Association for Information Systems

AIS Electronic Library (AISeL)

ICEB 2014 Proceedings

International Conference on Electronic Business (ICEB)

Winter 12-8-2014

Interpersonal Information Platform Reinforces The Significant Nature of Structure Cost in Latent Terrorist Activities—A Trial of The Biggest IM & Web Portal From China

Weiqing Zhuang

Zhenyu Liu

Guangyang Huang

Follow this and additional works at: https://aisel.aisnet.org/iceb2014

INTERPERSONAL INFORMATION PLATFORM REINFORCES THE SIGNIFICANT NATURE OF STRUCTURE COST IN LATENT TERRORIST ACTIVITIES—A TRIAL OF THE BIGGEST IM & WEB PORTAL FROM CHINA

Weiqing Zhuang, Fujian University of Technology, China,

Zhenyu Liu, Xiamen University, China,

Guangyang Huang, Fujian University of Technology, China,

ABSTRACT

This paper empirically examines a state to emerge objectively a "structure" characteristic in communicating with each latent terrorist on an Interpersonal Information Platform (IIP), and examines what factors lead to the "structure" characteristic intensified, drawing on two tests that guides the phenomenon of "structure" characteristic in disseminating and sharing of terrorism information through IIP of QQ group and NETEASE web portal from China. The interesting research results are informed of the administering authority could optimize the structure cost and value of posting to adjust the structure characteristic and behavior of posting in order to keep within limits in latent terrorist activities.

Keywords: Interpersonal information platform, structure cost, terrorism information dissemination.

LITERATURE REVIEW

The past literature on terrorist activity primarily focuses on what characteristics of society and economy would make people likely targets for terrorist acts [1]. Keohane and Zeckhauser [2] define four mechanisms by which a government may combat terrorism: reducing the stock of terrorists, limiting the flow of resources to terrorists, taking averting actions, and taking ameliorating steps, and further Edieal J. Pinker [3] focus on two defensive measures—deployment of physical resources, an example of an averting action, and issuance of warnings, an example of amelioration. However, In the digital world of today, information technology greatly promotes interpersonal communication, including message to deliver, life or job's plan to share, individual experience and beauty moment to say, and so on, the most frightening thing is IT also to be used successfully by terrorist. It is widely recognized that terrorists, like transnational groups that organize in networks composed of smaller groups called cells, communicate frequently by web-based channels [4]. And it is both popular for terrorists and counter-terrorists to adept at using the internet social network to spread their ideas.

Anson Yuanxi Liang et al. [5] describes a framework of intelligent environment with smart-active objects for crowd simulation to analyze group behavior and evacuation safety under terrorist circumstance. Counter-Terror Social Network Analysis and Intent Recognition (CT-SNAIR) work focuses on development of automated techniques and tools for detection and tracking of dynamically-changing terrorist networks as well as recognition of capability and potential intent [6]. In the period 2000-2010, the Global Terrorism Database(GTD) comprised 28200 terrorist incidents, more than 115000 facilities being affected [7]. And Athakorn Kengpol et al. [7] presents main effects like terrorist population and distribution(distance and time interval of incidents), and factors just as successful rate of attack, security rating, political factor, threat policy, sociological, target & location, urban environment, attack proposal, victims and time on terrorist behavior. Urs E. Gattiker & Helen Kelley utilized the theory of moral development to determine whether users develop a moralizing or a permissive stance regarding ethical dilemmas involving computer technology (i.e., computer viruses, distribution of a violent, sexual, and racial game, and encryption) and helped to further reduce risks and vulnerabilities of systems by identifying computer actions deemed ethically acceptable by users [8]. D. Keep et al. [9] present an approach to the modelling of human interaction in complex environments and its application to a security related scenario. To inspect the structure character of terrorist network, Jared P. Keller et al.[10] point out the structure and capabilities of a terrorist network and take a structural perspective to the challenge of addressing terrorist networks and show how various strategies impact the structure of the network in terms of its resiliency and capacity to carry out future attacks. The "six-element" analysis method for terrorist activities is proposed from the perspective of the"multiple relationships" among people, organizations, time, locations, methods and events, with a case study of "East Turkistan" terrorist activities.[11] Guillaume Roels and Xuanming Su [12] study how social planners can manipulate reference points and reference groups to make full use of social comparison effects, and conclude that the optimal reference structure depends critically on the mode of social comparison effect at our recommendations.

The rest of the paper is organized as follows. Section 2 provides three experimental phenomenon of "structure" characteristic in disseminating and sharing of terrorism information through Interpersonal Information Platform (IIP). Section 3 discusses our research methodology, for measuring the impact on structure characteristic and analyzing the structure mechanism. Section 4 presents a numerical study, which explores the impact of the various variables on the performance of structure cost reflected in doing some latent terrorist businesses on IIP. Section 5 discusses the implications of this research for theory and practice. Section 6 concludes the paper with a discussion of possible extensions.

EXPERIMENT PHENOMENON

Introduction

Summarizing these literatures, this research defines Marshall Van Alstyne and Erik Brynjolfsson's (2005)[13] so-called

distribution, diversity and homogeneity of community interactions, a electronic community which made up groups of individuals that participate in online contact and information sharing, and the information retrieval theory(Manning and Schutz, 2000[14]) that uses these indices to examine the relationship of changing interconnectivity, searching, and screening, as "structure" characteristic. Two uncorrelated tests had been done since a year ago were to be found the phenomenon of "structure" characteristic in disseminating and sharing of terrorism information through Interpersonal Information Platform(IIP), and got a very interesting result that different contents or disseminating ways of terrorism information been transferred unconsciously to different objects among IIP' users needed an atom of implicit cost, not included to information transferring cost, just as being done businesses into enterprise network gone enterprise to a mountain of network structure cost according to structural holes theory.

The first test aimed for what characteristic terrorists had and how they done work when they contacted such bloodcurdling attack messages on an IIP. Due to considering myself security and unnecessary trouble, this test was to play a majority of its parts in working for a satisfactory outcome in discovering the structure cost been and had a significantly effect on transferring attack activity information among dangerous men by QQ group(an Interpersonal Information Platform). Explosive growth in computer-mediated and networked communications can shrink distances and facilitate information exchange among people of various backgrounds, who also have the potential to fragment interaction and divide groups [13].

The second test focused on whether it was more prominent or not to show the "structure" characteristic on IIP supported by mobile terminal. This test mostly relied on the news channel of NETEASE web portal, been googling these items such as terrorist activities, terrorism, anti-socialism, anti-human, antigovernment, gangs, organized crime, and then read all comments of one news concerning terrorism to analyze the existence of "structure" in spreading a great deal of negative information.

ANALYSIS

The first test

There were three purposes in the first test to check the existence of "structure" and the law of "structure" how to impact the information dissemination to latent terrorists through IIP.

(1)In the past several months, applications to me to join into each of group of seven different title QQ groups respectively around terrorist activities, terrorism, anti-socialism, anti-human, antigovernment, gangs, organized crime, let me had an chance to be a lurker, taking part in those groups and could read group members' discussions on this platform but seldom contributed to them, and then could start my research test, only to observe the phenomenon of "structure" characteristic.

There are some samples of the test records as the following table. It gives fourteen columns, including the type of QQ group, QQ member numbers from a representative QQ group, once a posting time, time of duration in this discussion(unit: minute), the number of posts, key words of this discussion, times of repetition to key words, the number of interval posts to key words, key words initiating from group host or main participants, the number of members in this discussion, the number of main participants in this discussion, group host or main participants are authority, group participants present hierarchy, the number of posts from group host or main participants. For example, a record of terrorist activities QQ group listed in Jan. 3, 2014, 20:09 PM shows keeping 245 minutes in discussion, 105 posts, 7 times of repetition to key words, 14 interval posts to key words, 11 members in this discussion, 3 main participants in this discussion, 73 posts from group host or main participants, and group host or main participants are initiator, authority, and hierarchy.

Table 1 Samples of test records

QQ Group	QQ Member Number	Posting Time	Time of Duration	Posts	Key Words			Posting Man Number	Main Participants Number	Group Host or Main Participants are Authority	Group Participants Present Hierarchy	Posts from Group Host or Main Participants
					Times of Repetition	Interval Posts	Group Host or Main Participants are Initiator					
terrorist activities	90	Jan. 3,2014 (20:09)	245	105	7	14	Y	11	3	Y	Y	73
terrorism	76	Mar. 15,2014 (10:12)	161	131	12	11	Y	13	4	Y	Y	58
anti-socialism	130	Apr. 8,2014 (15:30)	136	164	11	12	Y	17	3	Y	Y	36
anti-human	97	Jun. 18,2014	24	29	2	4	N	4	1	Y	Y	5

		(21:07)										
anti-government	190	Jul. 6,2014 (11:47)	37	89	5	8	N	9	2	Y	Y	13
gangs	479	Aug. 13,2014 (22:13)	39	69	7	5	N	13	2	Y	Y	11
organized crime	428	Sep. 25,2014 (17:40)	67	117	14	5	Y	19	4	Y	Y	39

Table 2 Model notation

notation	definition
SC	Structure cost
MemNum	QQ Member Number
PosTim	Posting Time
TimDur	Time of Duration
Pos	Posts
TimRep	Times of Repetition
IntPos	Interval Posts
PosMNum	Posting Man Number
MaiPNum	Main Participants Number
PosGH	Posts from Group Host or Main Participants
Ini	Group Host or Main Participants are Initiator
Aut	Group Host or Main Participants are Authority
Hie	Group Participants Present Hierarchy
V	Value of posting
Utility	Utility of posting

Further correlation analysis of these test subjects by total 140 discussions from 20 discussion records collected by each of group of seven different title QQ groups presents as following. It is not obviously correlated to several couples of variables, just as QQ member numbers and times of repetition to key words, QQ member numbers and the number of interval posts to key words, QQ member numbers and group host or main participants are authority, QQ member numbers and group participants present hierarchy, time of duration in this discussion and key words initiating from group host or main participants, key words initiating from group host or main participants and the number of interval posts to key words, the number of interval posts to key words and group host or main participants are authority, the number of interval posts to key words and group participants present hierarchy, key words initiating from group host or main participants and the number of main participants in this discussion, besides, there are obviously correlated.

Hence, there are significant positive correlations between better "structure" superiority, measured by Initiator, Authority, Hierarchy, times of repetition to key words and the number of posts from group host or main participants, and more posts, more the number of members in this discussion (posting man number), as to prove the existence of "structure" character in transferring latent terrorist activities through IIP.

Table 3 Correlation analysis

	MemNum	TimDur	Pos	TimRep	IntPos	Ini	PosMNum	MaiPNum	Aut	Hie	PosGH
MemNum											
TimDur	0.896^{**}										
Pos	0.224^{*}	0.726^{**}									
TimRep	0.039	0.418^{**}	0.761^{**}								
IntPos	0.106	0.639^{**}	0.592^{**}	0.231^{**}							
Ini	0.345^{*}	0.049	0.140^{*}	0.161^{*}	0.055						
PosMNum	0.451^{*}	0.658^{**}	0.931^{**}	0.788^{**}	0.482^{**}	0.217^{**}					
MaiPNum	0.287^{*}	0.561^{**}	0.725^{**}	0.774^{**}	0.498^{**}	0.082	0.769^{**}				
Aut	0.198	0.491^{*}	0.333^{*}	0.470^{**}	0.113	0.345^{**}	0.538^{**}	0.617^{**}			

Hie	0.187	0.418[*]	0.306[*]	0.507[**]	0.098	0.401[**]	0.561[**]	0.546[**]	0.955[**]
PosGH	0.226[*]	0.846[**]	0.777[**]	0.549[**]	0.677[**]	0.145[*]	0.733[**]	0.775[**]	0.505[**]	0.499[**]

(2)For the sake of comparing the "structure" characteristic how impacted the dissemination of terrorism information in a QQ group gathered by dangerous men(terrorists, extremists, etc.) to in a QQ group gathered by normal men, the first test divided into two parts, one of which was a piece of attack activity information being made up and announced in the QQ group gathered by dangerous men, and then assessed the law of these messages spread out, and the second part was being done to the QQ group gathered by normal men as the same messages. Just as the detection system's ability to discriminate between attackers and normal users is referred to as its discrimination ability [15]. The different behaviors and rules of information dissemination list on the following table.

As the same attack message announced in the QQ group gathered by dangerous men and gathered by normal men respectively, it was conspicuous different in dividing the number of posts from group host or main participants by the number of posts, and it was of higher value to the ratio on IIP gathered by dangerous men to gathered by normal men. Similarly, it was somewhat different in posting time. As we can see the "structure" character impacts the dissemination of terrorism information in a QQ group gathered by dangerous men more significant than in a QQ group gathered by normal men. Further analysis shows that IIP reinforces the significant character of structure in latent terrorist activities. The social comparison effects theory from Guillaume Roels and Xuanming Su (2014) can explain the results.

(3)It was asked for ensuring the relativity of "structure" and poster activity on an IIP gathered by dangerous men, and further explained to the optimal average QQ member number in a type of QQ groups to maximize the ability of information dissemination.

Table 4 Samples of test records from different category

QQ Group	Test	QQ Member Number	Posting Time	Time of Duration	Posts	Key Word			Posting Man Number	Main Participants Number	Group Host or Main Participants are Authority	Group Participants Present Hierarchy	Posts from Group Host or Main Participants
						Times of Repetition	Interval Posts	Group Host or Main Participants are Initiator					
dangerous men	1	90	Jan.3, 2014 (20:09)	245	105	7	14	Y	11	3	Y	Y	73
normal men		45	Jan.12, 2014 (11:35)	235	87	2	4	N	6	1	Y	N	17
dangerous men	2	90	Feb.13, 2014 (15:30)	39	53	6	4	Y	7	2	Y	Y	36
normal men		45	Feb.22, 2014 (16:15)	24	21	2	3	N	3	0	N	N	0
dangerous men	3	90	Mar.23 ,2014 (23:00)	80	55	3	11	Y	6	2	Y	Y	23
normal men		45	Mar.16 ,2014 (22:15)	85	47	1	6	N	4	1	Y	N	4
dangerous men	4	90	May.8, 2014 (19:25)	49	25	2	4	Y	4	1	Y	Y	18
normal men		45	Jun.1, 2014 (15:05)	46	27	0	1	Y	2	1	N	N	15

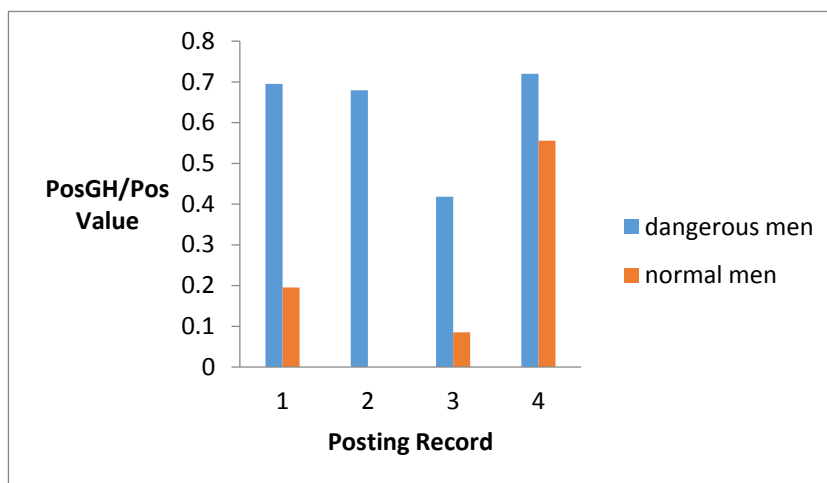Note: Testing to the same QQ group at the different time.

Fig. 1 The structure value of different category

Firstly, keyed in these seven key items, respectively moving around terrorist activities, terrorism, anti-socialism, anti-human, antigovernment, gangs and organized crime, for QQ group's search bar, and the results of descriptive statistic could be described as the following table 5. The average QQ members is around 15 to 20 to such groups from terrorist activities, terrorism, anti-socialism, anti-human and antigovernment, but it is within a large range of number for group from gangs and organized crime. There are also different in skewness and kurtosis on the performance of the information dissemination on IIP, especially the kurtosis is a lot different. For example, the anti-socialism and antigovernment group are more concentricity.

Table 5 Descriptive Statistic

Key Items	QQ Group Number		QQ Member Number of QQ Groups									
	(1)	(2)	Min	Max	Total	Average	Avg.SE	SD	Skewness	Skewness.SE	Kurtosis	Kurtosis.SE
terrorist activities	34	33	2	90	570	17.27	3.182	18.281	2.635	0.409	8.068	0.798
terrorism	94	76	2	76	1172	15.42	1.812	15.794	1.860	0.276	3.581	0.545
anti-socialism	113	98	2	130	1669	17.03	2.104	20.828	3.480	0.244	15.236	0.483
anti-human	292	248	2	97	3754	15.14	0.942	14.839	2.231	0.155	6.911	0.308
antigovernment	231	200	2	216	3898	19.49	1.884	26.638	4.311	0.172	24.313	0.342
gangs	213	213	7	349	12743	105.31	5.352	58.867	0.810	0.220	1.402	0.437
organized crime	270	268	2	428	12433	46.39	3.753	61.434	3.083	0.149	12.580	0.297

(1): while the member number of each QQ group are greater than zero;

(2): while the member number of each QQ group are greater than one, not including one.

Note: all QQ groups index ordered by its activeness.

Secondly, designs two indexes for measuring the level of structure on an IIP gathered by dangerous men to confirm the relativity of "structure" and poster activity, and compute the optimal average QQ member number in a type of QQ groups to maximize the ability of information dissemination.

$$①\quad \frac{Pos}{MemNum} \sim \frac{PosGH}{PosMNum}$$

Referring to the group host or main participants in a QQ group how about contribute to the propagation of such negative messages, and compare to the ability of information dissemination coming from all members of this group. If the group host or main participants contribute more to the propagation of such negative messages, it puts up the structure character to group host or main participants on this IIP.

$$②\quad \frac{PosGH}{PosMNum} \sim \frac{TimDur}{MaiPNum}$$

Referring to the group host or main participants how about hold to the propagation of such negative messages and prompt to more many members to join this discussion. If the group host or main participants hold more to the propagation of such negative messages or prompt more to members to join, it also puts up the structure character to group host or main participants

The Fourteenth International Conference on Electronic Business &

The First Global Conference on Internet and Information Systems, Taipei, December 8-12, 2014
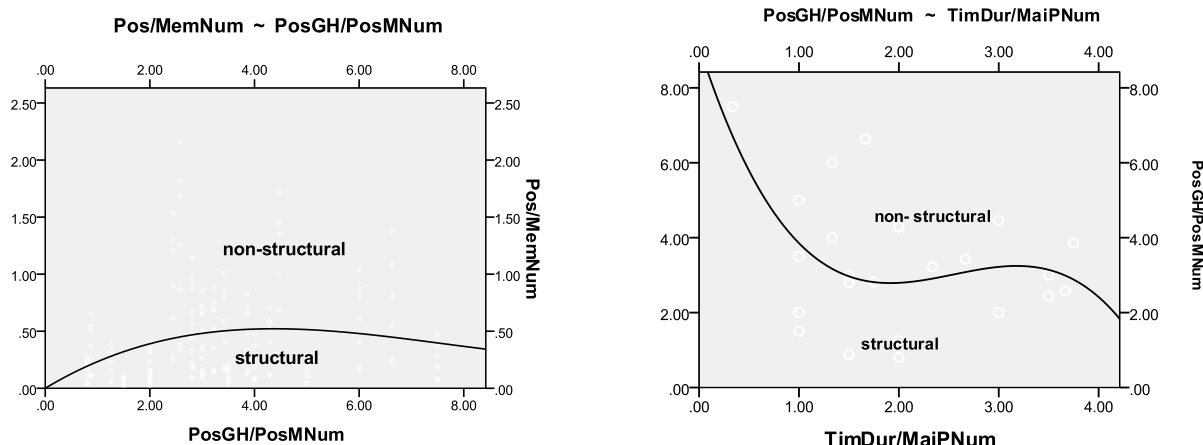
on this IIP.

Fig. 2 A structure index presents the structure character   Fig. 3 A structure index presents the structure character

If $\dfrac{Pos}{MemNum} > \dfrac{PosGH}{PosMNum}$, it presents non-structural character on this IIP marked on Fig.2, and $\dfrac{Pos}{MemNum} < \dfrac{PosGH}{PosMNum}$

shows the good structural character on the contrary.

Similarly, If $\dfrac{PosGH}{PosMNum} > \dfrac{TimDur}{MaiPNum}$, it presents non-structural character on this IIP marked on Fig.3, and

$\dfrac{PosGH}{PosMNum} < \dfrac{TimDur}{MaiPNum}$ shows the good structural character on the contrary.

The second test

In information era, recommender systems are becoming integral to how consumers discover media, and recommender systems can divide them into content-based versus collaborative filtering-based systems [16]. The forum postings contain a lot of violent information(malicious post), which statistically contain two features: few words and paragraphs, behaviorally as to the collaborative filtering-based system existing on most large body of web portals but we know less about how it affects. However, an usual "structure" of posting is more and more popular, temporarily called it storey post, being a long downward pattern that made up of cited posts from netizens all over the world. This test would like to know how the structure posting playing a role in information dissemination on an IIP gathered by dangerous men was.

We can see a larger number of such form comments as the Fig.4 on the news channel of NETEASE web portal. A post posted by a person widely cited by others turns up second floor, third floor, and going on to many floors, taking shape a hierarchic structure. This pattern of discussion reflects the good structure of a person who posts a post, and it intensifies the ability of information dissemination to person who posts a post. As a result of this test, there a more interesting is that a piece of negative message or attack message originates from a person will be easier and faster cited and then will form quickly this "floor" structure like as Fig.4.

(1)It points out that it is easier and faster to diffuse these pieces of negative messages or attack messages taking advantage of the good structure through IIP, but it is not the same as the diffusion of normal information.

(2)Another interesting result has been found indicates that a person contributing to the "floor" structure discussion of negative messages has to spend more time to answer other posts in order to intensify the diffusion of messages, being called "structure cost". Therefore, one should bear the structure cost to keep the discussion active, and the more participants cited the post, the more structure cost should the initiator of posting fall on.

Fig. 4 The pattern of structural posting

Results

Combining the analysis of the two tests, the structure cost can be described as the function of *MemNum, TimDur, Pos, TimRep, IntPos, PosMNum, MaiPNum, PosGH, Ini, Aut, Hie*. And then builds the function relationship of value of a person who advocates the latent terrorist activities on the IIP, containing the function of *PosTim, TimDur, Pos, PosMNum* and utility of posting.

$$SC = f(MemNum, TimDur, Pos, TimRep, IntPos, PosMNum, MaiPNum, PosGH, Ini, Aut, Hie) \quad (1)$$

$$V = f(PosTim, TimDur, Pos, PosMNum) + Utility \quad (2)$$

RESEARCH METHODOLOGY

This paper uses SNA(social network analysis) for reference, a model of dynamic terrorist network proposed, namely a cellular network [17][18], and uses the model of DyNet [19] account for information diffusion, and refers to the model of structure cost measured by Zhuang Weiqing and Liu Zhenyu [20]. Now, it neglects the effect of control variables in these two model, and then divides by the variable of *PosGH* (hypothesize *PosGH*>0), being used for measuring the impact on structure character.

$$SC = f_1(\underbrace{\frac{MemNum}{PosGH}}_{(+)}, \underbrace{\frac{TimDur}{PosGH}}_{(+)}, \underbrace{\frac{Pos}{PosGH}}_{(-)}, \underbrace{\frac{TimRep}{PosGH}}_{(+)}, \underbrace{\frac{IntPos}{PosGH}}_{(+)}, \underbrace{\frac{PosMNum}{PosGH}}_{(-)}, \underbrace{\frac{MaiPNum}{PosGH}}_{(+)}, 1) \quad (3)$$

$$V = f_2(\underbrace{\frac{TimDur}{PosGH}}_{(+)}, \underbrace{\frac{Pos}{PosGH}}_{(+)}, \underbrace{\frac{PosMNum}{PosGH}}_{(+)}) + \frac{Utility}{PosGH} \quad (4)$$

Since there are correlations with independent variables, the structure cost equation and value of posting equation both can be approximate to the multivariate linear equation.

Has a discussion under the condition of $SC - V = f_1 - f_2 - U = 0$.

(1) Then, takes the derivative on $\frac{Pos}{PosMNum}$, that is $f_1' - f_2' - U' = 0$. Therefore,

$$\frac{\partial f_{11}}{\partial \left(\frac{Pos}{PosMNum}\right)} = f_{11}\left(\frac{MemNum}{Pos} \cdot \frac{PosMNum}{PosGH}\right); \quad \frac{\partial f_{12}}{\partial \left(\frac{Pos}{PosMNum}\right)} = f_{12}\left(\frac{TimDur}{Pos} \cdot \frac{PosMNum}{PosGH}\right);$$

$$\frac{\partial f_{13}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{13}(\frac{PosMNum}{PosGH}) \; ; \quad \frac{\partial f_{14}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{14}(\frac{TimRep}{Pos} \cdot \frac{PosMNum}{PosGH}) \; ;$$

$$\frac{\partial f_{15}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{15}(\frac{IntPos}{Pos} \cdot \frac{PosMNum}{PosGH}) \; ; \quad \frac{\partial f_{16}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{16}(\frac{PosMNum}{Pos} \cdot \frac{PosMNum}{PosGH}) \; ;$$

$$\frac{\partial f_{17}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{17}(\frac{MaiPNum}{Pos} \cdot \frac{PosMNum}{PosGH}) \; ; \quad \frac{\partial f_{21}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{21}(\frac{TimDur}{Pos} \cdot \frac{PosMNum}{PosGH}) \; ;$$

$$\frac{\partial f_{22}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{22}(\frac{PosMNum}{PosGH}) \; ; \quad \frac{\partial f_{23}}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = f_{23}(\frac{PosMNum}{Pos} \cdot \frac{PosMNum}{PosGH}) \; ; \quad \frac{\partial U}{\partial \left(\dfrac{Pos}{PosMNum}\right)} = u_1 \cdot$$

The derivation equation of structure cost and value of posting can be further expressed as $f_{11} + f_{12} - f_{21} + f_{14} + f_{15} + f_{17} = f_{13} + f_{22} + f_{16} + f_{23} + u_1$, and then discuss the three situations of the relationship of structure cost and value of posting.

Case 1: $SC > V$, Takes the derivative on $\dfrac{Pos}{PosMNum}$.

Goes to $f_{11} + f_{12} - f_{21} + f_{14} + f_{15} + f_{17} > f_{13} + f_{22} + f_{16} + f_{23} + u_1$, that is

$f_{11} \uparrow + \underline{(f_{12} - f_{21})} \uparrow + f_{14} \downarrow + f_{15} \downarrow + f_{17} \to \gg f_{13} \downarrow + f_{22} \downarrow + f_{16} \uparrow + f_{23} \uparrow + u_1 \to$, where $SC > V$.

It can be $f_{12} - f_{21} > 0$, therefore, $f_{12}(TimDur \cdot \dfrac{PosMNum}{Pos \cdot PosGH}) > f_{21}(TimDur \cdot \dfrac{PosMNum}{Pos \cdot PosGH})$

That means the role of the variable of "*TimDur*" to structure cost of posting is greater than the role of the variable of "*TimDur*" to value of posting under taking a consideration of variety of $\dfrac{Pos}{PosMNum}$. The results from this analysis are summarized below.

PROPOSITION 1. Where $SC > V$, it can be greater the influence of time of duration in posting to structure cost than the influence of time of duration in posting to value of posting both under taking a consideration of variety of $\dfrac{Pos}{PosMNum}$. That is

$$f_{12}(TimDur \cdot \frac{PosMNum}{Pos \cdot PosGH}) > f_{21}(TimDur \cdot \frac{PosMNum}{Pos \cdot PosGH}) \cdot$$

Similarly, the reverse results can be obtained where **Case 2:** $SC < V$ and are similar to **Case 3:** $SC = V$.

(2) Secondly, takes the derivative on $\dfrac{PosMNum}{PosGH}$, that is $f_1' - f_2' - U' = 0$. Therefore,

$f_{11} + f_{12} + f_{14} + f_{15} + f_{17} = f_{13} + f_{21} + f_{22} + u_1$,

Goes to $f_{11} + f_{12} + f_{14} + f_{15} + f_{17} > f_{13} + f_{21} + f_{22} + u_1$ where $SC > V$, that is,

$$f_{11}(\frac{MemNum}{PosMNum}) \uparrow + \left[f_{12}(\frac{TimDur}{PosMNum}) + f_{14}(\frac{TimRep}{PosMNum}) + f_{15}(\frac{IntPos}{PosMNum}) + f_{17}(\frac{MaiPNum}{PosMNum}) \right] \uparrow \cdot$$

$$> f_{13}(\frac{Pos}{PosMNum}) \uparrow + f_{21}(\frac{TimDur}{PosMNum}) \uparrow + f_{22}(\frac{Pos}{PosMNum}) \uparrow + u_1 \uparrow$$

It can be $\left[f_{12}(\dfrac{TimDur}{PosMNum}) + f_{14}(\dfrac{TimRep}{PosMNum}) + f_{15}(\dfrac{IntPos}{PosMNum}) + f_{17}(\dfrac{MaiPNum}{PosMNum}) \right]' > 0 \cdot$

That means that it is positive effect on the structure cost coming from these variables of "*TimDur*", "*TimRep*", "*IntPos*", "*MaiPNum*" under taking a consideration of variety of $\dfrac{PosMNum}{PosGH}$, and can be summarized below.

PROPOSITION 2. Where $SC > V$, it is positive effect on the structure cost coming from these variables of "*Time of Duration*", "*Times of Repetition*", "*Interval Posts*", "*Main Participants Number*" under taking a consideration of variety of $\dfrac{PosMNum}{PosGH}$. That is $\left[f_{12}(\dfrac{TimDur}{PosMNum}) + f_{14}(\dfrac{TimRep}{PosMNum}) + f_{15}(\dfrac{IntPos}{PosMNum}) + f_{17}(\dfrac{MaiPNum}{PosMNum}) \right]' > 0 \cdot$

Similarly, the reverse results can be obtained where **Case 2:** $SC < V$ and are similar to **Case 3:** $SC = V$.

(3) Thirdly, takes the derivative on $\frac{MaiPNum}{TimDur}$, that is $f_1' - f_2' - U' = 0$. Therefore,

$f_{11} + f_{12} + f_{14} + f_{15} + f_{17} = f_{13} + f_{16} + f_{21} + f_{22} + f_{23} + u_1$,

Goes to $\quad f_{11} + f_{12} + f_{14} + f_{15} + f_{17} > f_{13} + f_{16} + f_{21} + f_{22} + f_{23} + u_1 \quad$ where $\quad SC > V$, that is,

$f_{11} \downarrow + f_{12} \downarrow + \underline{(f_{14} + f_{15})} \uparrow + f_{17} \downarrow > f_{13} \downarrow + f_{16} \downarrow + f_{21} \downarrow + f_{22} \downarrow + f_{23} \downarrow + u_1 \downarrow$.

It can be $\quad f_{14}' + f_{15}' > 0$, that is, $\quad f_{14}'(\frac{TimRep}{MaiPNum} \cdot \frac{TimDur}{PosGH}) + f_{15}'(\frac{IntPos}{MaiPNum} \cdot \frac{TimDur}{PosGH}) > 0$.

That means that it is positive effect on the structure cost coming from these variables of "*TimRep*", "*IntPos*" under taking a consideration of variety of $\frac{MaiPNum}{TimDur}$, and can be summarized below.

PROPOSITION 3. Where $SC > V$, it is positive effect on the structure cost coming from these variables of "*Times of Repetition*", "*Interval Posts*" under taking a consideration of variety of $\frac{MaiPNum}{TimDur}$. That is

$f_{14}'(\frac{TimRep}{MaiPNum} \cdot \frac{TimDur}{PosGH}) + f_{15}'(\frac{IntPos}{MaiPNum} \cdot \frac{TimDur}{PosGH}) > 0$.

Similarly, the reverse results can be obtained where **Case 2:** $SC < V$ and are similar to **Case 3:** $SC = V$.

NUMERICAL STUDY

In this section, it reports the results of an extensive set of experiments designed to explore the impact of the various variables on the performance of structure cost reflected in doing some latent terrorist businesses on IIP. Presuming the structure cost equation and value of posting equation both are approximate to the multivariate linear equation, and can be severally described as formula (5) and (6).

$$SC = a + b_1 \cdot \frac{MemNum}{PosGH} + b_2 \cdot \frac{TimDur}{PosGH} - b_3 \cdot \frac{Pos}{PosGH} + b_4 \cdot \frac{TimRep}{PosGH} + b_5 \cdot \frac{IntPos}{PosGH} - b_6 \cdot \frac{PosMNum}{PosGH} \quad (5)$$
$$+ b_7 \cdot \frac{MaiPNum}{PosGH} + b_8 \cdot \frac{Ini \times TimDur}{PosGH} + b_9 \cdot \frac{Aut \times PosMNum \times Pos}{PosGH} + b_{10} \cdot \frac{Hie \times TimRep \times IntPos}{PosGH})$$

$$V = c + d_1 \cdot \frac{TimDur}{PosGH} + d_2 \cdot \frac{Pos}{PosGH} + d_3 \cdot \frac{PosMNum}{PosGH} + d_4 \cdot \frac{Utility}{PosGH} + d_5 \cdot \frac{PosTim \times TimDur}{PosGH} \quad (6)$$

Where $SC = V$, then neglects the utility of group host or main participants, the model of $SC - V = 0$ can be regressed.

$$0 = (a - c) + b_1 \cdot \frac{MemNum}{PosGH} + (b_2 - d_1) \cdot \frac{TimDur}{PosGH} - (b_3 + d_2) \cdot \frac{Pos}{PosGH} + b_4 \cdot \frac{TimRep}{PosGH} + b_5 \cdot \frac{IntPos}{PosGH} - (b_6 + d_3) \cdot \frac{PosMNum}{PosGH} \quad (7)$$
$$+ b_7 \cdot \frac{MaiPNum}{PosGH} + b_8 \cdot \frac{Ini \times TimDur}{PosGH} + b_9 \cdot \frac{Aut \times PosMNum \times Pos}{PosGH} + b_{10} \cdot \frac{Hie \times TimRep \times IntPos}{PosGH} - d_4 \cdot \frac{PosTim \times TimDur}{PosGH}$$

One situation of regression result shows as the Table 6 that the independent variable *MemNum/PosGH* is significant associated with *TimDur/PosGH*, *Pos/PosGH*, *IntPos/PosGH*, *MaiPNum/PosGH*, *Ini×TimDur/PosGH*, *Aut×PosMNum×Pos/PosGH*.

Table 6 Results of regression model

		Model
Dependent Variable	*TimDur/PosGH*	0.048^{*} (1.667)
	Pos/PosGH	0.316^{***} (3.680)
	TimRep/PosGH	0.112 (1.204)
	IntPos/PosGH	0.751^{***} (13.267)
	PosMNum/PosGH	-0.042 (-0.544)

MaiPNum/PosGH	-0.108** (-2.271)
Ini×TimDur/PosGH	-0.497*** (-4.778)
Aut×PosMNum×Pos/PosGH	0.486*** (8.497)
Hie×TimRep×IntPos/PosGH	-0.019 (-0.178)
PosTim×TimDur/PosGH	0.006 (0.128)
Independent Variable	*MemNum/PosGH*

Other three regression models stress the optimal relationship of structure characteristic between value of posting. The model 1 shows that the independent variable *Pos/PosGH* is significant associated with *MemNum/PosGH*, *TimRep/PosGH*, *IntPos/PosGH*, *MaiPNum/PosGH*, *Ini×TimDur/PosGH*, *Hie×TimRep×IntPos/PosGH*, *PosTim×TimDur/PosGH*. The model 2 shows that the independent variable *PosMNum/PosGH* is significant associated with *TimRep/PosGH*, *IntPos/PosGH*, *MaiPNum/PosGH*, *Aut×PosMNum×Pos/PosGH*, *Hie×TimRep×IntPos/PosGH*, *PosTim×TimDur/PosGH*. And the model 3 shows that the independent variable *MaiPNum/PosGH* is significant associated with *MemNum/PosGH*, *TimDur/PosGH*, *Pos/PosGH*, *PosMNum/PosGH*, *Ini×TimDur/PosGH*.

Table 7 Results of regression model

		Model 1		Model 2		Model 3
Dependent Variable	*MemNum/PosGH*	0.261*** (3.680)	*MemNum/PosGH*	-0.046 (-0.544)	*MemNum/PosGH*	-0.306** (-2.271)
	TimDur/PosGH	-0.002 (-0.086)	*TimDur/PosGH*	0.017 (0.583)	*TimDur/PosGH*	0.176*** (3.790)
	TimRep/PosGH	0.538*** (7.361)	*Pos/PosGH*	0.032 (0.341)	*Pos/PosGH*	0.529*** (3.656)
	IntPos/PosGH	-0.166** (-2.235)	*TimRep/PosGH*	0.539*** (6.190)	*TimRep/PosGH*	-0.100 (-0.634)
	PosMNum/PosGH	0.024 (0.341)	*IntPos/PosGH*	0.491*** (6.384)	*IntPos/PosGH*	0.192 (1.379)
	MaiPNum/PosGH	0.154*** (3.656)	*MaiPNum/PosGH*	0.255*** (5.566)	*PosMNum/PosGH*	0.668*** (5.566)
	Ini×TimDur/PosGH	0.882*** (12.346)	*Ini×TimDur/PosGH*	0.133 (1.151)	*Ini×TimDur/PosGH*	-0.469** (-2.549)
	Aut×PosMNum×Pos /PosGH	-0.012 (-0.183)	*Aut×PosMNum×Pos /PosGH*	0.539*** (9.370)	*Aut×PosMNum×Pos /PosGH*	-0.187 (-1.614)
	Hie×TimRep×IntPos /PosGH	-0.593*** (-7.095)	*Hie×TimRep×IntPos /PosGH*	-0.690*** (-7.243)	*Hie×TimRep×IntPos /PosGH*	0.234 (1.311)
	PosTim×TimDur /PosGH	0.188*** (4.350)	*PosTim×TimDur /PosGH*	-0.099* (-1.901)	*PosTim×TimDur /PosGH*	-0.100 (-1.185)
Independent Variable	*Pos/PosGH*		*PosMNum/PosGH*		*MaiPNum/PosGH*	

DISCUSSION

There are two uncorrelated tests had been done since a year ago being found the phenomenon of "structure" characteristic in disseminating and sharing of terrorism information through Interpersonal Information Platform(IIP), and further made sure what factors affect the "structure" characteristic and defined the structure cost to measure the structure characteristic playing a role on doing some latent terrorist businesses on IIP, finally explored the optimal relationship between the structure cost and value of posting in disseminating and sharing of terrorism information to some latent terrorist using by IIP.

The existence of "structure" characteristic in terrorism information dissemination. Terrorism groups on such Interpersonal Information Platform are common in disseminating and sharing of terrorism information being affected the "structure" characteristic. There are significant positive correlations between better "structure" superiority and more posts, more the number of members in this discussion(posting man number), as to prove the existence of "structure" character in transferring latent terrorist activities through IIP.

It is more obvious the "structure" characteristic impacts the dissemination of terrorism information in a group

gathered by dangerous men than in a QQ group gathered by normal men. As the same attack message announced in the QQ group gathered by dangerous men and gathered by normal men respectively, it is of higher value to the ratio on IIP gathered by dangerous men to gathered by normal men.

Using the $\dfrac{Pos}{MemNum} \sim \dfrac{PosGH}{PosMNum}$ **&** $\dfrac{PosGH}{PosMNum} \sim \dfrac{TimDur}{MaiPNum}$ **to judge the level of structure**. There are two indexes designed for measuring the level of structure on an IIP gathered by dangerous men to confirm the relativity of "structure" and poster activity, and compute the optimal average QQ member number in a type of QQ groups to maximize the ability of information dissemination. We can see if $\dfrac{Pos}{MemNum} > \dfrac{PosGH}{PosMNum}$ **&** $\dfrac{PosGH}{PosMNum} > \dfrac{TimDur}{MaiPNum}$, that presents non-structural character on this IIP that indicates it is not good for disseminating terrorism information, and $\dfrac{Pos}{MemNum} < \dfrac{PosGH}{PosMNum}$ **&** $\dfrac{PosGH}{PosMNum} < \dfrac{TimDur}{MaiPNum}$ shows the good structural character on this IIP on the contrary.

An "structure" of posting shows greater efficiency and more effectiveness in information disseminating on an IIP gathered by dangerous men. A post posted by a person widely cited by others turns up second floor, third floor, and going on to many floors, taking shape a hierarchic structure. (1)It points out that it is easier and faster to diffuse these pieces of negative messages or attack messages taking advantage of the good structure through IIP, but it is not the same as the diffusion of normal information. Hence, we can prohibit the behavior of cited posting in which a man posts a piece of negative or terrorism message to destroy the structure of posting, but it is not required to a man posting a piece of positive or affirmative message. (2)A person contributing to the "floor" structure discussion of negative messages has to spend more time to answer other posts in order to intensify the diffusion of messages, being called "structure cost". Therefore, one should bear the structure cost to keep the discussion active, and the more participants cited the post, the more structure cost should the initiator of posting fall on. So, we can further investigate the relationship between the structure cost and value of posting a piece of negative or terrorism message and then design the rule of posting on IIP to raise the structure cost exceeding the return from terrorism information dissemination in order to restrict the effect of latent terrorist using the IIP.

Properties of impacting on structure cost and value of posting. (1)It can be greater the influence of time of duration in posting to structure cost than the influence of time of duration in posting to value of posting both under taking a consideration of variety of $\dfrac{Pos}{PosMNum}$, where $SC > V$. (2)It is positive effect on the structure cost coming from these variables of "*Time of Duration*", "*Times of Repetition*", "*Interval Posts*", "*Main Participants Number*" under taking a consideration of variety of $\dfrac{PosMNum}{PosGH}$, where $SC > V$. (3)It is positive effect on the structure cost coming from these variables of "*Times of Repetition*", "*Interval Posts*" under taking a consideration of variety of $\dfrac{MaiPNum}{TimDur}$, where $SC > V$.

The optimal relationship of structure characteristic between value of posting. (1)To emphasize the structure characteristic from *Pos/PosGH*, we can enhance member numbers, times of repetition to key words, the number of main participants in this discussion, key words initiating from group host or main participants, and posting time, also reduce the number of interval posts to key words and group participants present hierarchy. (2)To emphasize the structure characteristic from *PosMNum/PosGH*, we can enhance member numbers, times of repetition to key words, the number of interval posts to key words, the number of main participants in this discussion, and group host or main participants are authority, also reduce group participants present hierarchy and posting time. (3)To emphasize the structure characteristic from *MaiPNum/PosGH*, we can enhance time of duration in this discussion, the number of posting, and posting man number, also reduce member numbers and key words initiating from group host or main participants.

CONCLUSION

This paper empirically examines a state to emerge objectively a "structure" characteristic in communicating with each latent terrorist on an Interpersonal Information Platform(IIP), and examines what factors lead to the "structure" characteristic intensified, drawing on two tests that guides the phenomenon of "structure" characteristic in disseminating and sharing of terrorism information through IIP of QQ group and NETEASE web portal from China. As the results of the tests highlight the Interpersonal Information Platform reinforcing the significant nature of structure cost in latent terrorist activities. The structure cost looks at the ability of latent terrorists imposing their costs to maximize their information dissemination using Interpersonal Information Platform. Therefore, the research results are informed of the administering authority could optimize the structure cost and value of posting to adjust the structure characteristic and behavior of posting in order to keep within limits in latent terrorist activities. An extended research to this paper goes to consummate the structure cost model and verify the variability of terrorist activities in disseminating terrorism information on IIP under the posting environment of vast quantities of information.

ACKNOWLEDGMENT

REFERENCES

[1]   Lai, B. (2007) '"Draining the swamp": an empirical examination of the production of international terrorism, 1968-1998', *Conflict Management and Peace Science*, Vol. 24, pp. 297-310.

[2]   Keohane, N. O. & Zeckhauser, R. J. (2003) 'The ecology of terror defense' *J. Risk Uncertainty*, Vol. 26, No. 2, pp. 201-229.

[3]   Pinker, E. J. (2007) 'An analysis of short-term responses to threats of terrorism', *Management Science*, Vol. 53, No. 6, pp. 865-880.

[4]   Adler, R. M. (2007) 'A dynamic social network software platform for counter-terrorism decision support', *Conflict Management and Peace Science*, Vol. 24, pp. 297-310.

[5]   Liang, A. Y., Low, M. Y. H., Lees, M. H., Cai, W. & Zhou, S. (2007) 'A framework of Intelligent Environment with Smart-active Objects (IESAO) for Flexible and efficient crowd simulation', *Conflict Management and Peace Science*, Vol. 24, pp. 297-310.

[6]   Weinstein, C., Campbell, W., Delaney, B., & O'Leary, G. (2009) 'Modeling and detection techniques for counter-terror social network analysis and intent recognition', Aerospace conference, 2009 IEEE, pp. 1-16.

[7]   Kengpol, A., & Neungrit, P. (2012) 'A prediction of terrorist distribution range radius and elapsing time: a case study in southern parts of Thailand', 2012 European Intelligence and Security Informatics Conference, pp. 180-188.

[8]   Gattiker, U. E., & Kelley, H. (1999) 'Morality and computers: Attitudes and differences in moral judgments', *Information Systems Research*, Vol. 10, No. 3, pp. 233-254.

[9]   Keep D., Piper I., Green A., Bunder R. (2011) 'Modelling of behaviours in response to terrorist activity', In F. Chan, D. Marinova & R. S. Anderssen (Eds.), 19th International Congress on Modelling and Simulation, pp. 475-481.

[10]   Keller, J. P., Desouza, K. C., & Lin, Y. (2010) 'Dismantling terrorist networks: Evaluating strategic options using agent-based modeling', *Technological Forecasting and Social Change*, Vol. 77, No. 7, pp. 1014-1036.

[11]   Fu, J., Chai, J., Sun, D., & Wang, S. (2012) 'Multi-factor analysis of terrorist activities based on social network', In *Business Intelligence and Financial Engineering (BIFE), 2012 Fifth International Conference on*, pp. 476-480.

[12]   Roels, G., & Su, X. (2013) 'Optimal design of social comparison effects: Setting reference groups and reference points', *Management Science*, Vol. 60, No. 3, pp. 606-627.

[13]   Van Alstyne, M., & Brynjolfsson, E. (2005) 'Global village or cyber-balkans? Modeling and measuring the integration of electronic communities', *Management Science*, Vol. 51, No. 6, pp. 851-868.

[14]   Manning, C., H. Schutz. (2000) *Foundations of Statistical Natural Language Processing,* MIT Press, Cambridge, MA.

[15]   Mookerjee, V., Mookerjee, R., Bensoussan, A. & Yue, W. T. (2011) 'When hackers talk: Managing information security under variable attack rates and knowledge dissemination', *Information Systems Research*, Vol. 22, No. 3, pp. 606-623.

[16]   Hosanagar, K., Fleder, D., Lee, D., & Buja, A. (2014) 'Will the global village fracture into tribes? recommender systems and their effects on consumer fragmentation', *Management Science*, Vol. 60, No. 4, pp. 805-823.

[17]   Falkenrath, R. (2000) 'Analytic models and policy prescription: Understanding recent innovation in counterterrorism', *Technical Report BCSIA Discussion Paper 2000-31*, John F. Kennedy School of Government, Harvard University.

[18]   Rothenberg, R. (2002) 'From whole cloth: Making up the terrorist network', *Connections*, Vol. 24, No. 3, pp. 36-42.

[19]   Carley K.M., Reminga J., Borgatti S. (2003) 'Destabilizing dynamic networks under conditions of uncertainty', In: IEEE KIMAS, Boston, MA, pp. 121-126.

[20]   Zhuang, W., Liu Z. (2013) 'Research on the Fitness with Industry Type and Interorganizational Information Systems Topological Structure Based on Structure Cost', *Operations Research and Management Science*, Vol. 22, No. 6, pp. 215-224.(in Chinese)

The Fourteenth International Conference on Electronic Business &

The First Global Conference on Internet and Information Systems, Taipei, December 8-12, 2014