The Influence of Religion and Gender on Information Security Problems in Cross-Cultural Environments

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Abstract

The purposes of this paper are to find whether religion and/or gender has relation with information security problems or not in cross-cultural environments and to know how they are related with each other. Analyzing the data collected by a comprehensive series of international surveys on problems related to information security management in 8 investee countries/community, this paper identifies serious potential problems and finds statistically which problem has relation with religion and/or gender. The data had been collected through Internet-based surveys from more than 1,000 local employees working for foreign companies. The most common problems is "unintentional sharing of confidential information." The problem of "using a previous company's confidential information" sits in the second position. Both of them are found to have relation with religion as well as gender. As far as these two problems are concerned, Buddhists are found to be the riskiest, especially women; women are 2 times as risky as men. This study may be the first empirical analysis of human-related problems of information security in relation to religion and/or gender in cross-cultural working environments.

Keywords

Religion, gender, human-related, information security, cultural difference, cross-cultural environment

1. Introduction

This study tries to find religious and gender influence on information security problems in cross-cultural environments in the context of globalization of economy and growing mutual dependency all over the world. This study handles human-related problems concerning information security management (ISM) in foreign companies. Many foreign companies dispatch managers to their oversea subsidiaries from their home countries. Some of these managers are not so interested in the local culture. In the mean time, their headquarters pushes them to implement security policies based on their headquarters' to protect their business information such as trade secrets. There may arise information security problems due to cultural differences between foreign managers and their local employees. Asai and his co-researchers (2009, 2010, and 2011) have conducted a comprehensive series of international surveys encompassing 8 investee countries and 12 investor countries. They have collected more than 1,000 responses from them. This paper discusses the relations between serious problems and religion as well as gender.

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2. Cultural dimensions

There are a wide variety of theories concerning cultural differences, such as those proposed by Hall (1976), Straker (2002), Hofstede (2004) and House (2004). This research has adopted the Hofstede's framework because his framework is the most comprehensive about how the sense of values in workplaces is influenced by culture and because he analyzed a large database which covered almost all the major countries. Based on the cultural data collected, Hofstede identified five cultural dimensions (CD) and graded 74 countries on indices for each dimension. Yates (2006) interpreted and summarized Hofstede's definitions which are briefly illustrated in Table 1.

Cultural dimension	Characteristics	
	High	Low
Power Distance Index (PDI)	Some individuals wield larger power than others.	All people should have equal rights.
Individualism (IDV)	Ties between individuals are loose.	Ties between individuals are tight.
Masculinity (MAS)	Managers are decisive and assertive.	Managers strive for consensus.
Uncertainty Avoidance Index (UAI)	Many rules and resistance to change.	Few rules and high tolerance of deviant ideas.
Long Term Orientation (LTO)	Persistence and a sense of shame.	Bottom-line oriented.

Table 1 Hofstede's Cultural Dimensions

3. Research method

3.1. Assumption

Cultural gap between foreign managers and their local employees

Foreign managers in foreign companies may face problems in implementing their information security policy if there is a cultural gap between an investee country and an investor country and if foreign managers are not aware of this gap.

Potential and Severity

The word "potential" in this paper means probability of occurrence. On the other hand, the word "severity" in this paper means empirically surveyed potential dependent on the number of employees who give affirmative answers to the questions which may trigger related problems. The more employees with affirmative

answers are there, the higher the potential is as far as human-related problems are concerned. At the same time, the more employees with affirmative answers are there, the severer the concerned problem is when it takes place. Thus it is natural to understand that both potential and severity are dependent on the number of affirmative answers.

3.2. Approach

1. Set potential problems based on Hofstede's scores and analyzers' experience.
2. Develop questions related to each potential problem, based on Hofstede's study (2004) and attach basic questions such as religion and gender.
3. Poll local employees working for foreign companies.
4. Evaluate severities of the problems.
5. Select serious problems.
6. Find their relations with religion and gender.

4. Chronology and profile of surveys

This study is based on the data collected by a comprehensive series of international surveys on ISM-related problems in 8 countries / community. They are Malaysia, Thailand, Venezuela, the East African Community (EAC), Brazil, India, China and Russia. Malaysia and Thailand were picked up as precedent examples of investee countries in ASEAN; Venezuela and the EAC were selected as example of suppliers of natural resources; Brazil, India, China and Russia, or BRICs were chosen as rising countries which attract investment. All of them were taken up as visited investee countries. The surveys were carried out in order to evaluate the severity of potential problems due to cultural differences in foreign companies in those countries. The visiting investor countries concerned were more than 12 countries including Japan, US and UK. The series of surveys started in Malaysia in March 2008 and ended in Russia in June 2010. More than 1,000 respondents answered the questionnaires.

Problem Number	MYS	THA	VEN	EAC	BRA	IND	CHN	RUS	Total
①	-	255	-	30	61	151	186	152	835
②	140	255	-	30	61	151	186	152	975
③	140	255	59	30	61	-	186	-	731
④	-	-	59	30	61	151	186	-	487
⑤	-	255	59	30	61	151	186	-	742

Table 2 Distribution of respondents – problems and surveyed countries

Table 2 shows the distribution of respondents across the countries surveyed. Once a problem is taken up, all the related surveyed countries are picked up so that we may obtain the higher reliability of the analysis of influence as widely as possible.

Religion	MYS	THA	VEN	EAC	BRA	IND	CHN	RUS	Total
Christian	15	13	52	Not asked	58	18	11	143	310
Muslim	89	2	-	Not asked	-	12	-	3	106
Hindu	6	-	-	Not asked	-	120	-	-	126
Buddhist	27	239	4	Not asked	-	-	49	2	321
Atheist	1	-	2	Not asked	-	-	124	4	131
Others	2	1	1	Not asked	3	1	2	-	10
Total	140	255	59	30	61	151	186	152	1034

Table 3 Distribution of respondents – religion and surveyed countries

Table 3 shows the distribution of respondents across the religions and the surveyed countries. In the survey in the EAC, religions were not asked. We can see that the proportion of religions of Malaysia seems to be natural if we assume that Chinese Malaysians are mainly Buddhists and Christians. The religious proportion looks like the proportion of ethnic groups in Malaysia. This sample can be judged good as far as the dominant religions are concerned.

Table 4 shows the distribution of respondents' gender. As we focused on workers, the proportion of gender is male-oriented in most countries. This does not seem to be a problem because they represented environments in their workplaces.

Gender	MYS	THA	VEN	EAC	BRA	IND	CHN	RUS	Total
Male	80	91	34	Not asked	46	113	102	97	563
Female	60	164	25	Not asked	15	36	84	43	427
Not Answered	-	-	-	30	-	2	-	12	44
Total	140	255	59	30	61	151	186	152	1034

Table 4 Distribution of respondents – gender and surveyed countries

5.   Relations with religion and gender

5.1. Selection of serious problems

Based on Hofstede's framework of culture and interviews of local employees working for foreign companies, we developed a basic list of potential problems in March 2008. We customized the basic list to adapt to each investee country every time we started each survey. In analyzing the result, problems for which more than 50% of their respondents gave affirmative answers were considered as serious. Table 5 lists the numbers of problems surveyed, the most and the second most serious problems with their severities in percentages of answers agreeing to their occurrence (affirmative answers), and newly given codes in conjunction with the codes shown in Table 6. Table 6 is a list of serious problems condensed and integrated by eliminating duplicated problems listed in Table 5.

Investee Countries	Total number of problems	Severity	Affirmative Answers (%)	Problems	Code
MYS	8	Primary	100.0	Unintentional sharing of confidential information.	②
		Secondary	92.9	Lower priority to information security policy.	③
THA	10	Primary	99.2	Using previous company's confidential information.	⑤
		Secondary	96.7	Unintentional sharing of confidential information.	②
VEN	7	Primary	83.1	There is a tendency to place lower priority to rules rather than friendship or feelings.	③
		Secondary	67.8	There is a tendency for employees to use any means to reach goals owing to high competitiveness.	④
EAC	11	Primary	100.0	Using previous company's confidential information.	⑤
		Secondary	93.3	Unintentional sharing of confidential information.	②
BRA	9	Primary	95.1	Using previous company's confidential information.	⑤
		Secondary	86.9	Using any means to reach goals owing to high competitiveness.	④
IND	8	Primary	84.8	Unintentional sharing of confidential information.	②
		Secondary	79.5	Using previous company's confidential information.	⑤
CHN	8	Primary	93.5	Using any means to reach goals owing to the high competitiveness.	④
		Secondary	91.4	Lower priority to information security policy.	③
RUS	8	Primary	93.4	Unintentional sharing of confidential information.	②
		Secondary	60.5	Concealing faults made by friends.	①

Table 5 Serious Problems of each Investee Country

5.2. Analysis of influences of religion and gender

Table 6 also shows the related CD, the relations with religion and gender, and the numbers of countries with the risk concerned. From Table 5 and Table 6, we can see that:

1. There is no serious problem in the most or the second most serious problems concerning PDI.

2. Except for Problem ①"Concealing faults made by friends.", the most or the second most serious problems are common in several countries.

3. All the most or the second most serious problems are related with religion.

4. Problem ①"Concealing faults made by friends", Problem ②"Unintentional sharing of confidential information." and Problem ⑤"Using previous company's confidential information." are related with gender as well.

Code	Serious Problems	CD	Relation / Significance Level		Number of Risk Countries
			Religion	Gender	
①	Concealing faults made by friends.	IDV	1%	1%	1
②	Unintentional sharing of confidential information.	IDV	1%	5%	5
③	Lower priority to information security policy.	UAI	1%	NR	3
④	Using any means to reach goals owing to high competitiveness.	MAS	1%	NR	3
⑤	Using previous company's confidential information.	LTO	1%	1%	4

Note: NR: Not related

Table 6 Serious Problems and their Relations with Religion and Gender

(%) $n = 798$

① Concealing faults made by friends.	Religion **					Total
	Christian	Muslim	Buddhist	Hindu	Atheist	
Affirmative	17.5	1.4	33.1	11.7	14.5	78.2
Not affirmative	12.9	0.8	3.3	3.4	1.5	21.8
Total	30.5	2.1	36.3	15.0	16.0	100.0
Magnification (Ratio)	1.4	1.8	10.2	3.4	9.7	3.6

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1% significance level

Table 7 Relation between Problem ① and Religion

The statistical test of independence in cross tabulation has proved that Problem ①"Concealing faults made by friends." is related with religion and gender with 1% significance level. Table 7 shows the relation between this problem and religion.

This table tells us that Buddhists and atheists are highly affirmative to support this problem. The Buddhist's magnification is 3 times as high as the Hindu's magnification, 7 times as high as the Christian's, and 6 times as high as the Muslim's. There is only one country which has this problem in the top position or the second position in severity. It is Russia while there are 6 countries where this problem was surveyed. They are Thailand, the EAC, Brazil, India, China and Russia.

Table 8 shows the relation between this problem and gender. Women's magnification is 2.3 times as high as men's. This implies that women live in higher context culture than men. More women conceal faults made by their friends than men. Buddhist women do more than the others.

(%) $n = 791$

① Concealing faults made by friends.	Gender **		Total
	Male	Female	
Affirmative	41.0	37.0	78.0
Not affirmative	15.8	6.2	22.0
Total	56.8	43.2	100.0
Magnification (Ratio)	2.6	6.0	3.5

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1% significance level

Table 8 Relation between Problem ① and Gender

The statistical test of independence in cross tabulation has proved that Problem ②"Unintentional sharing of confidential information." is related with religion and gender with 1% and 5% significance levels, respectively. Problem ② is based on IDV as Problem ① is. This problem was surveyed in Malaysia, Thailand, the EAC, Brazil, India, China and Russia. Table 9 shows the relation between this problem and religion. This table tells us that Buddhists are highly affirmative to support this problem. The Buddhist's magnification is 1.8 times as high as the Muslim's magnification and some 3 times as high as the Christian's. These seem to be natural if the Christian, the Muslim and the Buddhist live in individualistically in this order. There are 5 countries which have this problem in the top position or the second position in severity. They are Malaysia, Thailand, the EAC, India and Russia.

(%) $n = 937$

② Unintentional sharing of confidential information.	Religion **					Total
	Christian	Muslim	Buddhist	Hindu	Atheist	
Affirmative	25.1	10.7	32.8	11.8	11.4	91.8
Not affirmative	2.5	0.6	1.1	1.6	2.5	8.2
Total	27.5	11.3	33.8	13.4	13.9	100.0
Magnification (Ratio)	10.2	16.7	30.7	7.4	4.7	11.2

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1％significance level

Table 9 Relation between Problem ② and Religion

(%)   *n* = 931

② Unintentional sharing of confidential information.	Gender *		Total
	Male	Female	
Affirmative	51.1	40.6	91.7
Not affirmative	5.7	2.6	8.3
Total	56.8	43.2	100.0
Magnification (Ratio)	9.0	15.8	11.1

Note: Magnification: Affirmative answers / Not affirmative answers,
* 5% significance level

Table 10 Relation between Problem ② and Gender

Table 10 shows the relation between this problem and gender. Women's magnification is 2 times as high as men's. This implies that women live in higher context culture than men. They may chat and share information with their friends. Buddhist women do more than the others.

The statistical test of independence in cross tabulation has proved that Problem ③"Lower priority to information security policy." is related with religion with 1% and not related with gender. Problem ③ is based on IDV, UAI and MAS. This problem was surveyed in Malaysia, Thailand, Venezuela, the EAC, Brazil and China. Table 11 shows the relation between this problem and religion. This table tells us that Muslims are highly affirmative to support this problem. The Muslim's magnification is 7 times as high as the Christian's magnification and almost 2 times as high as the Buddhist's. There are 3 countries which have this problem in the top position or the second position in severity. They are Malaysia, Venezuela and China.

(%)   *n* = 692

③ Lower priority to information security policy.	Religion **					Total
	Christian	Muslim	Buddhist	Hindu	Atheist	
Affirmative	16.6	12.6	42.8	0.4	16.6	89.0
Not affirmative	4.9	0.6	3.3	0.4	1.7	11.0
Total	21.5	13.2	46.1	0.9	18.4	100.0
Magnification (Ratio)	3.4	21.8	12.9	1.0	9.6	8.1

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1% significance level

Table 11 Relation between Problem ③ and Religion

The statistical test of independence in cross tabulation has proved that Problem ④"Using any means to reach goals owing to high competitiveness." is related with religion with 1% and not related with gender. Problem ④ is based on MAS. This problem was surveyed in Brazil, Venezuela, the EAC, India and China. Table 12 shows the relation between this problem and religion. This table tells us that atheists are highly affirmative to support this problem. Atheists' magnification is 12 times as high as the Muslim's magnification, 5 times as high as the Christian's, and 2 times as high as the Buddhist's. This order is interesting. The longer the history of a religion is, the looser its binding of people's mind seems to be. There are 3 countries which

have this problem in the top position or the second position in severity. They are China, Brazil and Venezuela.

(%) $n = 450$

④ Using any means to reach goals owing to high competitiveness.	Religion **					Total
	Christian	Muslim	Buddhist	Hindu	Atheist	
Affirmative	23.8	1.6	10.4	16.2	26.4	78.4
Not affirmative	7.1	1.1	1.3	10.4	1.6	21.6
Total	30.9	2.7	11.8	26.7	28.0	100.0
Magnification * (Ratio)	3.3	1.4	7.8	1.6	17.0	3.6

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1％significance level

Table 12 Relation between Problem ④ and Religion

The statistical test of independence in cross tabulation has proved that Problem ⑤"Using previous company's confidential information." is related with religion and gender with 1% significance level. This problem was surveyed in Thailand, the EAC, Venezuela, Brazil, India and China. Table 13 shows the relation between this problem and religion. This table tells us that Buddhists and atheists are highly affirmative to support this problem. The Buddhist's magnification is 5 times as high as the Hindu's magnification, 7 times as high as the Christian's, and 14 times as high as the Muslim's. This profile looks like that of Problem①. There are 4 countries which have this problem in the top position or the second position in severity. They are Thailand, the EAC, Brazil and India.

(%) $n = 704$

⑤ Using previous company's confidential information.	Religion **					Total
	Christian	Muslim	Buddhist	Hindu	Atheist	
Affirmative	16.8	1.3	39.9	14.2	16.2	88.4
Not affirmative	4.8	0.7	1.6	2.8	1.7	11.6
Total	21.6	2.0	41.5	17.0	17.9	100.0
Magnification (Ratio)	3.5	1.8	25.5	5.0	9.5	7.6

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1％significance level

Table 13 Relation between Problem ⑤ and Religion

Table 14 shows the relation between this problem and gender. Women's magnification is twice as high as men's. This implies that women live in long-term oriented culture than men. More women use previous company's confidential information more than men. Buddhist women do more than the others.

(%) $n = 710$

⑤ Using previous company's confidential information.	Gender **		Total
	Male	Female	
Affirmative	46.2	42.1	88.3
Not affirmative	8.2	3.5	11.7
Total	54.4	45.6	100.0
Magnification (Ratio)	5.7	12.0	7.6

Note: Magnification: Affirmative answers / Not affirmative answers,
** 1％significance level

Table 14 Relation between Problem ⑤ and Gender

6. Conclusions and future work

From the findings mentioned above concerning cross-cultural environments, it can be concluded that:

1. No highly potential PDI-based problem is found.

2. The most geographically common serious problems are "Unintentional sharing of confidential information.", "Using previous company's confidential information." and "Lower priority to information security policy." These are followed by Problem "Using any means to reach goals owing to high competitiveness." which is followed by Problem "Concealing faults made by friends."

3. All of the above mentioned problems are related with religion with 1% confidence level.

4. As far as religious influence is concerned, the shorter the history of a religion is, the stricter it seems to be.

5. Only 3 out of the above mentioned problems are related with gender. They are "Concealing faults made by friends.", "Using previous company's confidential information." with 1% significance level and "Unintentional sharing of confidential information." with 5% significance level.

6. As far as the IDV-based problems, "Concealing faults made by friends." and "Unintentional sharing of confidential information." , and the LTO-based problem "Using previous company's confidential information." are concerned, Buddhists are the riskiest, especially women. Women are 2 times as risky as men.

7. Gender influences IDV-based problems and LTO-related problems only. Women are riskier than men. This sounds natural if women live in high context culture and long-term oriented culture more than men.

Taking these results into account, we can reduce the security risk of our information assets existing in our overseas subsidiary companies. This helps us expand our business globally.

It is interesting to know whether the results obtained in this study still hold true or not in more general environment not limited to cross-cultural environment. This is worth studying as future work.

7. References

Asai, T. and Fernando, S. (2011), "Human-Related Problems in Information Security in Indian Cross-Cultural Environments*", Journal of the Japan Society of Security Management* (Submitted on Oct. 5, 2010, under review)

Asai, T., Fernando, S. and Castillo, J. (2011), "Human-Related Problems in Information Security in Russian Cross-Cultural Environments", *International Journal of Japan Association for Management Systems*. (Submitted on Jan. 28, 2011, under review)

Asai, T. and Hakizabera, A.U. (2010-a), "Empirical Analysis of Human-Related Problems of Information Security in Cross-Cultural Environments -The Case of the East African Community-", *Proceedings of the Forth International Symposium on Human Aspects of Information Security & Assurance* (HAISA 2010).

Asai, T. and Hakizabera, A.U. (2010-b), "Human-Related Problems of Information Security in East African Cross-Cultural Environments", *Information Management and Computer Security*, Vol. 18, No. 5, 328-338.

Asai, T., Siripukdee, S., Waluyan, L., Noguera, S. (2009), "Potential Problems on Information Security Management in Cross -Cultural Environment – A Study of Cases of Foreign Companies including Japanese Companies in Thailand –", *International Journal of Japan Association for Management Systems,* Vo1. No.1, September 2009, 91-100.

Castillo, J., Waluyan, L., Asai, T. (2009), "Analysis of Potential Problems in People Management concerning Information Security in Cross-cultural Environment – A Study concerning Foreign Companies including Japanese Companies in Venezuela –", *Journal of Japan Association for Management Systems* Vol. 25, No.2, March 2009, 13-19.

Hall, E.T. (1976), *Beyond culture*, Anchor Books, New York, ISBN: 978-0385124744.

Hofstede, G. and Hofstede, G.J. (2004), *Cultures and organizations: software of the mind,* McGraw-Hill, New York, ISBN: 978-0071439596.

House, R.J. (2004), *Culture, leadership, and organizations, the GLOBE study of 62 Societies*, Sage Publications, California, ISBN: 978-0761924012.

Siripukdee, S., Waluyan, L., Noguera, S., Asai, T. (2010), "Empirical Analysis of Human-related Problems on Information Security in Cross-cultural Environment -Focusing on Japanese Companies in Thailand-", *Journal of Information and Management*, Vol.30, No.4, April 2010, 96-106.

Straker, D. (2002), "Trompenaars' four diversity cultures", http://changingminds.org/explanations/culture/trompenaars_four_cultures.htm (Accessed 20 September 2008)

Waluyan, L., Blos, M., Noguera, S., Asai, T. (2010), "Potential Problems in People Management concerning Information Security in Cross–cultural Environment －The Case of Brazil－", *Information Processing Society of Japan*, Journal Vol.51, No.2, February 2010, 613-623.

Waluyan, L., Siripukdee, S., Noguera, S., Asai, T. (2009), "Analysis of Potential Problems in People Management concerning Information Security in Cross–cultural Environment –In the Case of Malaysia–", *Proceedings of the 3rd International Symposium on Human Aspects of Information Security & Assurance* (HAISA 2009), ISBN978-1-84102-231-4, 13-24.

Yates,M.(2006), "Cultural differences", http://www.leadervalues.com/content/detail.asp? contentDetaillD-255&Type= More (Accessed 02 December 2008).