Web-based Thai Modifiers Study for Noise Annoyance Scales in Thailand

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ABSTRACT

The development of noise annoyance scales in Thai Language has been launched during March-September in 2013 using the paper-based Thai modifiers study, following the ICBEN method in Thailand. The 400 responds of paper-based Thai modifiers questionnaires were taken from mainly Bangkok and its vicinities. Some of responds came from other provinces in other sub-regions. Since September 2013, the web-based Thai modifiers study questionnaire form has been designed using web applications software. It has been launched on-line to collect the data in the middle of December 2013. The web-based form using web application will be beneficial technique to remotely get data through the internet access area with low budget on the paperless of data collection to take the mass volume of samples. The progress of the web-based Thai modifiers study will be summerized in this paper.

INTRODUCTION

Noise annoyance is one of the top ranking of environmental pollution in Thailand since 1992, reported by the environmental quality report of Thailand. (PCD 2013) The revised version of the second wave of the National Environmental Law in 1992 set new standards of environmental noise policies and law entering into force since then. Transportation noise, concluded by PCD is mostly contributed to the environmental noise levels in Thai society.

In order to investigate the noise situation root cause of noise annoyance, Thai modifiers study has conducted since early of 2013 using the ICBEN method including experiences of modifiers study in other countries—i.e. Japan, China, Vietnam, etc. (J.M.Fields, R.G.de Jong & T.Gjestland et al 2001, T.Yano, J.Igarashi & J.Kaku et al 2002, T.Yano and Hui Ma 2004)

The ICBEN method using the 21-English modifiers were applied to design the study in Thai language version of the form. The material for Thai modifiers test form was prepared by word selection in consultation with linguistics and noise researchers in Thailand in early 2013. The Thai modifiers were selected from pools of modifiers, collecting from the literature in the written Thai language by author in comparison of the English modifiers to prepare the form. During the discussion of words selection and pre-test of taking a test form by researchers, the web-based technique was initially recommended to apply for this study in the future.

METHODS

Word Selection

The ICBEN method of noise annoyance scale is applied to this study. The 21-English modifiers used in ICBEN study are shown in Figure 1. The material for Thai modifiers survey form is prepared by stepwise procedures: the wording selection, the consultation with linguistics expert, lawyer, and noise researchers in Thailand, the construction of the modifiers survey form in Thai language of the paper-based development since early of 2013.

Not at all bothered or annoyed NA	Somewhat bothered or annoyed SW	Very bothered or annoyed VY
Barely bothered or annoyed BA	Fairly bothered or annoyed FY	Highly bothered or annoyed HY
Insignificantly bothered or annoyed IF	Moderately bothered or annoyed MO	Strongly/ bothered or annoyed ST
Hardly bothered or annoyed HA	Significantly bothered or annoyed SI	Importantly bothered or annoyed IM
A little bothered or annoyed AL	Rather bothered or annoyed RA	Severely bothered or annoyed SE
Slightly bothered or annoyed SL	Considerably bothered or annoyed CN	Extremely bothered or annoyed EX
Partially bothered or annoyed PA	Substantially bothered or annoyed SU	Tremendously bothered or annoyed TR

Figure 1: The 21 English modifiers

ไม่รบกวน หรือไม่ทำให้รำคาญเลย NA	รบกวนบ้าง หรือทำให้รำคาญบ้าง SW	รบกวนอย่างมาก หรือ ทำให้รำคาญอย่างมาก VY
แทบจะไม่รบกวน หรือ แทบจะไม่ทำให้รำคาญ BA	รบกวนพอประมาณ หรือทำให้รำคาญพอประมาณ FY	รบกวนอย่างสูง เต็มที่/ หรือทำให้รำคาญอย่างสูงเต็มที่/ HY
ไม่น่าจะรบกวน หรือ ไม่น่าจะทำให้รำคาญ IF	รบกวนพอสมควร หรือทำให้รำคาญพอสมควร MO	รบกวนอย่างแรงกล้า หรือทำให้รำคาญอย่างแรงกล้า ST
เกือบจะไม่รบกวนเลย หรือ เกือบจะไม่ทำให้รำคาญเลย HA	รบกวนมากจริงๆ หรือ ทำให้รำคาญมากจริงๆ SI	รบกวนเหลือเกิน หรือ ทำให้รำคาญเหลือเกิน IM
รบกวนนิดหน่อย หรือ ทำให้รำคาญนิดหน่อย AL	ค่อนข้างจะรบกวน หรือ ค่อนข้างจะทำให้รำคาญ RA	รบกวนอย่างรุนแรง หรือ ทำให้รำคาญอย่างรุนแรง SE
รบกวนเล็กน้อย หรือ ทำให้รำคาญเล็กน้อย SL	ถือว่ารบกวน หรือ ถือว่าทำให้รำคาญ CN	รบกวนอย่างมากที่สุด หรือ ทำให้รำคาญอย่างมากที่สุด EX
รบกวนบ้างเหมือนกัน หรือทำให้รำคาญบ้างเหมือนกัน PA	รบกวนเหลือประมาณ หรือทำให้รำคาญเหลือประมาณ SU	รบกวนอย่างยิ่งยวด หรือ ทำให้รำคาญอย่างยิ่งยวด TR

Figure 2: The 21 Thai modifiers

Construction of the Thai Modifiers Study Form

The ICBEN survey form is applied to develop the Thai modifiers survey form. The form is prepared in Thai language. The 21 Thai modifiers are shown in Figure 2. The Thai modifiers study form are including of the 34 pages. There is including with six steps for taking a survey form by the respondents as shown in Figure 3.

The Paper-based Thai Modifiers Study

The 10 paper-based surveyed form of Thai modifiers study were distributed to do the preliminary test by linguistics expert, researchers, and staffs. There were some of observations from the first takers to add an instruction page to guide the expecting respondents to more easily take the survey and get the better understanding of the test. Many of them critiqued the format of the paper-based surveyed form and number of pages. They recommended to apply the web-based technique for future study.

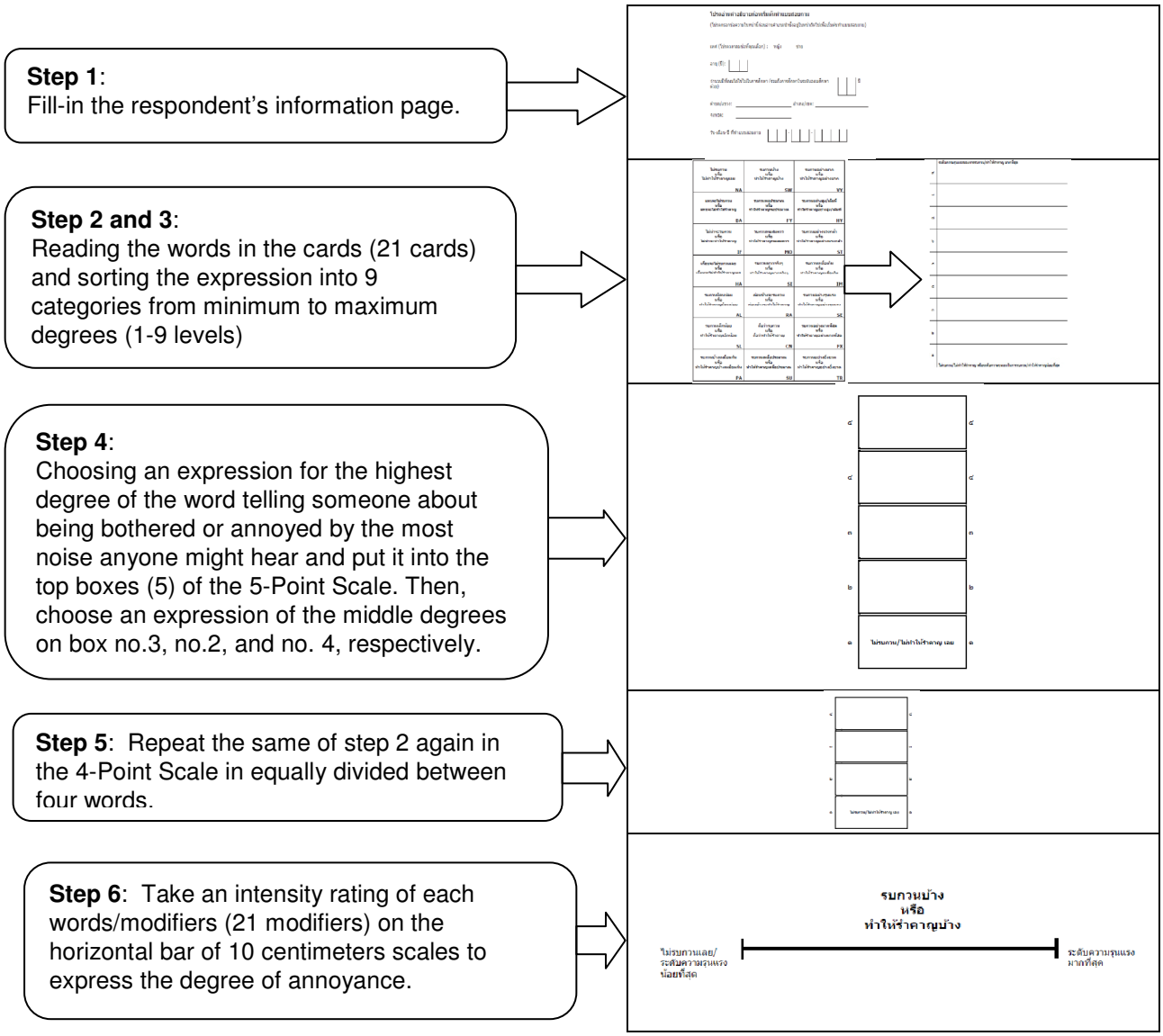

Figure 3: Six steps of taking a Thai modifiers study

The designed sample size of the respondents is divided into six sub-regions in Thailand: North, Northeast, East, West, South, Central with Bangkok and its Vicinities. Their age vary from 15s-60s with the balanced of sex: male and female. The designed sample size is about 1,200 samples from the whole country. The paper-based surveyed forms are designed to be distributed by hand to the expecting respondents.

The 800 paper-based copies of Thai modifiers study form were distributed to collect the data during February-June of 2013 by hand. The 400 paper-based copies were received from the respondents mainly in Bangkok and its vicinities. There were some of respondents from the province. We are still far away from the target sample size from the whole country. (K.Lertsawat, I.Yamada & T.Yano, et al 2013)

Development of the Web-based Thai Modifiers Study

The web-based Thai modifiers study has initally discussed among Thai researchers and Japanese researchers to apply for the Thai modifiers study in Thailand since the beginning of the paper-based Thai modifiers study survey form since 2013. The web-

based will increase chance to get more responds from outside of Bangkok in the most of the internet access area. The main concept and methodology of the original ICBEN modifiers study survey form as well as Thai version are preserved as same as possible.

The paper-based Thai modifiers study form is applied for designing the web-based Thai modifiers study form using the web application technique. The user interface (UI) are designed the web-based interface to preserve the paper-based format to adopt the behavior of test takers and test taking situations of each users. The UI development apply the handle dynamic object to make a distributed cards in angle of – 5 to 5 degrees as same as the paper-based situation with easily reading by users. The stepwise of event management from each test takers will arrange by two conditions—user's interested cards state and status/position of each cards including its possible next status/position. The UI connect to users and control the events by j-Query through the library of javascript language. The web-based formation arrangement apply the PHP language that its design is controlled by Twitter Bootstrap library. The MySQL is used for data collection. The respondents will take a test of web-based form as similar as the paper-based form.

RESULTS

The Web-based Thai Modifiers Study Form

There are seven pages/steps of taking the web-base Thai modifiers study. The designed form using the web application have been developed, tested, revised, and launched on-line for gathering the Thai modifiers data from test takers at http://krittika.pomz.net/ThaiModifierStudy/questionnaire/seqi.php. It has been started since late December 2013. The examples of them are shown in Figure 4 to 13.

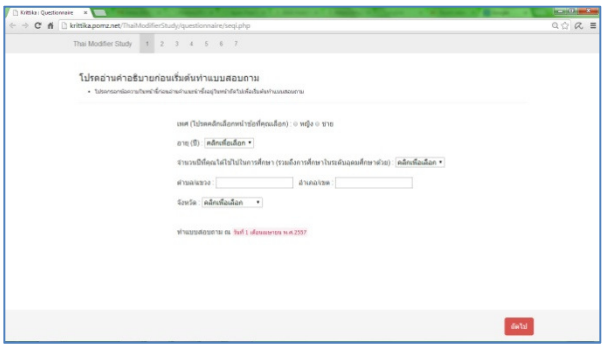

Figure 4: The web-based of the first page

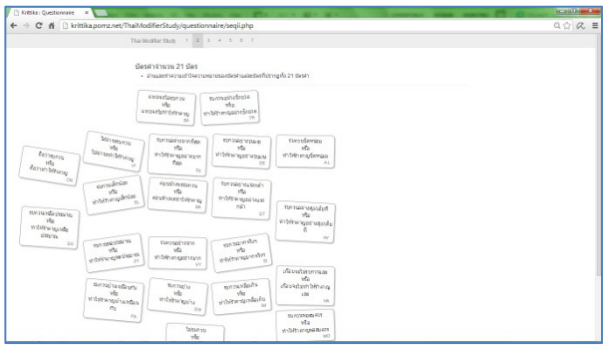

Figure 5: The 21 Thai modifiers cards

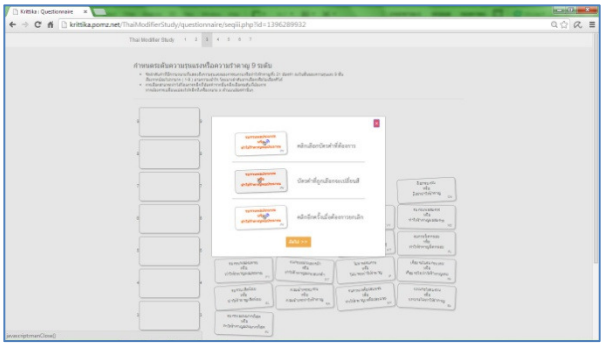

Figure 6: Instruction page for 9-point scale page

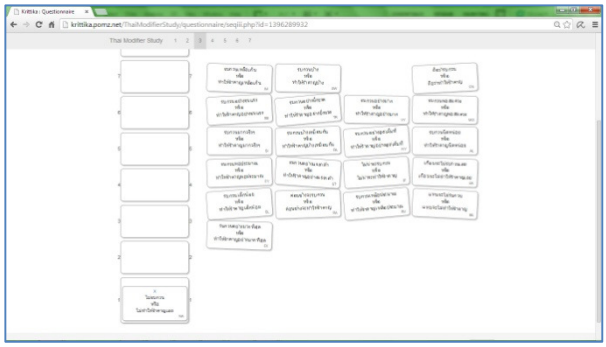

Figure 7: The 9-point scale page

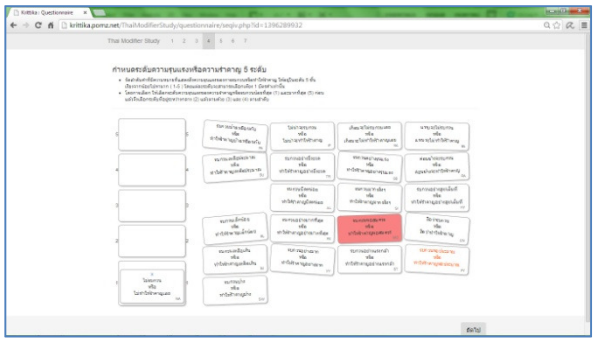

Figure 8: The 5-point scales page

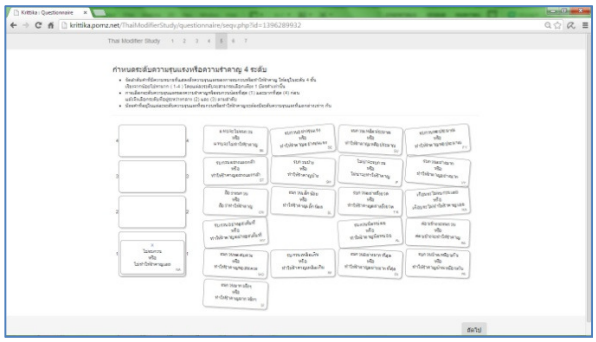

Figure 9: The 4-point scales page

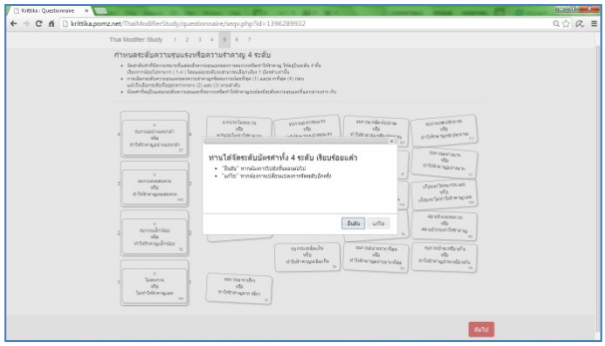

Figure 10: Confirm and records the data

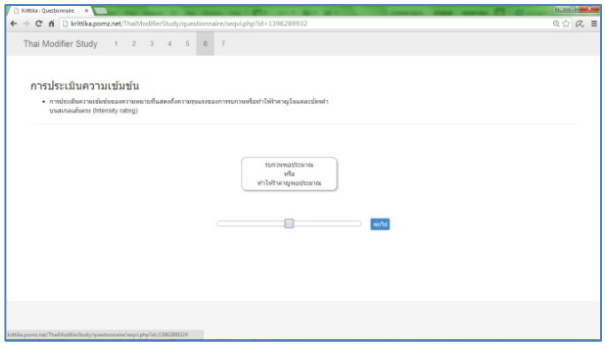

Figure 11: Intensity score page

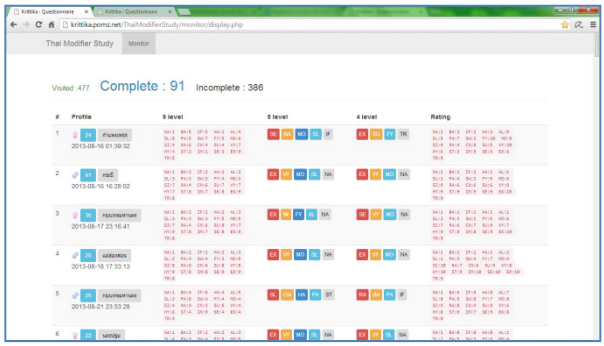

Figure 12: The monitoring page

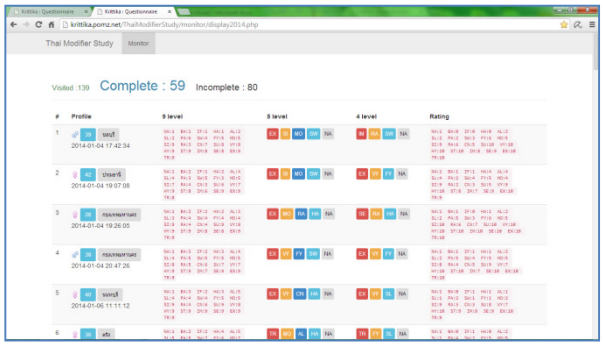

Figure 13: The monitoring page

The web applications will provide on-line monitoring page for tracking down the gathering data from each respondents by researcher. The monitoring page is shown in Figure 12 or at http://krittika.pomz.net/ThaiModifierStudy/monitor/display2014.php.

Although, the web-based technique will provide a paperless data collection of the modifiers study and reduce the time of data tally for analysis but there are many step to prepare for programming designs, testing, web accessing,etc. The preparation of web-based research will need to prepare budget for the web programming design, writing web application, web page airtime, internet access, etc.

Current Status of the Web-based Thai Modifiers Study

There are about 616 visitors to use the web-based Thai modifiers study on-line during late December 2013–beginning of April 2014. The are about 150 respondents in successing of taking the web-based Thai modifers. The 466 visitors cannot complete the web-based Thai modifiers test. The respondents numbers are shown in Table 1.

Observations from study

Some observations in various points of view, posting during late December 2013-early April 2014 are including the periods of taking a Thai modifiers test (over 30 minutes) are too long, the internet connecting speed are influences the responding time and stability of web page and its responds, there are too many steps to complete the test, some of test takers are not carefully reading the instruction, some of them left in idle during the test for too long periods when they go back to continue the page is hung over, when they do not read the instruction they are nobody to ask for answering their question during taking the test, some of them give up during the 9-point scale without reading instruction carefully, etc.

The web page URLs have distributed by e-mail or social media page (facebook, messenger, etc.) to colleagues, friends, researchers, university lecturers, alumni's web page, etc. In the begging of on-line distribution, there are some error in the programming language syntex making some visitors whom connect with slow rate of internet connection experiencing hanging page without any response and cannot go back to continue their test. That is the reason why the response rate is qute low in number in the beginning periods. The programmer took almost two month to fix this problem. The web-based Thai modifiers has been refreshed for collecting the data without any syntax error again in the middle of February 2014.

Althought, the web-based Thai modifiers study is so convenience to collect paperless data and reduce time to tally the data of respondents, but the programming design is not so easy to do in very short-term. There are some of computer-based syntax that programmers, researchers, testers, users/visitors, or else learing together to get familiar with its environment.

NEXT STEPS

Scale construction criteria for data analysis

The data analysis will be conducted in the future when the cummulating numbers of respondents will be about 1,200 samples, target sample size of the study. The web-based Thai modifiers study respondents will be added into the previous paper-based Thai modifiers study. Moreover, the selection of the response Thai modifiers will be compared between the paper-based technique and the web-based technique in the future.

The proposed scales using Thai modifiers from paper-based have been applied for designing social survey questionnaire form on airport noise annoyance study in Thailand. The more data set of respondents of Thai modifiers study will force to revise the proposed scales in the future, based on this study.

In the mean time, scale construction criteria for data analysis shall be prepared. In the intensity analysis is recommended by ICBEN method, the three criteria were used to determine the scale-point labels: the Equidistant Intensity, the Preference, and the Agreement.

The Equidistant intensity

The first criterion, the modifiers for the scale points should be close to the intensity score of 0, 25, 50, 75, and 100 on the scale of 100. Arithmetic mean and standard deviation of data collection in each modifier shall be calculated for the intensity score average and intensity score standard deviation, respectively. The index was Intensity Difference Score (I-C Delta) for example the difference between the modifier's mean

and the scale point's ideal intensity score (0, 25, 50, 75, or 100). (J.M.Fields, R.G.de Jong & T.Gjestland et al 2001, T.Yano, J.Igarashi & J.Kaku et al 2002, T.Yano and Hui Ma 2004)

The preference

The second criterion, the modifier should be selected at a particular scale point and not at the other points. The Net Preference score (P%) was used as the index. The P% is the net number of selections of the modifiers for a particular scale point divided by the total number of subjects. The net preference score may be negative if a word is chosen for more than two positions.(J.M.Fields, R.G.de Jong & T.Gjestland et al 2001, T.Yano, J.Igarashi & J.Kaku et al 2002, T.Yano and Hui Ma 2004)

The agreement

The third criterion, the Standard Deviation of the Intensity Score (StD) of each modifier. The StD of a modifier should be low. (J.M.Fields, R.G.de Jong & T.Gjestland et al 2001, T.Yano, J.Igarashi & J.Kaku et al 2002, T.Yano and Hui Ma 2004)

All of criteria will be applied for modifiers selection process of data collection from the field surveys. There are 15 steps to select the Thai modifier words for the answer scales. (Table 2) Finally, the only one modifier remained at each scales point.

Table 1: Respondents

Sub-region	Sex	Age (years)						
		<= 20	21-30	31-40	41-50	51-60	>60	Total
North	F	2	1	0	2	0	0	5
	M	3	3	2	3	0	0	11
	T	5	4	2	5	0	0	16
Northeast	F	1	11	0	1	0	0	13
	M	0	7	2	0	0	0	9
	T	1	18	2	1	0	0	22
East	F	0	0	0	0	0	0	0
	M	0	2	2	0	0	0	4
	T	0	2	2	0	0	0	4
West	F	0	10	0	0	0	2	12
	M	0	5	2	0	0	0	7
	T	0	15	2	0	0	2	19
South	F	0	2	2	3	0	2	9
	M	0	1	0	0	0	1	2
	T	0	3	2	3	0	3	11
Central, Bangkok and its vicinities	F	0	26	6	15	0	2	49
	M	0	17	8	2	2	0	29
	T	0	43	14	17	2	2	78

CONCLUSION

The web-based Thai modifiers study is an example to develop technique to collect the data in paperless approach to reduce time of data collection, increase number of respondents, particularly in remote area, facilitate better data analysis, etc. The web application technologies is common tools of communicating among people in present day around the world. Its may minimize cost of conducting research on noise annoyance and/or psycho-acoustics field of study in the future. The Thai modifiers study using web application will be improved in the near future, including the data

analysis functions. This study will also be very beneficial for comparative study among many languages in the future in Asian countries.

Table 2: Criteria to select modifiers

Pool formation stage	Step	Entrance criteria
BASE POOL	1	"Borderline" or higher investigator classification
LOW ACCEPTANCE POOL	2	P% ≧ 5% (Net preference score must be at least 5%)
	3	I-C Delta < 15 (Intensity score within 15 points of Intensity criterion)
	4	P% Delta < 20 (Preference score within 20% points of most popular remaining modifier's score)
	5	StD Delta < 15 (Standard deviation within 15 points of smallest remaining modifier's StD)
MIDDLE ACCEPTANCE POOL (10% pool)	6	I-C Delta < 10
	7	P% Delta < 15
	8	StD Delta < 10
HIGH ACCEPTANCE POOL (10%)	9	I-C Delta < 5
	10	P% Delta < 10
	11	StD Delta < 5
SINGLE RANKING POOL	12	Lowest IC-Delta Score
	13	Highest P% Score
	14	Lowest StD
FINAL JUDGEMENT	15	Judge > Borderline

ACKNOWLEDGEMENTS

We would like to give our sincere gratitude to Aviation Environment Research Center (AERC), Airport Environment Improvement Foundation (AEIF) of Japan for financial support on data collection of this project. The Thai modifiers study cannot be initiated without encouragement from many of Thai researchers, particularly Ms.Lalin Kovudhikulrungsri, Ms.Surocha Phoolsawat, Ms. Supaporn Malailoy, Dr.Prachaya Boonprasert, Ms.Nattaporn Ruengrtrith. We would like to thank Mr. Jaruwat Pailai, programmer for his fantastic tasks for us. We would like to thank all of respondents. We would like also thank AERC and EnLAW staffs for their support and patient.

REFERENCES

Pollution Control Department (2013), “Environmental Complaints Statistics” <http://www.pcd.go.th/info_serv/pol2_stat2555.html> access 28th February 2014. (in Thai language)

J.M.Fields, R.G. de Jong, T. Gjestland, I.H.Findell, R.F.S. Job, S. Kurra, P. Lercher, M. Vallet, T. Yano, R. Guski, U. Felscher-Suhr, and R. Schuemer (2001), “Standardized general purpose noise reaction questions for community noise surveys: research and a recommendation,” Journal of Sound and Vibration 242: 641-679.

T. Yano, J. Igarashi, J. Kaku, K. Kanda, T. Kaneko, S. Kuwano, Y. Nii, T. Sato, M. So, I. Yamada, Y. Yoshino (2002), International joint study on the measurement of community response to noise: construction of noise annoyance scale in Japanese, *Journal of Acoustical Society of Japan* 58: 101-110. (in Japanese)

Takashi Yano, and Hui Ma (2004), “Standardized noise annoyance scales in Chinese, Korean and Vietnamese,” Journal of Sound and Vibration 277: 583-588 .

Krittika Lertsawat, Ichiro Yamada, Takashi Yano, Lalin Kovudhikulrungsri, Supaporn Malailoy, and Surocha Phoolsawat (2013), “Initial of Noise Annoyance Scales Study for Preparation of the Social Survey around Airport in Bangkok” Inter-Noise 2013 Proceeding CD-Rom.