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Picture Frustration Study on Environmental Protection and Life Convenience around an Airport using Sentiment Analysis

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ABSTRACT

Studies for environmental protection around the airport have many ways to study the adverse impacts of various economic activities. The Picture Frustration Study is one method that can be applied to it. In this study, the 3-question cartoon of the Picture Frustration Study was distributed in the fieldwork to collect the data around the Bangkok International Airport in 2015. That dataset was used to assess the relationship between environmental protection and the convenience of life for the population living around the airport using sentiment analysis. We applied two strategies of sentiment analysis to interpret the response of the Picture Frustration Study, namely the RoBERTa and the WangchanBERTa. They are pre-trained language models for unsupervised language representation. The RoBERTa is a pre-trained English language model, while the WangchanBERTa is a pre-trained Thai language model. The similarity that results from both strategies is used to clarify the relationship between environmental protection and the convenience of life for the population living around the airport.

Keywords: Picture Frustration, Sentiment analysis, Aviation Environment

INTRODUCTION

There are several negative impacts of economic activity in the aviation industry, such as land use changes, environmental pollution in the vicinity of the airport, expansion of transportation capacity, urban development, etc. The airport development project will be a transportation hub. The international airport is a hub for changing modes of transportation from air transport to land transport or water transport. Those economic activities will raise many pollutants, including air emissions, noise, wastewater, hazardous wastes, etc. Pollution emissions are increased by changes in traffic volume that occur around an airport or air route.

In order to ensure that the airport services of the airport development project can occur continuously and that there are minimal obstacles caused by pollution management problems, there must be a study of the negative impacts caused by the services of the airport. The study takes special consideration of the pollution problems caused by aircraft operations in order to identify existing situations and appropriate mitigation and prevention measures. The quality of life and people's health in communities around the airport will be factors indicating the adverse impacts caused by the airport project. There are several methods that have been used to assess those adverse impacts. The Picture Frustration Study is one method that can be applied to it.

The Rosenzwig Picture Frustration Test, also known as the PF-study, was originally designed to assess personality traits by showing scenes depicting frustrating situations in cartoon characters and asking test takers to respond by reacting to their answers in the situations.[1] The PF-study was applied to the study of people's opinions about environmental protection, quality of life in terms of convenience in everyday life, and adverse impacts caused by the airport development project in Japan. It is later applied to a similar study of people's opinions around airports in Vietnam, too. The comparative study was published in 2020 [2].

PF-study gives people's opinions on a specific question in a verbal context. The questions in the PF-study questionnaire use cartoons that are minimally detailed enough to convey the context of the simulation situation so that respondents understand the question and can respond verbally. It is therefore very difficult to manually analyze the data in order to classify verbal opinions into individual answers, particularly with a large amount of data. The data analysis of the verbal dataset of people's opinions is challenging for the PF-study. In this study, natural language processing (NLP) is introduced to classify those verbal responses using state-of-the-art sentiment analysis techniques. The results will explain the people’s opinion of the environmental protection and life conveniences around Suvarnabhumi Airport.

METHODSb

This study introduces an NLP technique for categorizing verbal responses into three groups of opinions in PF-study. This is challenging in data processing in terms of both verbal context and the amount of information. The opinion expressed by the individual responding to the question in the PF-study cartoon questionnaire described the simulated situations. NLP is a subfield of artificial intelligence (AI) that deals with computational linguistics and modeling of human language using statistical, machine learning, and deep learning models. NLP primarily gives computers the ability to understand human text and spoken words, allowing them to communicate and interact with humans naturally. NLP includes many tasks, such as text generation, text classification, machine translation, speech recognition, sentiment analysis, etc. [3]

Sentiment Analysis

Transformers are language models that emerged in 2017 [4] and demonstrated their superiority over conventional methods in terms of both accuracy and efficiency in the machine translation task. More recently, Bidirectional Encoder Representations from Transformers (BERT) was proposed and became a popular language representation model based on the Transformer Architecture [5], which was designed to perform pretraining to produce bidirectional deep language representation from unlabeled text in an unsupervised manner. It is one of the most well-known applications of the models in text processing tasks, and the most prominent of these is machine translation.

Once the pretrained BERT model is constructed, it can be fine-tuned with an additional output layer on specific NLP tasks to achieve state-of-the-art performance. It is worth noting that the

pre-trained BERT is one of the pretraining approaches that can be pretrained on any general (large) text corpus and allow fine-tuning on a desired task, and this is beneficial for building a state-of-the-art language representation model when having limited data to directly train the other deep learning models for a specific task.

In this work, we utilize two optimized versions of the pre-trained BERT models, which are RoBERTa [6] and WangchanBERTa [7]. Specifically, RoBERTa and WangchanBERTa are both optimized versions of BERT, except that RoBERTa is the pre-trained BERT model trained on an English corpus, while WangchanBERTa was pretrained using a native Thai corpus. We then proceed to the fine-tuning phase for the sentiment analysis modeling to understand the unannotated verbal responses in the PF-study once the pre-trained models have been obtained.

For RoBERTa, the cardiffnlp Twitter RoBERTa base-sentiment model was employed to interpret verbal responses using the transformers library of Python. The Softmax function was then used to enumerate the weighted average for returns of negative, neutral, and positive prediction scores. For WangchanBERTa, the pretrained model's architecture is based on RoBERTa [6]. The wangchanberta-base-att-spm-uncased model was utilized for multiclass text classification. The wisesight_sentiment dataset is based on social media posts, including tweets, for four classes of text classification, such as positive, neutral, negative, and question.

In this study, we used two pre-trained language models to implement the PF-study response. Because we did not have the actual expression scale from a PF-study to generate a trained language model, two pre-trained language models, RoBERTa and WangchanBERTa, were used in the PF-study to understand the relationship between environmental protection and the convenience of life for the population living around the airport.

The RoBERTa model is a robustly optimized BERT pretraining approach for sentiment analysis [8]. BERT is a Bidirectional Encoder Representations from Transformer for unsupervised language processing that is based on neural network technique in language representation pre-trained text data. This model trained on approximately 124 million tweets from January 2018 to December 2021 and was fine-tuned for sentiment analysis with the TweetEval benchmark. It is suitable for English language [9]. That means the model accepts input text in English, and the output of the model represents labels on a negative, neutral, or positive scale. Because the PF-Study response is in Thai, then we create a text translation from Thai to English using PyThaiNLP before applying the RoBERTa model for sentiment analysis. The WangchanBERTa model is a pretraining transformer-based Thai language mode [7]. This model was trained on a monolingual language model for Thai based on RoBERTa architecture with a cleaned training set of approximately 79 GB for sentiment analysis. It implies that the WangchanBERTa model accepts input in Thai and that the output of the model is labeled as positive, negative, neutral, or a question.

Dataset of Picture Frustration Study

The dataset used in this study is the response to a questionnaire form of the PF-study that was collected from a sampling of people living in communities surrounding Suvarnabhumi Airport during the years 2014-2015. The questionnaire form is intended to collect demographic information, the geographical location of the respondent's household, and the respondent's opinions for the PF-study concurrently. The study area is the area that may be affected by aircraft noise from the airport services under the major flight paths. The 3-question cartoon from the original Japanese version of the PF-study is also used in a similar study around international airports in Japan and Vietnam. The comparative study of the Japanese dataset and the Vietnamese dataset was published in 2021 [10].

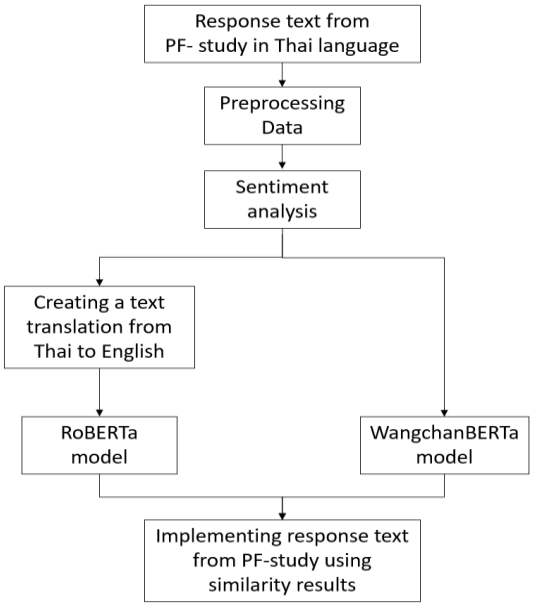
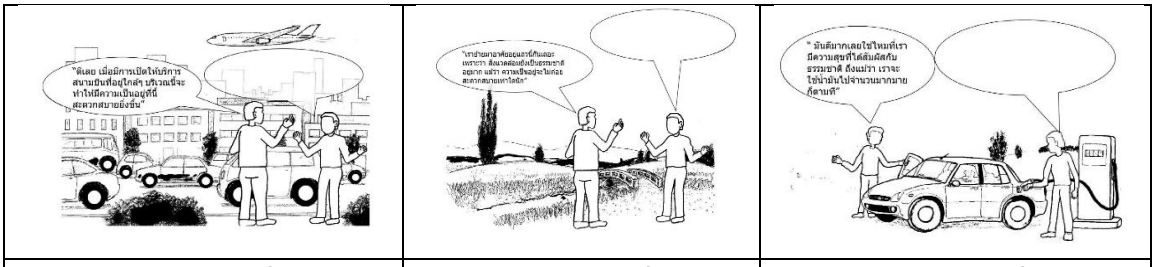


Figure 1: The workflow for sentiment analysis models

The questions in the PF-study questionnaire use cartoons that are minimally detailed enough to convey the context of the simulations raised so that respondents understand the question. The same original 3-question cartoon questionnaire form was applied to this study, also. It was translated into Thai as shown in Figure 2 [11].



Cartoon Question 1	Cartoon Question 2	Cartoon Question 3

Figure 2: The PF-study 3-question cartoon questionnaire form

In this paper, a paper-based, 3-question cartoon situations of the PF-study in Thai language was distributed to collect data in the communities surrounding Suvarnabhumi Airport in 2015. That dataset was used to assess the relationship between environmental protection and the convenience of life for the population living around the airport. Face-to-face interviews were used in the fieldwork study to collect completed questionnaires at random within the proposed noise exposure map of the 1st phase EIA report with the maximum capacity of 45 million passengers a year [12]. During 2014-2015, there were approximately 16,000 households inside the noise exposure map [13].

The cartoon questions represent the situation to ask the respondent's opinion of the trade-off between everyday life convenience and specific issues related to environmental protection. The first cartoon question will ask for opinions on aircraft noise and life convenience. The second cartoon question will ask for opinions on natural environments and life conveniences. The third cartoon question will ask for opinions on environmental preservation and life convenience. There were approximately 1,250 respondents in the fieldwork study. However, in our first-hand analysis using sentiment analysis, there were approximately 1,118 eligible respondents. All paper-based respondents were tabulated into the Excel worksheet for pre-processing and data analysis in the sentiment analysis.

RESULTS

In the fieldwork study, members of the research team went to the field in communities around Suvarnabhumi Airport to inquire about the opinions of people living in that area who may be adversely affected by the airport's service. Using the PF-study paper-based questionnaire, face-to-face interviews were conducted to ask people's opinions at their houses. Cartoon character in three questions that give examples of situations to pose questions for respondents to answer. There were observations that respondents were reluctant to answer open-ended questions in the survey; some of them repeatedly asked: "Do we really have to answer these three questions, right?" or "Why weren't there any choices to choose from among the questions?" or "Questions were too difficult for me to answer.", etc.

In the PF-study, which consists of three cartoon character simulation situations related to the different topics, questions about life convenience are raised to ask the people's opinion on aircraft noise from airport service, living in the natural environment, and environmental preservation. The first question asked respondents to express their opinions concerning any pollution from aircraft operation, in this case aircraft noise pollution, and life conveniences from airport operations. The second situation in the cartoon character, which gave scenarios based on situations, asked the respondents about the convenience of daily life and the quality of the natural environment in their surroundings. The third cartoon character asked a question about the issue of environmental preservation as a leisure purpose and the energy consumption in travel to enjoy the environment by giving examples of the aesthetics of leisure in the preserved natural environment while consuming lots of energy to travel and releasing pollution.

In preparation for data analysis, the 1,118 responses from the PF-study were tabulated into a worksheet. As mentioned, the conventional data analysis of the PF-study will consume resources in the process of reading local language, translating it into English if needed, and deciding on the classification of responses. We decided not to go with the traditional approach, where people read each response individually and then translate it from the local language to English to analyze the verbal data. But we choose to use computer processing methods using NLP without having to translate verbal Thai data into English.

NLP can be used to create tools for categorizing verbal responses. In this study, the proposed sentiment analysis models attempted to classify verbal responses with the purpose of making it easier to automatically interpret data about people's attitudes toward environmental protection and life convenience. From the preliminary data analysis, an overview of the dataset was provided, such as demographic data from those who answered the questionnaires, such as age, gender, location, living years of residence or building, and so on. The characteristics of the dataset from first-hand analysis were shown as follows:

This PF-study questionnaire requires that the respondents be selected to have lived in the study area for at least a year. This question will be asked as the first question to begin the survey. People who have lived in the study area for less than a year will be barred from taking the test. It is considered appropriate to select respondents who are residents of this area and have lived long enough to be able to express their opinions based on their daily experiences with environmental protection and life convenience, which is an area that may be affected by pollution from airport services.

Based on the dataset, it shows that most of the respondents lived in the study area for about 10-15 years. It can be said that most of the respondents were those who lived in the study area for more than a year to twenty years, considering that the group of respondents was appropriate to complete the questionnaire in this study. Since the airport's opening in 2006, a period of the living year has been incidentally appropriate for their experiences to take the questionnaire about environmental situations and daily life conveniences.

The PF study's respondents were mostly female (694:399), including twenty-five of those who did not wish to answer their gender questionnaire. The age range of the respondents was normally distributed in hierarchical order. (Table 1) Most of the respondents provide information about the characteristics of the houses or buildings they live in. They can be divided into two-story houses (523 people), one-story houses (284 people), townhouses, commercial buildings, or buildings with a height of less than 4 floors. (164 people) Apartments, condominiums, flats, or similar buildings (111 people), with 36 people not answering this question.

For preliminary analysis, three ordinal scales (negative, neutral, and positive) are proposed. All respondents' verbal opinions on three cartoon situations on the worksheet were categorized by machine into the three categories: negative, neutral, and positive. Sentiment analysis is a tool applied to data analysis using two models, RoBERTa and WangchanBERTa, as mentioned above. In this study, the gold standard, or actual categorization labeling by humans in verbal responses, is not available to validate the models.

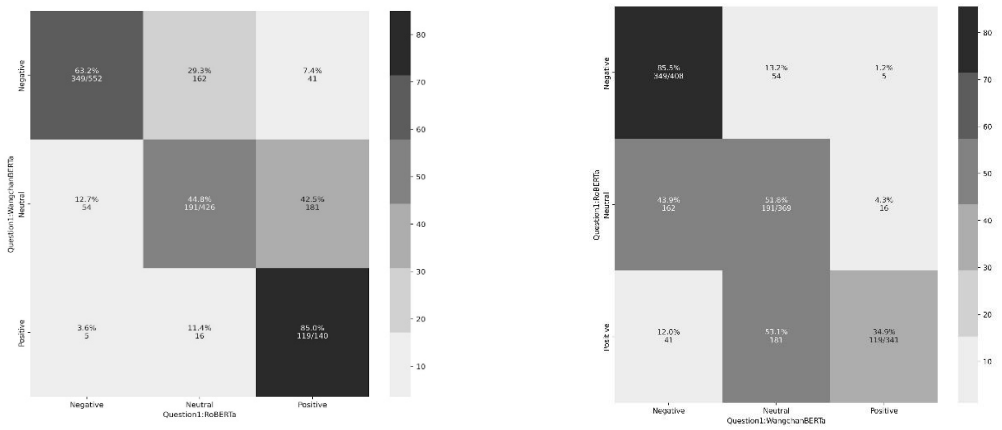
Table 1: Age

Age	**Number of people**
<20	58
20-29	89
30-39	184
40-49	309
50-59	239
60-69	158
≥ 70	72
Not prefer to answer	9

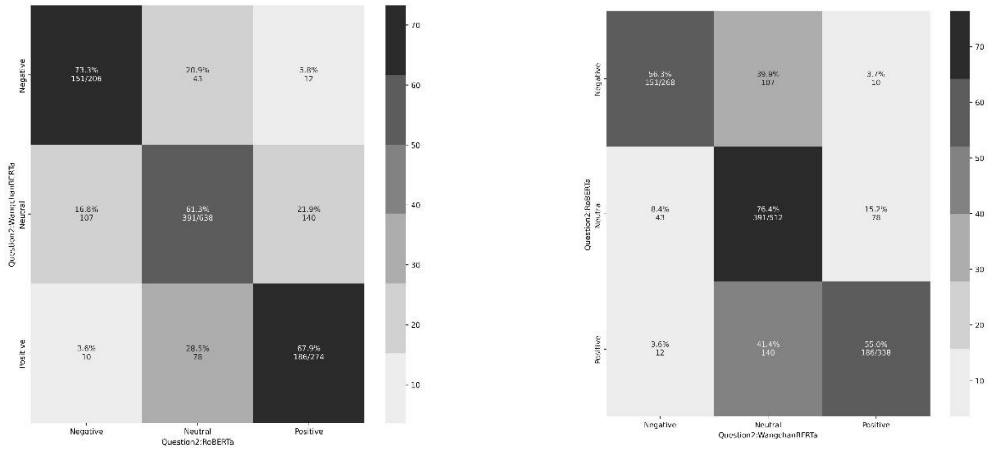
A confusion matrix or error matrix is introduced to plot the results of both models in this sentiment analysis. The matrices illustrate trends in the results of the models. The compared results show the agreement of two models from the same dataset. This indicates the proportions or percentages of each of the two predicted models on three different scales (negative, neutral, and positive) in the sentiment analysis. (Figure 3) The numbers in the matrices present the agreement of the results between the two models, indicating the different proportions. For example, the left graph of the situation in Question 1 says that the WangchanBERTa model predicts 63.2% negativity, which is identical to the ROBERTa model, whereas the right graph shows that the ROBERTa model predicts 85.5% negativity, which is identical to the WangchanBERTa model.

The examples from both graphs indicate that the number of 349 out of 1118 people answering Question 1 was negative for both models. By considering the diagonal, which means that results from both models have a similar direction of agreement, we therefore use the agreement method for the interpretation of the first-hand result using sentiment analysis in this study. The sentiment analysis results of both models in the matrices show the responses to each question from the respondents in the same direction for their opinion (Figure 4). The data in the above-mentioned figure shows whether the results from the two models are in agreement or not. But it does not show that the respondents answered the same question.

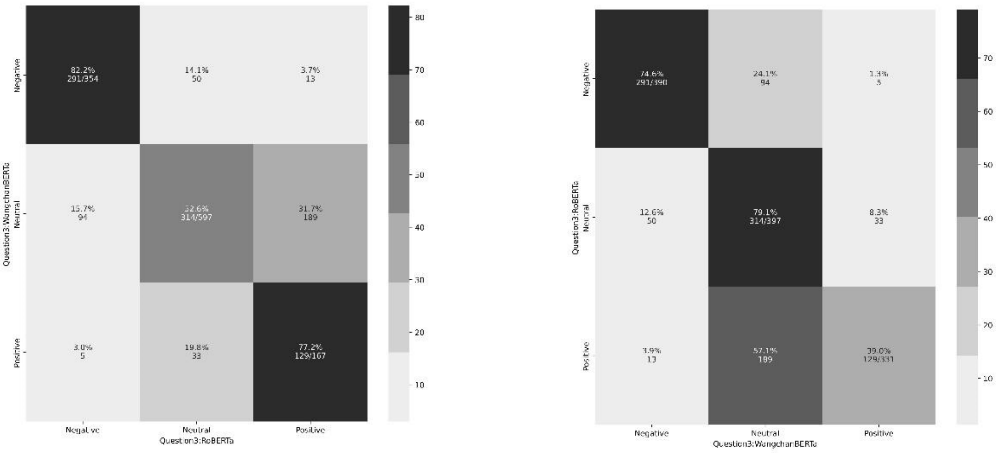
The responses to the situation in Question 1 were listed in descending order; negative, neutral, and positive, from the questionnaire in both model results. The situation in Question 2 was shown in descending order, with neutral, positive, and negative responses from both models. The answers to the situation in Question 3 were shown in descending order, with neutral, negative, and positive responses, respectively.



PF-study Question 1



PF-study Question 2



PF-study Question 3

Figure 3: Confusion matrix of the results from two models

The WangchanBERTa model gave fewer positive responses compared to the RoBERTa model. It can be said that the tendency of the results from the WangchanBERTa model is a rather negative response in the situation of Question 1, and rather neutral in the other two situations of Question 2 and 3. In comparison, the WangchanBERTa model predicted more negative and neutral responses than the RoBERTa model, while predicting fewer positive responses than the RoBERTa model.

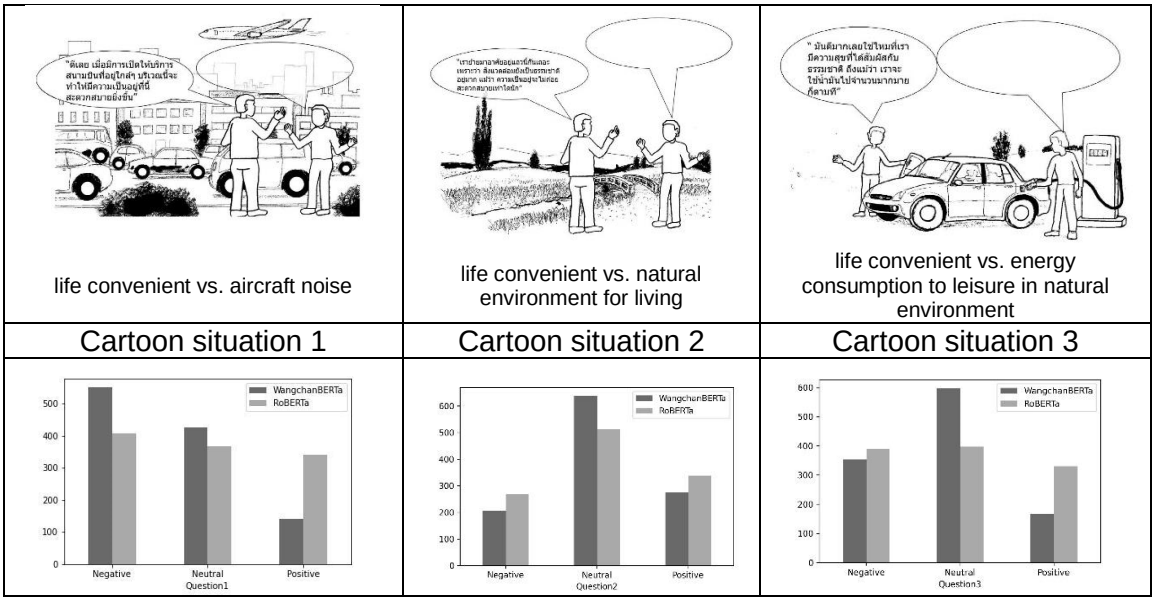


Figure 4: The PF-study three cartoon situation results of two models

The responses to the situation in Question 1 were listed in descending order; negative, neutral, and positive, from the questionnaire in both model results. The situation in Question 2 was shown in descending order, with neutral, positive, and negative responses from both models. The answers to the situation in Question 3 were shown in descending order, with neutral, negative, and positive responses, respectively. The WangchanBERTa model gave fewer positive responses compared to the RoBERTa model. It can be said that the tendency of the results from the WangchanBERTa model is a rather negative response in the situation of Question 1, and rather neutral in the other two situations of Question 2 and 3. In comparison, the WangchanBERTa model predicted more negative and neutral responses than the RoBERTa model, while predicting fewer positive responses than the RoBERTa model.

DISCUSSION

Characteristic of Dataset

Referring to the results, the demographic data of the PF-study responses demonstrated the preliminary considerations in this study. When those data were taken into cross-analysis, it revealed considerations about the data and their relationships. In this study, 694 females out of 1,118 respondents were obtained, including 25 who did not want to complete their gender questionnaire. In the WangchanBERTa model, there were approximately 353, 389, and 352 female respondents who replied as negatives in the situation of question 1 and neutrals in the situation of questions 2 and 3, respectively, while in the RoBERTa model, approximately 246, 322, and 251 female respondents replied as negatives, neutrals, and negatives, respectively. Based on observation and gender discrimination on the human rights issue, it may be said that the tendency of people to answer questions about gender is not confined to females or males, or even that it may not be necessary to ask respondents about their gender in the questionnaire related to life convenience and environment in the future study.

When considering the age of the respondents, the largest number of respondents were between the ages of 40 and 49 (309 out of 1,118 respondents), with the second highest number at the ages of 50 to 59 (239 out of 1,118 respondents), and the third in the ages of 30 to 39 (184 out of 1,118 respondents). When considering the age group of 40 to 49 years, the results of the cross-analysis of data from both models found that the largest number of respondents in this class, 309 out of 1118 respondents, answered the three situations with cartoon characters in the questionnaire.

According to the WangchanBERTa model, there were approximately 145, 169, and 176 respondents of this class who replied as negatives in the situation of question 1 and neutrals in the situation of questions 2 and 3, respectively, while in the RoBERTa model, approximately 114, 139, and 108 respondents replied as neutrals in all situations. For example, there were about 145 out of 309 respondents in the mode of 40-49 years old class who replied to the situation in Question 1 with negative responses in the WangchanBERTa Model, while there were about 114 out of 309 respondents replying with neutral responses in the RoBERTa Model, whose languages were not aligned in Thai and English, respectively.

The number of years that respondents lived in the study area, as mentioned above, was about 10 years for the largest number of respondents in the dataset. When considering cross-analysis according to the three situations in the PF-study, in the WangchanBERTa model, approximately 69, 90, and 82 respondents replied to negative responses in the situation of Question 1 and neutral responses in the situations of Question 2 and 3, respectively, while there were about 52, 69, and 52 respondents replied to negative, neural, and negative in the situations of Question 1, 2, and 3, respectively in the RoBERTa model.

Considering the number of years most respondents have lived in the area is between 10 and 15 years, it is considered a suitable group of respondents to conduct the questionnaire to report their opinions about life convenience and other issues such as the natural environment, energy consumption, environmental pollution, and sustainable development. Because they lived in the area long enough to provide information that reflected changes in environmental factors, that will affect the overall quality of life in the community.

Simulation Situations and Responses

The PF-study is a technique to apply the opinions reported by respondents in the field study regarding various adverse impacts analysis related to quality of life and health impact, particularly environmental pollutants, climate change, etc. From the PF-study questionnaire, question 1 asks for the opinions of respondents in the situation about whether the opening of a nearby airport improved the convenience of living. We can try to interpret those answers. What do the respondents think of the problem we attempted to ask using the cartoonish scenario of this PF-study of Question 1? Here are some examples of possible interpretation.

If respondents respond with "I agree" or "a positive" opinion of the result, this can be interpreted as a sign that they agree with the question in this situation. It is always good to have an airport service in your own neighborhood that brings convenience in terms of good infrastructure to the area. Particularly, the situations that are in line with the issue that needs to be inquired about regarding life convenience in everyday life. This will lead to the study of this data in conjunction with other collected data from the communities during the same period, such as aircraft noise levels and self-reported data on people's perceptions of sleep disturbance, speech interference, and annoyance, etc.

There may be different interpretations of the respondents' opinions for those who answer questions that were not clearly shown on the positive or negative side, as mentioned as "neutral" in this study. Respondents may be reluctant to respond or may not comment in any way about the benefits of airport services or the comforts of life compared to the negative effects that would arise from answers with opposite opinions. On the other hand, if the response was "I disagree" or a "negative" opinion of the results, it can be interpreted as they do not agree with the question in this situation. It is not clear how to interpret the result in relation to the aircraft noise issue in this situation either. When many respondents had a negative reaction to the situation in Question 1, they disagreed with the argument about a more comfortable life from the airport development project. It could possibly reflect their concerns about aircraft noise or other negative effects from airport services either. For them,

the airport service will not always improve or make living conditions more convenient, and it is understandable that respondents were possibly concerned about negative impacts such as noise pollution or air pollution from aircraft flight operations near them.

In the next situation, if the respondent answers with the words "I agree" or has a "positive" opinion of the results in Question 2, that means the respondent agrees with this question. They can bear some difficulties or discomfort in the convenience of everyday life in exchange for a good natural environment. If the answer does not indicate whether they agree or disagree as "neutral" in the results of two models, it may be interpreted as not knowing whether they exactly agree or disagree in the simulation scenario in the question. There may be so many possible causes that we cannot conclude their opinion on our own. But you may need more detailed information on the answer to Question 2 than just the direction of the opinion. Differently, the disagreeable responses in the situation raised in this question as "negative" understandably mean that the respondents weren't ready to experience the discomfort of daily life to live in a good natural environment.

In the simulation situation in Question 3, the situation asked the respondents to reflect on their opinions about everyday life comfort in the form of aesthetic enjoyment of natural surroundings during their travels in exchange for energy consumption through their willingness to pay for fuel costs while traveling or at leisure time. If the answers of the respondents were "agreed" or "positive" responses from the analysis of both models, it would mean they are willing to pay for fuel to fill up their vehicle during the trip for their enjoyment of the natural environment of traveling. Respondents' responses were "neutral," not implying that they were willing or unwilling to pay for gasoline to fill up the vehicle for an aesthetic journey through the natural surroundings. On the other hand, if the respondent answered "I disagreed" or "Negative" in the results of both models, it means that they disagree with the scenario of being willing to pay for gas to fill up the car during the journey to enjoy the natural surroundings of the journey. However, it is still not possible to detail the reasons for rejecting this point by analyzing these preliminary results.

From the results of both models, it can be seen that the answers to the situations in Question 1 were in descending order of negative, neutral, and positive, while the situations in Question 2 were neutral, positive, and negative, and those in Question 3 were neutral, negative, and positive, respectively.

Referring the sentiment analyses, it could be inferred that in Scenario 1, the majority of respondents who responded negatively may suspect the negative impacts of the airport development project, even if the project will bring convenience to everyday life by improving the infrastructure in the area. While the second rank group has not concluded their opinion in any direction. And the third-ranking minority respondents in this situation who answered with positive responses agreed with the development of public utilities in the area resulting from the airport development project.

For the second situation, most of the respondents responded as "neutral" or it could not conclude whether they agreed or disagreed at all. The people who responded as "positive" opinions in the second place understand that they will bear lower life convenience to live their life in a healthy natural environment. The smallest number of people who express negative opinions are opposed to moving to live their lives in the natural environment with a less comfortable life.

In the third question scenario, most people answered neutrally, which did not imply agreement or disagreement with the situation. However, in this situation, more people expressed negative or disagree than positive or agree. When considering the trend and direction information of the answers obtained from both models in this dataset, the point of concern is that most respondents would have questions or opinions based on the need to preserve the

environment. However, we are unable to confidently draw conclusions about the opinions of the respondents in this study. The improved data analysis methods will provide more details on the various doubtful discussions raised above. In the future study, the five categories of verbal analysis will be proposed in the sentiment analysis instead of the original three categories (negative, neutral, and positive). In addition, the cross-analysis of other studies in the same area will be introduced to enhance the data interpretation of this study.

Agreement Evaluation of the Models

To preliminarily determine the trend of results in the confusion matrices of the two pre-trained language models, the RoBERTa and WangchanBERTa models, we can interpret the tendencies of the sentiment of respondents replying to the three simulation situations in the cartoon character questions in the PF study. As mentioned above, it will not illustrate that respondents answered the same question in the confusion matrix. It is only used as a tool to measure the agreement of analytical results with both sentiment models.

In consideration of the matrix confusion trends, two pre-trained language models, RoBERTa and WangchanBERTa interpret the trend of sentiment in the same directions for three questions in PF-study as mentioned above. It can possibly be said that the results from both models were quite effective in interpreting the opinions of residents in the study area. In addition, the positive answers are greater than negative answers for a convenient and natural environment for living. On the other hand, most people respond negatively more than positively for a convenient and energy consumption to leisure in a natural environment.

That means most respondents replied negative for life convenient and aircraft noise (Question 1 in PF-study). Moreover, they answered neutral for the life convenience of both natural environments for living and energy consumption for leisure in a natural environment (Questions 2 and 3 in the PF-study). Then, the interpretation of sentiment analysis for questions 2 and 3 showed that most people respond on a neutral scale when considering three sentiment scales of negative, neutral, and positive. In future work on the improvement of analysis methods, the five scales can be investigated, which might reveal more details about understanding the trending of responses to questions 2 and 3 in the PF-study.

Although the trend of the data analysis of the two models was in the same direction, the actual label information of the verbal responses should be conducted in the dataset by humans to be used as the basis data for training the two machine learning models to learn how people would react to the same verbal responses. After we get the labeled dataset, which we call the "gold standard,", we will repeatedly train the model. The sentiment analysis of two models will be conducted on the dataset from the PF study again in the future. We hope that models trained using labeled data will validate the model for consistency with the dataset in our future studies.

Referring to the discussion points, the original three categories of verbal responses (negative, neutral, and positive) will be applied to five verbal categories (-2, -1, 0, 1, 2). It would be easier to compile those responses into a five-point scale of the self-reported opinions in the PF-study or other studies such as the social noise survey, noise measurement of the same period in the study area. The cross-section of data analysis and sentiment analysis will demonstrate the useful insight dataset can be used to develop policy proposals for improving the environment, quality of life, and livelihood of the people while simultaneously reducing pollution from airport services in the community area around the airport.

CONCLUSION

The PF-study investigates the environmental protection and life convenience of people who live near airports. Some of them have complained about the aircraft noise, vortices damaging

their roofs, and other pollution. The surveyed data came from communities living in the study area, as indicated by the noise exposure map or noise contour map affected by the airport service of Suvarnabhumi Airport during the years 2014-2015. The sentiment analysis provided interesting classification opinions of the surveyed dataset based on the analytical assumptions of the proposed models. However, this data analysis requires improvements to make the model more accurate in its classification of verbal responses and more multi-dimensional to get better results in the future. The research team plans to conduct a study attempting to set a gold standard scale to examine the verbal responses to validate the ordinal scale by predicting the actual expression scales in the PF-study responses to generate a trained language model based on the average answers from groups of people with factors such as age, gender, noise exposure levels, health issues, etc. The probability score will be adjusted from three to five-point scales.

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