. Findings with a strong statistical significance are written in red. Finally, findings with a moderate statistical significance are written in blue.

Country	PDI	IVC	M/F	UAI	LvS	IVR	Days	Average
Albania	90	20	80	70	61	15	29	29
Bangladesh	80	20	55	60	47	20	17.75	9.88
Bangladesh	80	20	55	60	47	20	2	
Brazil	69	38	49	76	44	59	11	
Brazil	69	38	49	76	44	59	21.6	
Brazil	69	38	49	76	44	59	20	13.18
Brazil	69	38	49	76	44	59	6	
Brazil	69	38	49	76	44	59	9.5	
Brazil	69	38	49	76	44	59	11	
Chile	63	23	28	86	31	68	17	17
China	80	20	66	30	87	24	11.66	12.33
China	80	20	66	30	87	24	13	
Egypt	70	25	45	80	7	4	6.5	6.5
Greece	60	35	57	100	45	50	18	18
India	77	48	56	40	51	26	2.8	7.07
India	77	48	56	40	51	26	10.8	
India	77	48	56	40	51	26	9	
India	77	48	56	40	51	26	7.92	

Country	PDI	IVC	M/F	UAI	LvS	IVR	Days	Average
India	77	48	56	40	51	26	4.86	
Indonesia	78	14	46	48	62	38	10	9.25
Indonesia	78	14	46	48	62	38	5	
Indonesia	78	14	46	48	62	38	8	
Indonesia	78	14	46	48	62	38	4	
Indonesia	78	14	46	48	62	38	8.75	
Indonesia	78	14	46	48	62	38	13	
Indonesia	78	14	46	48	62	38	16	
Iran	58	41	43	59	14	40	13	13.70
Iran	58	41	43	59	14	40	15.5	
Iran	58	41	43	59	14	40	18	
Iran	58	41	43	59	14	40	16.8	
Iran	58	41	43	59	14	40	9.5	
Iran	58	41	43	59	14	40	11.33	
Iran	58	41	43	59	14	40	21.5	
Iran	58	41	43	59	14	40	4	
Iraq	95	30	70	85	25	17	5.57	5.57
Italy	50	76	70	75	61	30	5	5
Malaysia	100	26	50	36	41	57	6	6
Mexico	81	30	69	82	24	97	14.75	11.63
Mexico	81	30	69	82	24	97	8.5	
Pakistan	55	14	50	70	50	0	1	9.98
Pakistan	55	14	50	70	50	0	15	
Pakistan	55	14	50	70	50	0	9.2	
Pakistan	55	14	50	70	50	0	14.8	

Country	PDI	IVC	M/F	UAI	LvS	IVR	Days	Average
Pakistan	55	14	50	70	50	0	14.66	
Pakistan	55	14	50	70	50	0	5.2	
Saudi Arabia	95	25	60	80	36	52	16	22.5
Saudi Arabia	95	25	60	80	36	52	29	
Syria	80	35	52	60	30	Null	14.5	12.17
Syria	80	35	52	60	30	Null	10	
Syria	80	35	52	60	30	Null	12	
Taiwan	58	17	45	69	93	49	15	13.5
Taiwan	58	17	45	69	93	49	12	
Turkey	66	37	45	85	49	49	10.33	10.64
Turkey	66	37	45	85	49	49	18	
Turkey	66	37	45	85	49	49	4	
Turkey	66	37	45	85	49	49	11.5	
Turkey	66	37	45	85	49	49	17	
Turkey	66	37	45	85	49	49	3	

Multi-year

Country	PDI	IVC	M/F	UAI	LvS	IVR	Days	Average
Albania	90	20	80	70	61	15	29	29
Bangladesh	80	20	55	60	47	20	17.75	9.875
Brazil	69	38	49	76	44	59	20	13.18
Chile	63	23	28	86	31	68	17	17
China	80	20	66	30	87	24	11.67	12.33
Egypt	70	25	45	80	7	4	6.5	6.5

Country	PDI	IVC	M/F	UAI	LvS	IVR	Days	Average
Greece	60	35	57	100	45	50	18	18
India	77	48	56	40	51	26	2.8	7.07
Indonesia	78	14	46	48	62	38	10	9.25
Iran	58	41	43	59	14	40	13	13.47
Iraq	95	30	70	85	25	17	5.57	5.57
Italy	50	76	70	75	61	30	5	5
Malaysia	100	26	50	36	41	57	6	6
Mexico	81	30	69	82	24	97	14.75	11.625
Pakistan	55	14	50	70	50	0	1	9.97
Saudi Arabia	95	25	60	80	36	52	26	22.5
Syria	80	35	52	60	30	Null	14.5	12.16
Taiwan	58	17	45	69	93	49	15	13.5
Turkey	66	37	45	85	49	49	10.33	10.64
15	29							
20	9.87							
59	13.18							
68	17							
24	12.33							
4	6.5							
50	18							
26	7.07							
38	9.25							
40	13.47							
17	5.56							

Country	PDI	IVC	M/F	UAI	LvS	IVR	Days	Average
30	5							
57	6							
97	14.75							
0	9.9							
52	22.5							
49	13.5							
49	10.6							
	r = 0.0062	r = -0.1866	r = 0.0147	r = 0.2978	r = 0.1404	r = 0.3970		
Bangladesh	80	20	55	60	47	20	9.87	
Brazil	69	38	49	76	44	59	13.18	
China	80	20	66	30	87	24	11.66	
India	77	48	56	40	51	26	7.07	
Indonesia	78	14	46	48	62	38	9.25	
Iran	58	41	43	59	14	40	13.47	
Mexico	81	30	69	82	24	97	14.75	
Pakistan	55	14	50	70	50	0	9.9	
Saudi Arabia	95	25	60	80	36	52	22.5	
Syria	80	35	52	60	30	Null	12.16	
Taiwan	58	17	45	69	93	49	13.5	
Turkey	66	37	45	85	49	49	10.6	
	r = 0.2363	r = -0.0095	r = 0.0805	**r = 0.5113**	**r = -0.4680**	**r = 0.7107**		

Appendix E: Cyber and Kinetic Time-Interval Data

This appendix provides the data that was used to measure time intervals between cyber and kinetic events. The time interval was based on the nearest cyber and kinetic dates. This was chosen due to the uncertainty in pairing the events. The maximum interval between events was set to 30 days. This value, while not perfect, was chosen as a baseline; in reality most events occurred within 14 days. Tests were performed across all six dimensions for 10-year and five-year values in order to test H_4 and H_5. The hypothesis test set the cultural dimension as the independent variable and the time interval as the dependent variable.

The kinetic event dates were aligned against the cyber event dates. Cyber and kinetic pairs were evaluated by country pairs for each year. A total of 1,270 events were examined and 186 pairs, or 372 entries, were matched. When multiple events between pairs occurred in a year, those events were averaged.

Cyber and Kinetic Pairings (2004)

Source	**Target**	**Date**					
France	China kinetic	1/26/2004,	x	x	X		
	Cyber	X	8/29/04	9/22/04	09/25/2004,		
Taiwan	China kinetic	3/10/04	x	**10/13/04**	11/27/04	12/27/04	**(12 days)**
	Cyber	X	08/29,	**10/1,**	X	x	
United States	China	0/5/04	x				
	cyber	X	07/03,				
Iraq	Poland (kin.)	**5/4/04**	x				
	cyber	**04/20,**	11/29,	**14 days**			
		kinetic	cyber				
China	Taiwan	1/16/04	x				

Source	Target	Date					
		1/28/04	x				
		3/25/04	x				
		4/1/04	x				
		4/15/04	x				
		5/5/04	x				
		5/12/04	x				
		5/25/04	x				
		08/09,	x				
		08/15,	x				
		09/15,	**08/31,**	**15**			
		10/13,	**09/30,**	**13**			
		11/12,	X				
		11/27,	**11/20,**	**7**			
Iraq	Turkey (kin.)	9/29/04	**11/14/04**				
	Cyber	04/20,	**11/29/15**	**15 days**			
Malaysia	United Kingdom (kinetic)	5/3/04	X				
	Cyber	x	2/6/15				
Iraq	United States	Cyber	Kinetic				
		X	02/8/04				
		X	04-07 04/09				
		X	04/12/04				
		X	04/16/04				

Source	Target	Date					
		X	04/22-04/23				
		04/26,	**04/25,**		**1**		**1**
		X	05/01, 05/03-05/04				
		05/11	X				
		05/16-05/17	X				
		05/19-05/21,	X				
		05/24	X				
		06/04/04	X				
		6/7/04	**06/10,**				**3**
		8/5/04	**08/04,**		**1**		**1**
		11/28/04	**11/29,**				**1**
		12/2/04	X				
		12/13/04	**12/16,**		**3**		**3**
		12/19/04	**12/16,**				**3**
		12/21/04	**12/23,**		**2**		**2**
Brazil	United States	**11/5/04**		**11/5/04**			**11**
	cyber	**10/25/04,**		**10/25/04,**	**11 days**		
	01/23,01/26	05/01,08/12,	08/30, 12/22/,	03/06, 05/2	10/24, 11/29,	07/21,	08/11 , 09/06

Cyber and Kinetic Pairings (2005)

Source	**Target**	**Date**						
Greece	Albania	Kinetic	X	11/1 - 11/3				nothing
		Cyber	04/04,	X				
Mexico	Argentina	Kinetic	01/06,	**04/19,**	**11/4/05**			**9.5**
		Cyber	x	**04/15,**	**11/19,**			
				4 days	**15 days**	k-c		
			08/11, 09/23, 10/11 12/20,					
Brazil	Argentina	Kinetic	5/10/05					nothing
		Cyber	06/13,					
			33 days	09/22, 01/17, 01/29, 02/20, 06/14, 02/16,				
Mexico	Brazil	Kinetic	**05/10/05**	x	x			
		Cyber	**04/15,**	06/16,	09/23,			
			25 days					**25**
Brazil	China	Kinetic	**10/3/05**					
		Cyber	**10/12,**					
			9 days					**9**
Indonesia	China	kinetic	5/9/05	x				
		cyber	X	12/08,				
Taiwan	China	1/1/05	X					

Source	Target	Date						
Taiwan	China	2/20/05	X					
Taiwan	China	3/14/05	X					
Taiwan	China	3/20/05	X					
Taiwan	China	3/24/05	X					
Taiwan	China	4/1/05	X					
Taiwan	China	4/4/05	X					
Taiwan	China	**4/8/05**	**04/23,**	**15 days**				
Taiwan	China	**5/9/05**	**04/23,**	16	same cyber event count nearest pair			
Taiwan	China	5/13/05	X					
Taiwan	China	5/27/05	X					
Taiwan	China	7/7/05	X					
Taiwan	China	7/14/05	X					
Taiwan	China	8/16/05	X					
Taiwan	China	10/4/05	X					
Taiwan	China	10/18/05	X					
Taiwan	China	11/12/05	X					
Taiwan	China	11/15/05	X					
Taiwan	China	12/24/05	X					
Indonesia	Malaysia		1/25/05	**03/08,**	**04/25,**			
				03/10,	**04/07,**			
				2	**18**			
China	Philippines	kinetic	05/5/05	x	x			

Source	**Target**	**Date**						
		cyber	X	10/29,	11/10,			
Germany	Poland	kinetic	04/16/05	x				
		cyber	X	07/22,				
Albania	Saudi Arabia	kinetic	**05/25,**	6/9/05				
		cyber	**04/26,**	x				
			29 days					
Iran	United Kingdom		X	02/11/05	x	05/25,		
			01/07, 01/09	X	04/09,	x		
Indonesia	United States	kinetic	01/15-01/16	05/27,	x	09/24,		
		cyber	X	X	08/08,	x		
Brazil	United States	kinetic	**03/23/05**	**10/27,**	**11/05,**			
		cyber	**02/24,**	**09/27,**	**11/14,**			
			27	**30**	**9**			
China	United States	kinetic	05/10,	05/24,	x	12/22,		
		cyber	X	X	11/10,	x		

Source	Target	Date						
Iran	United States	kinetic	05/24,	06/19,	07/03,	07/06,	11/30,	**12/1 - 12/2,**
		cyber	04/23,	x	x	x	x	**12/28,**
			31 days					**26 days**
Mexico	United States	kinetic	02/01,	03/18,	04/07,	**06/01-06/02,**		
		cyber	X	x	x	**06/16,**		
						14 days		
Morocco	United States	Kinetic	X	8/17/05				
		Cyber	06/13,	X				

Cyber and Kinetic Pairings (2006)

Source	Target	Date			
Mexico	Argentina	Kinetic	02/03,	**04/10,**	
		Cyber	x	**04/08,**	
				2 days	
Indonesia	Australia	Kinetic	**3/27/06**	4/18/06	6/5/06
	Australia	Cyber	**04/01/,**	X	X
			5 days		
Mexico	Brazil	Kinetic	**3/28/06**	7/20/06	8/15/06 x
		Cyber	**04/12,**	X	X 02/19
			15 days		

Source	Target	Date			
Iran	India	Kinetic	9/20/06	11/17/06	X
		Cyber	X	X	03/18,
Brazil	Iran	Kinetic	4/19/06		
		Cyber	03/05,		
			45 days		
United States	Philippines	Kinetic	01/24,	01/28,	07/13**,** 07/15
		Cyber	X	X	06/03, x
					40
Iran	Russian Federation	Kinetic	03/10,	X	11/08,
		Cyber	X	6/13/06	X
Iran	Turkey	Kinetic	X	X	**8/1,**
		Cyber	04/20,	07/09,	**07/25,**
					7 days
		Kinetic	Cyber		
Iran	United Kingdom	**2/8/06**	**01/17,**	**22 days**	
		02/14,	X		
		02/18,	X		
		X	05/13,		
		X	08/04,		

Source	Target	Date			
Brazil	United States	Kinetic	10/14/06	X	
		Cyber	11/22,		
			39 days		
		Kinetic	Cyber		
Italy	United States	3/6/06	X		
		3/13/06	X		
		3/23/06	**03/28,**	**5 days**	
		4/25/06	X		
		7/22/06	X		
		11/21/06	X		
Indonesia	United States	Kinetic	Cyber		
		3/15/06	X		
		2/19/2006 - 02/20/2006 x			
		11/14/2006 - 11/20/2006	X		
		X	06/06- 06/07,		
		X	06/26,		
Turkey	United States	Kinetic	3/24/06	X	
		Cyber	X	07/18, 07/21, 07/24- 07/25, 07/29, 08/02, 11/15, 11/23, 12/11, 12/14,	
		Kinetic	Cyber		
Iran	United States	1/16/06	X		

Source	Target	Date			
		1/20/06	X		
		5/3/06	**04/30,**	**3 days**	
		8/10/2006 -08/11/2006	**07/22,**	**18 days**	
		8/30/06	X		
		09/05/06-09/06/07	X		
		11/28/2006 - 11/30/2006	X		
		12/30/06	X		
		X	06/04,		
Iran	Pakistan	Kinetic	08/29, 08/31	X	
		Cyber	X	12/31,	

Cyber and Kinetic Pairings (2007)

Source	**Target**	**Date**						
Chile	Argentina	kinetic	**3/9/07**					**17 days**
		cyber	**2/20/15**					
			17 days					
Turkey	Brazil	kinetic	**2/16/07**	X				
		cyber	**1/28/15**	07/28, 01/11, 05/03, 10/08, 11/22, 10/30, 07/20, 08/19,				**19 days**
			19 days					
Mexico	Brazil	kinetic	X	5/19/07	05/22,			Nothing
		cyber	3/8/15	X	X			
Indonesia	China	kinetic	6/8/07	X				Nothing
		cyber	X	11/04,				
Mexico	China	kinetic	8/20/07	X				Nothing
		cyber	X	04/12, 04/18-04/19, 03/11- 03/12, 03/15,				
Indonesia	Malaysia	kinetic	**8/29/07**	X				**8 days**
		cyber	**8/21/15**	07/18,				
			8 days					
United States	Turkey	kinetic	X	10/21/07				Nothing
		cyber	01/08,	X				

Source	**Target**	**Date**						
Turkey	United Kingdom	kinetic	X	X	**11/24/07**			**10 days**
		cyber	01/03, 01/11, 01/25, 07/12, 07/29,		**11/14,**			
					10 days			
Iran	United States		Kinetic	Cyber				
			01/11/2007	**01/16/2007**	**5 days**			
			X	01/24				
			X	02/16				
			03/29-03/30/2007	**03/03/2007**	**26**			
			04/18/2007	X				
			05/04-05/05/2007	X				
			5/7/07	X				
			5/10/07	X				
			5/12- 05/13/07	X				
			5/15/07	X				
			5/19/07	X				
			5/23/07	X				
			5/25/2007 - 05/28/2007	X				
			5/31/07	X				
			8/20/07	X				
			9/23/07	X				
			10/2/07	X				
			10/7/07	X				
			10/31/07	X				

Source	Target	Date						
			11/9/07	X				
			11/13/07	X				
			11/16/2007	X				
Turkey	United States	kinetic	**11/3/07**	12/18/07	X			
		cyber	**11/01,**	x	04/13, 04/21, 01/14, 01/26, 03/01, 10/09			
			2 days					
Brazil	United States	kinetic	**3/8/2007 - 03/09/2007**	**04/18,**	06/04 - 06/05,	x		**15 days**
		cyber	**03/28,**	**04/28,**	X	01/03/05/04,	See CD	
			20	**10**				
Brazil	United Kingdom	kinetic	**11/02,**	X				**25 days**
		cyber	**11/27,**	01/03, 04/28, 05/04, 07/21, 01/28, 03/28, 07/14, 07/22,				
			25 days	k-c				

Cyber and Kinetic Pairings (2008)

Source	Target	Date					
Brazil	Argentina	kinetic	1/1/08	X			
		cyber	X	03/12, 10/03, 07/26, 08/14, 09/24,			
Iran	Egypt	kinetic	4/14/08	12/31/08	X		
		cyber	X	X	07/13, 07/15, 09/24		
			kinetic	cyber			
Pakistan	India		1/27/08	X			
			2/13/08	X			
			7/7 -8	X			
			7/26/08	X			
			7/28/2008-08/03/2008	X			
			8/16/08	X			
			8/19/08	X			
			8/25/08	X			
			8/27/08	X			
			9/28/08	X			
			10/4/08	X			
			12/15/2008 - 12/16/2008	**12/14,**			
			12/19/08	**12/18, X**			
Iran	Jordan	kinetic	11/17/08	X			
		cyber	X	04/18, 05/30			

Source	**Target**	**Date**					
Turkey	Malaysia	kinetic	7/2/08	X			
		cyber	X	08/13, 09/08- 09/09, 09/12, 10/27, 12/03, 12/09			
Iran	**Philippines**	kinetic	**6/2/2008 - 06/03/2008**		X		
		cyber	**6/20/15**	04/16, 04/27, 08/13,			
			18 days				
					S		
Turkey	Saudi Arabia	kinetic	11/26/2008 -11/27/2008,	X			
		cyber	X	04/16- 04/17, 06/10, 01/30, 02/10, 02/14,			
Iran	United Kingdom	kinetic	12/31/08	X			
		cyber	X	07/22,			
			Kinetic	cyber			
Iran	United States		1/8/08	X			
			1/13/08	X			
			1/23/08	X			
			3/4/08	X			
			3/9/08	X			
			5/2/08	X			
			9/5/08	X			
			9/23/08	X			
			10/2/08	X			
			10/3/08	X			
			10/12/08	X			

Source	Target	Date					
			10/29/08	X			
			11/3/08	X			
			11/6/08	X			
			11/8/2008 -11/11/2008	X			
			11/30/08	X			
			12/24/08	X			
Turkey	United States	kinetic	**3/8/08**	X			
		cyber	**03/26,**	04/26, 08/20, 02/10, 02/13, 04/28, 08/24,			
			18 days				
Brazil	United States	kinetic	4/10/08	**10/27/08**	11/4/08	x	
		cyber	X	**10/21/08**	X	01/18, 10/21, 06/02,	
				6 days			

Cyber and Kinetic Pairings (2009)

Source	Target	Kinetic	Cyber			
Iran	Argentina	9/29/09	04/05,			
India	Australia	5/31/09	x			
		9/21/09	x			
		X	12/30,			
India	**Bangladesh**	3/16/09	x			
		3/22/09	x			
		4/25/09	x			
		4/27/2009 - 4/28/09	x			
		6/13/09	x			
		7/17/09	x			
		X	09/12,			
		8/1/09	x			
		12/11/09	**12/17,**	**6 days**		
Iran	**Brazil**	9/24/09	x			
		11/21/09	**12/18,**	**27 days**		
Turkey	**China**	**7/7/09**	**07/09,**	**2 days**	06/24,	
					X	
Netherlands	China	7/6/09	x			
		7/9- 07/10	x			
		X	12/24,			

Source	Target	Kinetic	Cyber			
Iran	Egypt	1/1/09	x			
		1/11/09	x			
		1/12/09	x			
		X	04/02 - 04/03,			
		X	04/17,			
		X	04/21,			
		X	08/22,			
		12/21/09	x			
Pakistan	India	3/21/09	x			
		3/27/09	**04/02,**	**6**		
		6/29/09	x			
		7/5/09	x			
		8/5/09	x			
		8/31/09	x			
		09/01- 09/02,	x			
		X	11/07, 11/15,			
		9/22/09	x			
		10/2/09	x			
		12/6/09	**11/12,**	**24**		
		12/19/09	x			
		X	04/09, 04/16, 05/05,			
Indonesia	**Malaysia**	**9/2/09**	**09/06,**	**4 days**		

Source	Target	Kinetic	Cyber			
		10/20-10/21,	x			
		X	05/17, 06/20, 09/06, 09/12, 11/21, 09/14,			
Turkey	Nepal	4/17/09	11/01,			
		X	x			
Iran	Pakistan	1/1/09	05/14,			
		10/21/09				
India	Pakistan	1/27/09	x			
		3/15/09	X			
		3/17/09	X			
		4/24/09	X			
		5/30/09	X			
		6/1/09	X			
		6/3/09	X			
		7/5/09	x			
		9/19/09	**09/18,**	1	c-k	
		9/22/09	**09/21,**	1	c-k	
		10/9/09	**10/10,**	1	c-k	
		10/14/09				
		11/15-11/17				
		11/20/09	**11/25,**	**5**	k-c	
		12/25/09	x			

Source	Target	Kinetic	Cyber			
Turkey	Russian Federation	**12/20/09**	**12/26,**	**6 days**		
Iran	Saudi Arabia	10/20/09	x			
		11/2/09	x			
		X	07/01, 12/16,			
Iran	**United Kingdom**	**6/20/09**	**05/28,**	**23**		
		6/23/09	x			
		6/28- 06/29,	x			
		7/1/09	x			
		12/2/09	**12/12,**	**10**		
Brazil	United States	**4/20/09**	**04/12,**	**8 days**		
		3/17/09	x			
		1/15/09	x			
		1/20/09	**02/01,**	**12 days**		
		8/29/09	x			
		9/17/09	**09/19,**	**2 days**		
		11/5/09	**10/19,**	**16 days**		
		X	07/07,			
Iran	**United States**	**1/15/09**	**01/14,**	1 day	c-k	
		01/21 - 01/24,	x			
		1/26/09	x			
		1/28 - 01/31,	x			

Source	Target	Kinetic	Cyber			
		2/2 - 02/04	x			
		2/7/09	x			
		2/10/09	x			
		2/12/09	x			
		04/16 - 04/17,	x			
		4/21/09	x			
		5/6/09	x			
		5/11/09	x			
		3/26/09	x			
		3/28/09	x			
		4/9/09	x			
		5/25/09	**05/19,**	**6 days**	c-k	
		8/15/09	**08/10,**	**5**		
		9/14/09	x			
		12/29/09	x			
		9/23/09	x			
		9/25/09	x			
		10/28/09	x			
		11/4/09	**11/22,**	**18 days**	k-c	
		X	07/23,			
Iraq	United States	1/20/09	x			
		2/23/09	x			
		02/24 - 02/27,	x			
		05/02 - 05/03,	x			

Source	**Target**	**Kinetic**	**Cyber**			
		5/5/09	x			
		5/12/09	x			
		05/16 - 05/17	x			
		4/13/09	x			
		5/31/09	x			
		6/8/09	x			
		6/29/09	x			
		7/3/09	x			
		7/5/09	x			
		07/26 - 07/27	x			
		X	11/02,			
Egypt	United States	5/20/09	x			
		5/27/09	x			
		8/4/09	X			
		8/6/09	X			
		11/26/09	10/25,	31		
		11/27/09	X			
China	**India**	**9/23/, 09/24,**		02/01- 02/02,		
		09/06,				
		13 days				
Turkey	United States	2/26/09	x	nothing		

Cyber and Kinetic Pairings (2010)

Source	**Target**	**Date**				
Argentina	Brazil	Kinetic	6/18/10	08/07,		
		cyber	02/16, x	X		
Turkey	**China**	kinetic	**10/9/10**			
		cyber	**09/30**			
			10 days			
			Kinetic	Cyber		
Pakistan	**India**		**1/19/10**	**01/02,**	**17**	c-k
			3/4/10	**03/08,**	**4**	k-c
			5/1/10	**04/23,**	**8**	c-k
			5/19/10	**X**		
			5/23/10	**X**		
			6/20/10	**X**		
			6/22/10	**X**		
			7/7/2010-7/8/10	**X**		
			7/17/10	**X**		
			8/4/10	**07/29,**	**6**	c-k
			8/22/10	**X**		
			10/25/10	**10/14,**	**11**	c-k
			X	01/02, 04/14, 09/28, 12/10,		
Brazil	Iran	kinetic	3/3/10	05/10,	05/15,	x

Source	**Target**	**Date**				
		cyber	X	X	x	06/25,
Iran	Iraq	kinetic	4/10/2010-4/11/10	5/13/2010 -5/14/10	7/17/10	x
		cyber	X	X	x	11/06 - 11/07
			Kinetic	cyber		
Turkey	Israel		1/18/10	02/26,	39 days	
			5/31/10	x		
			6/2/10	x		
			8/3/10	x		
			12/7/10	x		
			12/10/10	x		
Bangladesh	Malaysia	kinetic	2/24/10	x		
		cyber	X	04/08,		
Egypt	Malaysia	kinetic	2/26/10	x	06/23,	
		cyber	X	05/15,	x	
Indonesia	**Malaysia**	kinetic	Cyber			
		3/3/10	**02/19,**	**12 days**		
		4/12/10	**04/27,**	**15 days**		

Source	Target	Date				
		8/27/10	**08/31, 08/23,**	4	c-k	
		10/15/10	**10/09,**	4		
		x	05/12, 08/31, 08/01, 08/22, 09/21, ,			
		x	10/03, 10/08, 10/25, 12/28, 05/11			
India	Nepal	kinetic	12/3/10	x	x	
		cyber	X	01/14,	02/20,	
			Kinetic			
India	**Pakistan**		1/19/2010 - 1/20/10	x		
			1/23/10	x		
			1/26/2010 - 1/28/10	**02/22,**	**26 days**	k-c
			3/23/2010 - 3/24/10	**03/23,**	**1 day**	k-c
			4/6/10	x		
			4/10/10	x		
			5/1/10	**04/25,**	**6 days**	c-k
			05/04-05/05	**x**		
			5/8/10	**x**		
			5/23/10	**x**		
			5/25/10	**x**		
			7/8/10	**x**		
			7/14/10	**x**		
			7/23/10	**x**		
			8/2/10	**07/29,**	**4 days**	c-k
			8/31/10	**08/13,**	**19 days**	c-k

Source	**Target**	**Date**				
			9/2- 09/03/10	**x**		
			10/3/10	**x**		
			10/30/10	**x**		
			11/5/10	**x**		
			11/20/10	**11/29,**	**9 days**	k-c
			12/11/10	**x**		
			12/21/10	**x**		
			12/27/10	**x**		
Iran	Pakistan	kinetic	cyber			
		1/14/10	x			
		7/19/10	x			
		12/20/10	x			
		x	10/28, 02/17, 09/11,			
Turkey	Syria	kinetic	7/29/2010 -7/30/10	x		
		cyber	x	02/27,		
			kinetic	cyber		
Iran	**United Kingdom**		2/11/10	x		
			2/16/10	x		
			8/16/10	**08/29,**	**13 days**	k-c
			11/4/10	x		
			11/6/10	x		

Source	**Target**	**Date**				
			12/12/2010 - 12/13/10	x		
			12/17/10	x		
Brazil	United States	kinetic	3/9/10			
		cyber	4/9/15	31 days		
Egypt	United States	kinetic	2/15/10	x		
		cyber	x	4/22,		
Iran	**United States**	kinetic	1/13/10	x		
		cyber	2/28/10	x		
			4/17/10	**04/23,**	**6 days**	
			6/8/10	x		
			7/6/10	x		
			8/2/10	x		
			8/29/10	x		
			8/31/10	x		
			9/13/10	x		
			9/19/10	x		
			10/29/10	x		
			11/5/2010 -11/6/10	x		
			12/3/10	X		
Turkey	**United States**	kinetic	**3/8/10**			
		cyber	**02/23,**	13 days	c-k	

Cyber and Kinetic Pairings (2011)

Source	Target	Date					
India	**Bangladesh**		1/10/11	x			
			1/22/11	x			
			2/1/11	**02/21,**	**20 days**		
			4/25/11	x			
			5/1/11	x			
			8/11/11	x			
			8/24/11	x			
			9/11/11	x			
			12/18/11	x			
Iran	**Egypt**	kinetic	**2/13/11**	**2/15/11**	x		
		cyber	**02/14,**	**02/14,**	04/03,		
Bangladesh	India	kinetic	X	4/17/11	7/13/11	8/10/11	
		cyber	01/02,	x	x	x	
Iran	**India**	kinetic	**8/1/11**	12/26,	x		
		cyber	**8/25/15**	x	09/29, 02/25, 02/29, 04/16, 09/13,		
			24 days	k-c			
			Kinetic	cyber			
Pakistan	**India**		**1/28/11**	**01/19,**	**8 days**	c-k	
			3/2/11	**03/23,**	**21**	k-c	

Source	**Target**	**Date**					
			5/14/2011- 5/16/11	x			
			7/28/11	**08/15,**	18	k-c	
			10/23/2011-10/24/11	**10/21,**	2	c-k	
			X	09/13, 11/16, 01/19, 03/23, 04/05,			
			X	09/18, 09/15-16, 11/21, 11/29, 12/11, 01/17			
Turkey	Iran	k/c	12/14/11	09/03,			
			X	x			
Turkey	Iraq	k/c	10/16/11	06/25,			
			X	x			
			Kinetic	cyber			
Iran	Israel		1/10 -01/11/11	x			
			9/10/11	x			
			9/13/11	x			
			X	07/06,			
Jordan	Israel	kinetic	4/11/11	x			
		cyber	X	09/17,			
Syria	**Jordan**	kinetic	**3/26/11**	**04/04,**	**9 days**		
		cyber	6/17/11	x			
			11/15/11	x			
			11/23/11	x			

Source	**Target**	**Date**					
Iraq	Libya	kinetic	2/18/11	x			
		cyber	X	08/25,			
			kinetic	cyber			
India	**Pakistan**		**3/26/11**	**03/23,**	**3**	ck	
			4/30/11	x			
			5/3/11	x			
			06/30-7/1/11	**07/02,**	**1**	k-c	
			7/12/11	**07/18,**	**6**	k-c	
			9/1 - 9/2,	**08/16,**	**16**	c-k	
			9/8/11	x			
			9/20/11	**09/24,**	**4**	kc	
			12/13/11	**11/30,**	**13**		
			X	02/22, 11/26, 11/28, 03/02, 01/20,			
Iran	**Philippines**	kinetic	**11/25/11**				
		cyber	**10/30/15**	04/01, 05/30, 08/06, 04/13, 07/06			
			26 days				
			kinetic	cyber			
Iran	**Saudi Arabia**		3/19/11	x			
			4/3/11	**03/31,**	**4**		
			4/6/11	**04/07,**	**1**		
			4/9/2011- 4/13/11	x			

Source	Target	Date					
			4/18/11	x			
			4/20- 04/21,	x			
			10/11/2011 -	x			
			10/17/2011 - 10/20/11	x			
			10/17/11	x			
			10/23/11	x			
			10/25/11	x			
			11/2/2011 - 11/4/11	x			
			11/7/11	x			
			11/18/11	x			
			12/6/11	x			
			12/29/11	x			
Iraq	Saudi Arabia	kinetic	4/23/11	x			
		cyber	X	08/05,			
Libya	Saudi Arabia	kinetic	3/11/11	x			
		cyber	X	01/24, 08/28, 12/17,			
Iran	Syria	kinetic	6/6/2011 - 6/7/11	x			
		cyber	X	10/04, 10/29, 11/04,			
Iraq	Turkey	kinetic	3/30/11	10/16,	x		
		cyber	2/25/15	12/05,	05/14,		

Source	**Target**	**Date**					
Saudi Arabia	**Turkey**	kinetic	11/14/11	x			
		cyber	**12/10,**	**12/26,**			
			1/26,	x			
Syria	**Turkey**	kinetic	6/25/11		**11/23/11**		
		cyber	02/26,		**11/03**		
					20 days		
			kinetic	cyber			
Iran	**United Kingdom**		1/22/11	**x**			
			1/24/11	x			
			8/10/11	x			
			8/13/2011 - 0 8/15/11	x			
			11/9/11	x			
			11/22/11	x			
			11/25/11	**11/25,**	0		
			11/29- 11/30,	x			
			12/1/2011 - 12/4/11	x			
			12/15/11	x			
			12/18/11	x			
			12/22/11	x			
			X	07/03,			
Pakistan	**United Kingdom**	kinetic	6/2/11	10/10/11	**11/2/11**		
		cyber	X	x	**11/27,**		

Source	**Target**	**Date**					
					25 days		
Syria	United Kingdom	kinetic	10/8/11	x			
		cyber	X	02/27,			
			kinetic	cyber			
Iran	**United States**		1/6 - 01/07,	x			
			1/7/11	x			
			1/21/11	x			
			2/3/11	x			
			2/14/11	x			
			2/26/11	x			
			2/28/11	**03/24,**	**25 days**		
			4/21/11	x			
			4/25/11	x			
			4/30/11	x			
			5/9/11	x			
			5/21/2011 - 5/22/11	x			
			5/24/11	x			
			6/9/11	x			
			6/28/11	x			
			9/10/11	**09/19,**	**9 days**		
			10/28/2011 - 10/29/11		1		
			10/31/2011 - 11/1/11	x			
			11/4/11	x			

Source	Target	Date					
			11/6/11	x			
			11/8/2011 - 11/9/11	x			
			12/5/11	x			
			12/10/11	x			
			12/17/2011 - 12/23/11	x			
			12/27/2011 - 12/29/11	x			
Saudi Arabia	United States	kinetic	3/7/11	x			
		cyber	X	12/12,			

Cyber and Kinetic Pairings (2012)

Source	Target	Date					
Brazil	**Argentina**	kinetic	**6/19/12**				
		cyber	**6/8/15**				
Indonesia	Australia		10/11/12	X			
			X	08/24,			
			kinetic	cyber			
India	**Bangladesh**		2/5/12	X			
			2/10/12	**02/11,**	**1**	k-c	
			2/22/12	**02/25,**	**3**	k-c	
			3/18/12	**03/14,**	**4**	c-k	
			4/3/12	X			

Source	Target	Date					
			5/6/12	**05/11,**	**5**	k-c	
			6/13/12	**X**			
			6/16/12	**X**			
			6/19/12	**X**			
			7/2 -07/03,	**X**			
			7/28/12	**08/11,**	**14**	k-c	
			8/29/12	**09/09,**	**12**	k-c	
			9/2/12	**09/09,**	**7**	k-c	
			10/18/2012 - 10/20	**09/30,**	**19**	c-k	
			10/31/12	**10/29,**	**2**	c-k	
			11/19/12	**11/20,**	**1**	k-c	
			12/17/12	**12/09,**	**8**	c-k	
			12/29/2012 -12/30/12	**X**			
Pakistan	Bangladesh		kinetic	**cyber**			
			3/7/12	x			
			X	5/6/,			
			8/12/12	x			
			12/2/12	x			
India	**China**		3/28/12	x			
			3/30/12	x			
			9/4/12	**09/05,**	**1**		
Malaysia	**China**		**11/27/12**	x			

Source	Target	Date					
			11/21,	01/07/04			
Pakistan	China		11/8/12	x			
			X	04/07,			
Bangladesh	**India**		kinetic	cyber			
			1/20/12	x			
			1/24/2012 - 1/25/12	**02/26,**	**9**		
			4/3/12	x			
			5/4/12	x			
			8/13/2012 - 8/14/12	**09/11,**	**29**		
			10/18/12	**10/13,**	**5**		
			x	02/06, 03/03, 09/11, 09/30, 11/29,			
Pakistan	**India**		1/10/12	x			
			1/18/12	**01/15,**	**3**		
			3/7/12	**02/11,**	**25**		
			4/26/12	x			
			6/15/12	**05/30,**	**16**		
			7/5/12	x			
			7/16/12	x			
			7/18/12	x			
			7/27/12	x			
			8/8/12	x			

Source	Target	Date					
			8/10/12	x			
			8/16/2012 - 8/17/12	**08/15,**	**1**		
			11/4/12	x			
			11/23/12	x			
			x	10/07,			
Saudi Arabia	Iran		8/5/12	x			
Syria	**Lebanon**		4/10/12	x			
			5/3/12	x			
			5/10/12	x			
			8/15/12	**08/09,**	**4**		
			8/28/12	x			
			12/2/12	x			
			12/4/12	x			
India	Nepal		8/31/12				
			x				
India	**Pakistan**		**1/27/12**	**01/26,**	**1 day**		
			1/28/12	x			
			3/18/12	**02/26,**	**21 days**		
			4/27/2012 - 4/28/12				
			5/3/12	**05/11,**	**8**		
			5/11/12	**05/11,**	**0 /n/a**		

Source	Target	Date					
			7/1/12	**06/13,**	**18**		
			7/12/2012 - 7/13/12	**08/02,**	**19**		
			8/17/12	**08/06,**	**15**		
			10/12/12	**10/02,**	**10**		
			10/13/12	**x**			
			10/17/12	**x**			
			10/27/12	**10/25,**	**2**		
			12/15/12	**12/25,**	**10**		
			12/20/12	**12/25,**	**5**		
			x	01/01, 01/03, 02/11, 06/04, 06/10-06/13,			
			x	08/02, 11/9, 11/15, 11/16,11/19			
Syria	Saudi Arabia		kinetic	cyber			
			07/18,	x			
			x	03/05,			
			08/02,	x			
			08/11-08/12,	x			
			08/14,	x			
			10/15-10/16,	x			
Egypt	South Africa		6/28/12	x			
			x	03/06,			
Egypt	**Syria**		2/19/12	x			
			7/18/12	x			

Source	Target	Date					
			7/21/12	x			
			9/6/12	**09/16,**	**10**	k-c	
Turkey	**Syria**		1/10/12	x			
			1/11/12	x			
			3/1/12	x			
			3/7/12	x			
			5/9/12	**04/18,**	**21**	c-k	
			5/12-05/13	x			
			5/13/12	x			
			8/3/12	x			
			8/4/12	x			
			8/5/12	x			
			10/4/2012 - 10/6/12	x			
			10/6/12	x			
			10/8/12	x			
			10/12/12	x			
			10/14/12	x			
			10/18/12	x			
			10/23/12	x			
			10/30/12	x			
			12/24/12	x			
Greece	**Turkey**		**11/14/12**	**10/27/15**	**18**	c-k	

Source	Target	Date					
Iran	Turkey		1/12/12	x			
			x	06/15, 11/14,			
Syria	**Turkey**		**2/7/12**	**02/03,**	**4**	c-k	
			2/19/2012 - 2/20/12	**03/08,**	**17**	k-c	
			6/22/12	x			
			6/23/12	x			
			6/25/2012 - 6/28/12	x			
			7/4/12	x			
			7/20/12	x			
			7/28/12	x			
			8/3/2012 - 8/5/12	x			
			8/11/12	x			
			9/15/12	**10/07,**	**24**	k-c	
			12/31/12	x			
Iran	**United Kingdom**		1/15/12	x			
			1/31/12	x			
			3/10/12	x			
			4/9/12	**04/24,**	**15**	k-c	
Bangladesh	**United States**		**10/19/12**	10/25/12			
			09/21,	x			
			28 days				

Source	Target	Date					
Egypt	**United States**		**2/13/12**	**02/16,**	**3**	k-c	
			7/14/12	x			
			9/11/2012 - 9/15/12	x			
			9/11/12	x			
			9/17/2012 - 9/19/12	x			
			9/23/12	x			
			9/25/12	x			
			9/29/12	x			
			10/12/12	x			
			11/21/12	x			
India	United States		x	01/01,			
			4/26/12	x			
			7/18/12	x			
			9/26/12	x			
Indonesia	**United States**		**9/3/12**	**08/21,**	**13 days**		
			11/21/12				
Iran	**United States**		1/3/12	x			
			1/8/2012 - 1/12/12	x			
			1/23/12	x			
			3/2/12	x			
			3/23/12	x			

Source	Target	Date					
			5/22/12	**04/24,**	**28**	c-k	
			5/29/12	x			
			7/13/12	x			
			8/10/12	x			
			9/12/12	x			
Malaysia	United States		x	11/7/2012 - 11/8/12			
			08/23,	x			
Saudi Arabia	**United States**		**9/14/12**				
			08/16,	**29**			
Turkey	**United States**		**8/11/12**				
			08/24,				
			13				

Cyber and Kinetic Pairings (2013)

Source	Target	Date					
Philippines	Australia		kinetic	Cyber			
			1/5/13	X			
			10/30/13	X			
			10/31/13	X			
			x	10/31/13			

Source	Target	Date					
India	**Bangladesh**		**2/7/13**	**02/07,**	**0**		
			3/3/13	**03/11,**	**8**		
			4/11/13	X			
			5/22/13	X			
			6/3/2013- 6/4/13	X			
			7/20/13	X			
			9/25/13	X			
			10/7/13	X			
			11/4/13	X			
			11/29/13	X			
			12/15/13	X			
Indonesia	Bangladesh		3/14/13	X			
			x	07/29,			
			x	08/28,			
Pakistan	Bangladesh		10/23/13	X			
			x	04/03,			
			12/17/13	X			
Syria	Brazil		9/24/13	X			
			x	06/29,			
			x	7/29,			
			x	11/05,			

Source	Target	Date					
Turkey	**Egypt**		**2/16/13**	**02/25,**	**9**		
			7/4/2013 - 7/6/13	**07/08,**	**2**		
			7/16/13	**07/15,**	**1**		
			x	02/16, 07/31, 08/02, 09/23,			
Bangladesh	**India**		1/6/13	X			
			1/13/13	**01/11,**	**2 days**	c-k	
			1/17/13	X			
			2/2/13	X			
			3/1/13	X			
			3/3/2013 - 3/4/13	X			
			9/29/2013 - 9/30/13	X			
			11/24/13	X			
			12/15/13	X			
			12/17/13	X			
Indonesia	**India**		**10/21/13**	**11/05,**	**15**	k-c	
Pakistan	**India**		**1/8/2013 - 1/12/13**	**01/07,**	**1**		
			1/15/ - 1/16/13	X			
			1/24 – 1/25/13	X			
			1/27 – 1/28/13	X			
			2/15/13	**02/10**	**5**		
			2/28/13	X			

Source	Target	Date					
			3/13/13	X			
			3/15/13	X			
			4/5/13	X			
			5/6/ - 05/0713	**04/23,**	**13**		
			5/25/13	X			
			6/2/13	X			
			6/7/13	X			
			7/8/ - 7/9/13	**07/04,**	**5**		
			7/21/13	X			
			7/26/13	X			
			08/06 - 08/19	**08/18,**	**1**		
			8/22/13	X			
			8/25/13	X			
			8/27 – 08/29/13	X			
			10/19/2013 - 10/20/13	**10/17,**	**2**		
			10/24/13	X			
			10/28/13	X			
			12/17/13	**11/26,**	**21**		
			x	08/11, 11/19, 01/02, 02/10			
			x	08/11, 09/03, 09/11,			
Syria	**Iran**		**3/19/13**	**04/12 - 04/13,**	24		
			1/25/04	X			
Turkey	Iran		x	9/25/13			

Source	Target	Date					
			08/05,	X			
Syria	**Jordan**		2/27/13	X			
			4/7/13	X			
			4/23/13	**04/19,**	**4**	c-k	
			X	12/27, 06/20			
Syria	**Lebanon**		**2/9/13**	**02/13,**	**4**		
			4/19/13	**04/12,**	**5**		
			6/9/13	**05/31,**	**10**		
			x	02/15, 02/28,			
Syria	Libya		x	9/23/13			
			03/01,	X			
Egypt	Malaysia		8/29/13	X			
			x	9/23/13			
Indonesia	Malaysia		6/21/13	8/10/13	x		
			x	X	09/17,		
Saudi Arabia	Malaysia		7/29/2013 - 7/30/13	X			
			x	01/20,			
Malaysia	Nigeria		1/23/13	11/27/13	x		

Source	Target	Date					
			X	X	03/28,		
India	**Pakistan**		**1/6/2013 - 1/11/13**	**01/12,**	**1**		
			1/14/13	X			
			1/15/13	**01/14,**	**1**		
			1/17/13	**01/16,**	**1**		
			1/22/13	X			
			1/24/13	X			
			1/30/13	X			
			1/31/13	X			
			2/15/13	**02/14,**	**1**		
			2/16/13	X			
			2/25/13	X			
			2/27/13	X			
			3/1/13	X			
			3/3/13	X			
			3/6, 03/07,	X			
			3/10/13	X			
			3/25/13	X			
			3/30- 03/31,	X			
			4/25/13	X			
			4/27/13	X			
			4/30/13	X			
			5/6-05/07	X			
			5/14/13	X			

Source	Target	Date					
			5/20/13	X			
			7/21/13	**06/31,**	**22**		
			7/27/13	X			
			8/9/13	X			
			08/11, 08/12	X			
			8/17/13	X			
			08/21-08/23	X			
			9/3/13	X			
			9/5/13	X			
			9/16/13	X			
			10/2/13	X			
			10/25/13	X			
			11/28/13	X			
			12/17/13	X			
Syria	Russian Federation		11/15/13	11/20/13	x		
			X	X	03/14,		
Syria	Saudi Arabia		04/17,	X			
			5/21/13	X			
			5/29/13	X			
			10/4/13	X			
Iran	Syria		5/4/13	5/14/13	5/16/13	x	
			X	X	x	11/22,	

Source	**Target**	**Date**					
Indonesia	Turkey		6/10/13	X	x		
			X	02/19,	03/26,		
Pakistan	Turkey		9/19/13	x			
			X	06/12,			
Syria	**Turkey**		2/18/13	x			
			2/24/13	x			
			7/20/13	x			
			12/28/13	**12/04,**	**24**		
			X	01/13, 05/04, 06/03, 10/01, 11/14,12/04,			
Argentina	United Kingdom		1/2/13	x			
			1/31/2013 - 2/2/13	x			
			2/7/2013 - 2/8/13	x			
Iran	United Kingdom		4/20/13	x			
			10/8/2013 - 10/9/13	x			
			11/19/13	x			
			12/11/13	x	01/11, 07/14,		
			12/14/13	x			
			12/28/13	x			
Pakistan	United Kingdom		5/17/13	x			

Source	Target	Date					
			6/20/13	x			
			7/13/13	x			
			X	09/04,			
			X	12/15,			
Indonesia	**United States**		**10/30/13**	**10/13**			
Iran	**United States**		7/17/13	X			
			8/25/13	X			
			9/3/13	X			
			9/9/13	X			
			09/25/2031 - 9/26/2013	X			
			9/30/13	X			
			10/1/13	X			
			10/15/13	**10/11,**	**4**		
			10/17/2013, 10/18/13	X			
			11/4/13	X			
			12/18/13	X			
Pakistan	**United States**		1/23/13	X			
			4/17/13	X			
			8/26/13	X			
			9/19/13	X			
			10/30/2013 - 10/31/2013	**11/01,**	**1**		
			11/22/13	X			

Source	Target	Date					
			11/25/13	X			
Turkey	**United States**		1/14/13	X			
			2/24/13	X			
			2/28/13	X			
			3/2/13	**03/02,**	**0**		
			11/20/13	X			

References

[Bargh 2008]
Bargh, J.A. & Morsella, E. The Unconscious Mind. *Perspectives on Psychological Science.* Volume 3. Number 1. 2008. Pages 73-79.

[Baumeister 2010]
Baumeister, R.F & Masicampo, E.J. Conscious Thought is for Facilitating Social and Cultural Interactions: How Mental Simulations Serve the Animal-Culture Interface. *Psychological Review.* Volume 117. Number 3. 2010. Pages 945-971.

[Beidleman 2009]
Beidleman, Scott W. Defining and Deterring Cyber War. Army War College, Carlisle Barracks. 2009.

[Cohen 1988]
Cohen, J. *Statistical Power Analysis for the Behavioral Sciences 2nd Edition.* Lawrence. 1988.

[Dijksterhuis 2004]
Dijksterhuis, A. Think Different: The Merits of Unconscious Thought in Preference Development and Decision Making. *Journal of Personality and Social Psychology.* Volume 87. Number 5. November 2004. Pages 586-598. doi:10.1037/0022-3514.87.5.586.

[Evans 2008]
Evans, J.S.B.T. (2008). Dual-Processing Accounts of Reasoning, Judgement and Social Cognition. *Annual Review Psychology.* Volume 59. January 2008. Pages 255-278. doi: 10.1146/annurev.psych.59.103006.093629.

[Gauthier 2001]
Gauthier, T. D. Detecting Trends Using Spearman's Rank Correlation Coefficient. *Environmental Forensics*. Volume 2. Number 4. 2001. Pages 359-362.

[Goldstein 1992]
Goldstein, J. S. A Conflict-Cooperation Scale for WEIS Events Data. *Journal of Conflict Resolution.* Volume 36. Number 2. 1992. Pages 369-385.

[Guess 2004]
Guess, C.D. Decision Making in Individualistic and Collectivist Cultures. *Online Readings in Psychology and Culture.* Volume 4. 2004.

[Guss 2010]
Guss, C.D. & Dorner, D. Cultural Differences in Dynamic Decision-Making Strategies in a Non-Linear, Time-Delayed Task. *Cognitive Systems Research.* Volume 12, Number 3-4. September-December 2011. Pages 365-376. http://dx.doi.org/10.1016/j.cogsys.2010.12.003

[Hauke 2011]
Hauke, Jan & Kossowski, Tomasz. Comparison of Values of Pearson's and Spearman's Correlation Coefficients on the Same Sets of Data. *Quaestiones Geographicae*. Volume 30. Number 2. 2011. Pages 87-93. http://geoinfo.amu.edu.pl/qg/archives/2011/QG302_087-093.pdf

[Hofstede 2010]
Hofstede, G.J. et al. *Cultures and Organizations.* McGraw-Hill Publishing. 2010.

[Hofstede 2013]
Hofstede, Geert. *The Hofstede Centre*. September 14, 2015 [accessed]. http://www.geert-hofstede.com.

[Hollander 2013]
Hollander, M. et al. *Nonparametric Statistical Methods*. John Wiley & Sons. 2013.

[Minkov 2013]
Minkov, Michael. *Cross-Cultural Analysis: The Science and Art of Comparing the World's Modern Societies and Their Cultures*. SAGE Publications. 2013.

[Valeriano 2014]
Valeriano, B. & Maness, R. C. The Dynamics of Cyber Conflict Between Rival Antagonists, 2001–11. *Journal of Peace Research.* Volume 51. Number 3. 2014. Pages 347-360.

[Sample 2013]
Sample, C. Applicability of Cultural Markers in Computer Network Attack Attribution. Pages 361-369. *Proceedings of the 12th European Conference on Information Warfare and Security.* July 2013.

[Sample 2014]
Sample, C. & Karamanian, Ara. Hofstede's Cultural Markers in Computer Network Attack Behaviours. Pages 191-200. *Proceedings of the 9th International Conference on Cyber Warfare and Security, ICCWS 2014.* March 2014.

[Woo 2003]
Woo, H. J. (2003). *The Hacker Mentality: Exploring The Relationship Between Psychological Variables And Hacking Activities* [Doctoral Diss.]. University of Georgia. 2003. https://getd.libs.uga.edu/pdfs/woo_hyung-jin_200305_phd.pdf

[Woo 2004]
Woo, H. J., Kim & Dominick, J. Hackers: Militants or Merry Pranksters? A Content Analysis of Defaced Web Pages. *Media Psychology.* Volume 6. 2004. Pages 63-82.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
(Leave Blank)	November 2015	Final

4. TITLE AND SUBTITLE	5. FUNDING NUMBERS
Cyber + Culture Early Warning Study	FA8721-05-C-0003

6. AUTHOR(S)

Char Sample

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Software Engineering Institute Carnegie Mellon University Pittsburgh, PA 15213	CMU/SEI-2015-SR-025

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
AFLCMC/PZE/Hanscom Enterprise Acquisition Division 20 Schilling Circle Building 1305 Hanscom AFB, MA 01731-2116	n/a

11. SUPPLEMENTARY NOTES

12A DISTRIBUTION/AVAILABILITY STATEMENT	12B DISTRIBUTION CODE
Unclassified/Unlimited, DTIC, NTIS	

13. ABSTRACT (MAXIMUM 200 WORDS)

This study examines the relationship between cyber and kinetic events through the lens of Hofstede's cultural dimensions, over a 10-year span of data that began on January 1, 2004, and completed on December 31, 2013. Due to the relative newness of the cyber environment, a five-year interval was also examined for the cyber behavior. This was due primarily to the significant increase in cyber activity beginning at year 2010.

This study is structured to allow for the examination of actors involved in cyber events (specifically web defacements) where those events relate to kinetic activities, by using culture as the framework in which the events are discussed. This study was designed to profile cyber actors, and to examine the time interval between cyber and kinetic events in order to gain greater insights into nation-state cyber responses to kinetic events.

The study results present findings about the relationships of cultural values and the cyber and kinetic actions that have been observed and recorded.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Culture, cyber kinetic actions, web defacements	128

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL