

A Foresight Study of Artificial Intelligence Application through Voice Recognition in Detecting and Assisting Emotional Distress of Secondary Student in Malaysia

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Abstract: Stress and depression have a negative impact on learning process and academic performance of secondary students. Thus, this study aims to examine issues and drivers related to their emotional distress as school environment cause some of the behavioral problems. Each student face challenges and conflicts when changes occur within them either in terms of biological, physical, emotional and mental. In coping with their emotional distress, one way is through sharing their feelings and thoughts via voice recognition application using Artificial Intelligence (AI) technology. The application can assist them by talking to them, and the student does not have to worry about the others because the machine does not have feelings such as judgmental or biased. The objectives of this study are first, to examine issues and drivers on AI application via voice-recognition in detecting and assisting emotional distress among secondary students and second, to foresight future scenario related to AI application via voice recognition. This study used STEEPV analysis in examining the issues and drivers related to AI application. A total of 280 secondary students in Johor Bahru completed the survey. The results of the survey concluded that are technology development enables the detecting of emotional distress through voice recognition and secondly, the needs in automatically detection of the sign and early symptoms for students and four scenarios on the future trends that were discovered from scenario building. This research will give benefits to students and counsellor teachers as voice recognition able to detect and assisting emotional distress, therefore early precaution can be taken by stakeholders.

Keywords: Emotional distress, Artificial intelligence, Voice recognition

1. Introduction

Everyone in this world required to have a good and positive mental health as it results in positive development in terms of their overall health and wellbeing. According to Jones (2015), it is essential for everyone to have positive sense of identity, able to manage emotions and build social relationship with others. Unfortunately, if someone are unable to have positive mental health, it is estimated that 20-30% of them will experience with emotional distress and worse, lead to mental health problems (Boyce, 2004). Since mental health is important in people's development, thus, this study will focus on secondary school students as early precautions can be taken before it getting worse. Furthermore, the today's challenges such as online learning class contribute to more stressful situation. This study aims to examine issue and drivers of Artificial Intelligence (AI) application via voice recognition in detecting and assisting students' emotional distress. The general idea is that application will help the student to assist them in coping with their grief. The student will able to monitor their mental health everyday day.

Furthermore, the application also gives benefits to the counsellor's teachers. The teachers can also use the apps for detection of anxiety and depression that caused by emotional distress. The exposure is by voice recognition which comes from the idea in a recent study, a correlation between the voice of the patient and emotional distress (Marmor et al., 2016). The AI will analyse the student's voice and come out of the diagnose. So, it will make teachers task more accessible and more accurate diagnose.

1.1 Research Background

Stress is a situation where a person have feelings of emotional due to an event that trigger them either to be positively or negatively thinking. Usually, people keep to claim stress as negative situation, but stress can become a positive situation, depends on how people face with the event. Stress can come in many types of feelings such as angry, frustrated and nervous. One main point here is how the person look and manage his or her own stress. Similar to an adult, a teenager also face with stress, mainly challenges at school whereby they need to get good results, compete with his or her friend and currently challenges with online learning due to Covid-19 pandemic. If stress is not being managed properly and no coping mechanism apply, it will lead to distress. Distress is an aversive, negative state in which coping and adaptation processes fail to return an organism to physiological and psychological homeostasis (Carstens & Moberg, 2000). When students unable to respond and resolve their problems, it can triggers feelings such as fatigue, physical illness, sleep disturbance, poor concentration and more worsen, it lead to anxiety, depression and taking drug and alcohol use.

Meanwhile, in Malaysia, there are three significant challenges: mental health issues, academic pressure and unfavourable school experience (Rafidi, 2020). Even though the education system started to focused on cognitive, emotional intelligence and spiritual intelligence, academic achievement still a top priority. These factors that lead the challenge to survive schooling years. Stress also a contributing factor to the rise of mental health issues such as emotional distress among student. The class environment, such as disruption from a misbehaving classmate, also take part as a student, find it difficult to understand the lessons and raise the student's stress.

1.2 Problem Statements

There are two issues motivated this research to be conducted. Firstly, the issue of student that experience emotional distress is arising. This is proven by a national survey that revealed that Malaysian aged 13 to 17 are suffering from mental health problems. According to Program Minda Sihat in 2017 by the Ministry of Education, out of 284,516 students who have to participate. 5104 students have identified received intervention from school's counsellors (Chonghui et al., 2018). Besides the Ministry of Health of Malaysia have conducted a mental health survey in 2012, which the result was 5.5% of the were try to attempt in suicide. Another study was conducted in 2017 by the Ministry of Health in shows that 10% from 247,497 students in Malaysia attempting suicide during the past 12 months. From the survey shows there is rising suicidal thought in the student that led by the emotional distress.

Next, the student suffers emotional distress which related to inappropriate task or workload, such as assignments, examinations and being compared to other achievement and bias treatment from teachers (Yusoff et al. 2011). So the student must manage the stress by learning coping mechanisms. Student refuses to express their feeling. The counsellors' teachers can play their role by using the application to detecting students' problems. So the result can be more accurate and fast to identify the emotional distress. Moreover, schools need more counsellor teachers. They stated that each session with student consuming about half an hour and if with the parent it will take about two hours. The average of 1,200 students visits school counsellor a year, and their services are needed about 2% each year (Rajaendram, 2019). So it can be concluded that, to solve this problem the counsellor teachers can use this application to assist their student.

The second issues are the readiness of using the application in school. The application is still new in Malaysia. The initial overview of Artificial Intelligence (AI) is in an infant state. Furthermore, AI Readiness Index compiled by Oxford Insights revealed Malaysia at ranked 22 in the world for readiness to implement AI in the delivery of public services to citizens (Canada's International Development Research Centre (IDRC), 2020).

1.3 Research Questions

- (i) What are the issues and drivers of Artificial Intelligence (AI) application through voice recognition in detecting and assisting emotional distress among secondary school students?
- (ii) What are the future trends Artificial Intelligence (AI) application through voice recognition in detecting and assisting emotional distress among secondary school students?

1.4 Research Objectives

- (i) To examine the issues and drivers of Artificial Intelligence (AI) application through voice recognition in detecting and assisting emotional distress among secondary school students.
- (ii) To explore future trends of Artificial Intelligence (AI) application through voice recognition in detecting and assisting emotional distress among secondary school students.

1.5 Research Scope

This research is conducted to perceive the insight of secondary students to think about using Artificial Intelligence (AI) as the detection of emotional distress through voice recognition. Therefore, secondary students are suitable as respondents for this research. Using table to determining sample size by Krejcie & Morgan (1970), a total 351 secondary school students was selected as respondents for this study, based on total population of 49,357 secondary school students in Johor Bahru.

1.6 Significance of Research

This research will benefits students and counsellor teachers. The application will help them by assisting them in managing their distress problem. Besides, having the use of the mobile application will accompany them. It can also give a response to them whenever the student feels terrible. Students who develop stress reduction skills learn how to handle and cope better without hurting themselves or others. Besides, this application will reduce the anxiety for the student to open up their feeling. The essential things in the coping mechanism, the student, need to more talk if they were facing a stressful day. So the application can assist them by talking to them, and the student does not have to worry about the others because the machine does not have feelings such as judgmental or biased.

2. Literature Review

In this chapter, the researcher does a literature review based on past research that revolves around Artificial Intelligence (AI) technology. It also will discuss the issue and critical drivers in STEEPV

method. STEEPV methods will look into social, technology, environment, economy, political and value. It will review all the issues and drivers of AI application through voice recognition in detecting and assisting emotional distress among secondary school students.

Social is related to ways of life (e.g. use of leisure time, family living patterns); demographic structures, social inclusion and cohesion issues (e.g. lifestyles, level of (in)equality, educational trends), health consciousness or population growth. Technology is related to rates of technological progress, the pace of innovation diffusion, risk of technology (e.g., health and security problems) and technology incentives. Economic is related to level & distribution of economic growth, industrial structures, competition, markets & financial issues, purchasing power, exchange rates. The environment is related to sustainability & climate change; more localized environmental issues (e.g., pollution, resource depletion, associated biodiversity and welfare concerns). Political is related to Dominant political viewpoints/parties, political (in)stability, regulation & legal issues, government actions, lobbying by NGOs/pressure groups. Value can be related to attitudes to working life (e.g., entrepreneurialism, career aspirations, deference to authority, demands mobility across jobs, places, etc.). It is also can be a preference for leisure, culture and social relations.

Table 1 shows all ten key terms derived from STEEPV analysis. These ten key terms were merged from a total of 74 issues and drivers related to AI application through voice-recognition in detecting and to assisting the emotional distress of secondary students in Malaysia.

Table 1: Key terms

No.	Key Terms
1	Needs in automatically detection the sign and early symptoms.
2	Technology development enables the detecting of emotional distress through voice recognitions.
3	Increase the chances for students accessing their mental health
4	A.I. technology is more reliable than human competency.
5	School environment policy in assisting mental health student.
6	Rules and regulation that can safeguards user's data, privacy and security.
7	Accuracy in detecting the symptom of emotional distress/depression.
8	An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost.
9	Data collection are massive to increase A.I. technology capabilities in detection.
10	School environment led to emotional distress among student.

3. Methodology

The methodology is the part where it focuses on the data collection method and the aspects needed in research. The effectiveness of research is determined by the data collection method, data analysis and the outcome of the research. Among the topics discussed in this chapter include research design, population and sampling, research instrument, data analysis, pilot test and the data analysis method at the final stage of research.

3.1 Research Design

In this study, the researcher uses a quantitative method as a research design. Quantitative approach is a process where the data is obtained through specific procedures like conduct a questionnaire or survey, observation or get an insight to the problem statement of the research.

3.2 Population and Sampling

A total population of secondary school students in Johor Bahru was 49,357. The sample size of study was based on table to determining sample size by Krejcie & Morgan (1970). Based on the table, there are 351 secondary school students was selected as respondents in this study.

3.3 Research Instrument

Research instrument is also an essential element for a research. The main research instrument in this study is questionnaire. The questionnaire was self-developed based on the merged issues and drivers from STEEPV analysis. There are four sections in the questionnaire, which are demographic (Section A), importance of AI application through voice recognition (Section B), impact and uncertainty of AI application through voice recognition (Section C and Section D).

3.4 Data Collection

Data collection stage is essential in ensuring that the research results obtained, which is accurate, definite, and it can be justified by solid reasoning. Types of data used for the research is primary data. The research is conducted to see the insight of secondary students to think about using artificial intelligence as the detection of emotional distress. Therefore, secondary students are suitable as respondents for this research. The research will be conducted in Johor Bahru by using survey method.

3.5 Data Analysis

After collecting all the data, and compiled it together. The data have been analysed statistically. Since the research is a descriptive method, therefore, the obtained quantitative data is analysed using frequency and percentage to find the main driver of the research.

4. Results and Discussions

4.1 Demographic Profile

Table 2 reports demographic profile of respondents. Majority of respondents were female as compared to male respondents. There are slightly balance in number of respondents who were in Form 4 and Form 5. Almost half of the respondents were Malay. In regards to knowledge and familiarity of Artificial Intelligence and mental health application, majority of them are familiar with the application. Almost half of respondent do not familiar in using mental health application. However, they tend to acknowledge that the application is useful.

Table 2: Demographic profile

	Frequency (<i>f</i>)	Percentage (%)
Gender		
Male	96	34.3
Female	184	65.7
Total	280	100.0
Age		
16 (Form 4)	117	41.8
17 (Form 5)	163	58.2
Total	280	100.0
Races		
Malay	139	49.6
Chinese	53	18.9
India	47	16.8

Others	41	14.6
Total	280	100.0
Knowledge and familiarity of Artificial Intelligence and Mental Health application		
Yes	176	62.9
No	104	37.1
Total	280	100
Frequency of Mental Health Application Familiarity Among Students		
Yes (more than 5)	52	18.6
Yes (less than 5)	100	25.7
No	128	45.7
Total	280	100
The Usage of Mental Health Application Among Students		
Yes	96	34.3
No	184	65.7
Total	280	100
The Usefulness of Mental Health Application		
Very Useful	44	15.7
Useful	108	38.6
Somewhat Useful	86	30.7
Not Useful	42	15.0
Total	280	100

4.2 Analysis of Key Terms based on its Importance

Based on Table 3, key term 10, “An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost” scored the highest mean ($\mu=3.43$, $\sigma=1.33$). It indicates most of the respondents agreed the importance of early detection of emotional distress can improve the quality of life. The lowest mean represents by the key term 1 “School environment led to emotional distress among student” ($\mu=2.38$, $\sigma=1.42$). It shows respondents tend to claim that school environment is only a factor that lead to emotional distress among students. Perhaps, they are many other factors that can trigger emotional distress among secondary school students.

Table 3: Descriptive analysis on importance variable

No.	Key Terms	Mean (μ)	Standard Deviation (σ)
1	School environment led to emotional distress among student.	2.38	1.42
2	School environment policy in assisting mental health student.	3.33	1.31
3	Needs in automatically detection the sign and early symptoms.	3.16	1.31
4	AI technology is more reliable than human competency.	3.20	1.36
5	Artificial Intelligence technology will help estimated accurately through voice recognition in detecting the emotional distress of student	3.19	1.37
6	Technology development enables the detecting of emotional distress through voice recognitions.	3.38	1.31

7	Data collection are massive to increase AI technology capabilities in detection.	3.17	1.32
8	Increase the chances for students accessing their mental health	3.28	1.28
9	Rules and regulation that can safeguards user's data, privacy and security.	3.41	1.45
10	An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost.	3.43	1.33

4.3 Analysis of Key Terms based on its Impact

From Table 4, highest mean was related to key term 1 “School environment led to emotional distress among student” ($\mu=3.45$, $\sigma=1.34$) and driver 10 “An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost” ($\mu=3.43$, $\sigma=1.33$). Therefore, more of respondents agreed that school environment have impact on emotional distress, while early detection of emotional distress lead to improve quality of life. The lowest mean is by the key term 7 “Data collection are massive to increase AI technology capabilities in detection” ($\mu=2.69$, $\sigma=1.33$).

Table 4: Descriptive analysis on impact variable

No.	Key Terms	Mean (μ)	Standard Deviation (σ)
1	School environment led to emotional distress among student.	3.45	1.34
2	School environment policy in assisting mental health student.	3.34	1.29
3	Needs in automatically detection the sign and early symptoms.	3.22	1.28
4	AI technology is more reliable than human competency.	3.37	1.26
5	Artificial Intelligence technology will help estimated accurately through voice recognition in detecting the emotional distress of student	3.25	1.24
6	Technology development enables the detecting of emotional distress through voice recognitions.	3.31	1.30
7	Data collection are massive to increase AI technology capabilities in detection.	2.69	1.33
8	Increase the chances for students accessing their mental health	3.30	1.33
9	Rules and regulation that can safeguards user's data, privacy and security.	3.40	1.34
10	An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost.	3.45	1.31

4.4 Analysis of Key Terms based on its Uncertainty

Based on Table 5, all key terms have mean average below 3.00 except for key term 6 “Technology development enables the detecting of emotional distress through voice recognitions” ($\mu=3.00$, $\sigma=1.38$). Even though this key term 6 scored highest mean, but still respondents still have moderate certainty that

the technology able to detect emotional distress. The lowest mean score was 2.80, for the key term 1 “School environment led to emotional distress among student.”

Table 5: Descriptive analysis on uncertainty variable

No.	Key Terms	Mean (μ)	Standard Deviation (σ)
1	School environment led to emotional distress among student.	2.80	1.49
2	School environment policy in assisting mental health student.	2.90	1.38
3	Needs in automatically detection the sign and early symptoms.	2.98	1.30
4	AI technology is more reliable than human competency.	2.96	1.36
5	Artificial Intelligence technology will help estimated accurately through voice recognition in detecting the emotional distress of student	2.96	1.34
6	Technology development enables the detecting of emotional distress through voice recognitions.	3.00	1.38
7	Data collection are massive to increase AI technology capabilities in detection.	2.86	1.35
8	Increase the chances for students accessing their mental health	2.93	1.43
9	Rules and regulation that can safeguards user’s data, privacy and security.	2.89	1.50
10	An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost.	2.88	1.33

4.5 Impact-Uncertainty Analysis

Impact-uncertainty was analysed by plotting the mean of variables impact and uncertainty in a graph. Two key terms with the highest mean value of variables impact and uncertainty will be used for determining the future scenario. The mean of impact and uncertainty variables are illustrated in Table 6. Hence, all the data have been plotted as in Figure 1 and two key terms were used in generating the future scenario. The highest plot in the graph will be picked as the, main two key terms.

Table 6: Mean of key terms based on its impact and uncertainty

No.	Key Terms	Impact	Uncertainty
1	School environment led to emotional distress among student.	3.45	2.80
2	School environment policy in assisting mental health student.	3.34	2.90
3	Needs in automatically detection the sign and early symptoms.	3.22	2.98
4	AI technology is more reliable than human competency.	3.37	2.96
5	Artificial Intelligence technology will help estimated accurately through voice recognition in detecting the emotional distress of student	3.25	2.96

6	Technology development enables the detecting of emotional distress through voice recognitions.	3.31	3.00
7	Data collection are massive to increase AI technology capabilities in detection.	2.69	2.86
8	Increase the chances for students accessing their mental health	3.30	2.93
9	Rules and regulation that can safeguards user's data, privacy and security.	3.40	2.89
10	An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost.	3.45	2.88

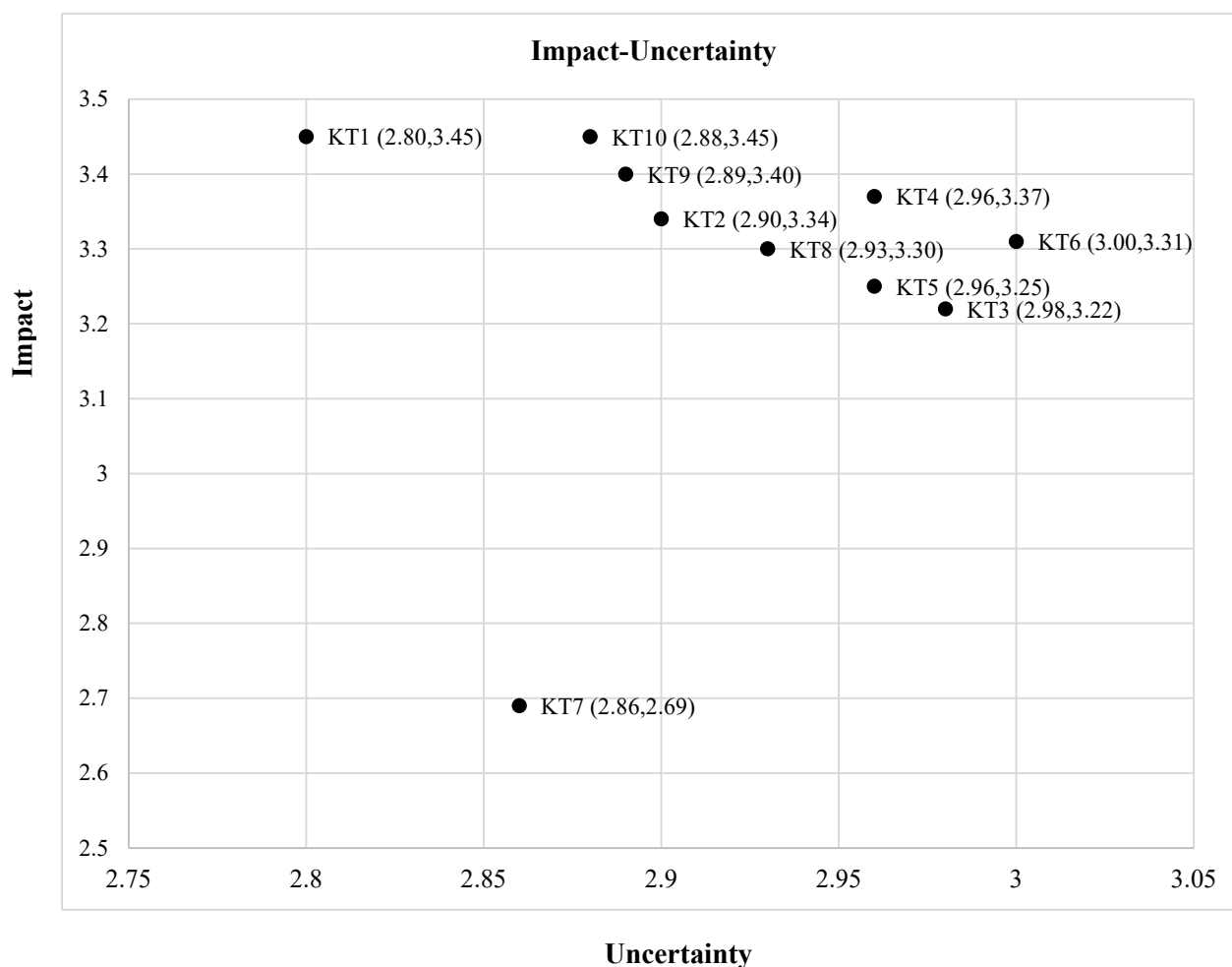


Figure 1: Impact-uncertainty of the key terms

As illustrated in Figure 1, top two key terms were identified which have the highest impact and uncertainty for the future trends of Artificial Intelligence (AI) application through voice recognition in assisting and detecting emotional distress among secondary school students. An early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost (KT10) has the highest impact and technology development enables the detecting of emotional distress through voice recognitions (KT6) has the highest uncertainty. These two key terms (KT6 and KT10) were used to build a scenario analysis in exploring the future trends of Artificial Intelligence (AI) application through voice recognition in assisting and detecting emotional distress among secondary school students.

4.6 Discussion

(a) Issues and Drivers of Artificial Intelligence (AI) Application through Voice Recognition in Detecting and Assisting Emotional Distress among Secondary School Students

In this segment, the researcher conducts a literature review that circles around artificial intelligence based on previous study. The dilemma and vital drivers of the STEEPV have been discussed. The methods of STEEPV would explore societal, technical, cultural, fiscal, political, and value problems. It would discuss all the challenges and requirements for using A.I. Technology to identify and support high students with emotional distress. The researcher identified all the key and drivers issues by outsourcing from secondary data. All the readings are from article, journal or any newspaper from internet that regarding to this study have been break down into issues and drivers related to social, technological, economics, environmental, political and values. After that, all the identified drivers and issues were used as the questionnaire to measure the level of importance, impact and uncertainty. The result has been achieved by giving out survey through Google Form and distributed to secondary students in Johor Bahru. All the data have been collected and analysed. Researcher have found out that the driver for this study is technology development enables the detecting of emotional distress through voice recognitions and the needs in automatically detection of the sign and early symptoms for students.

(b) Future trends of Artificial Intelligence (AI) Application through Voice Recognition in Detecting and Assisting Emotional Distress among Secondary School Students

Two key terms from impact and certainty analysis were used to define the scenario space and to shape narrative production and predetermined elements to define the strategic issues that needed to be addressed across all the scenarios. The direction of change will follow the positive and negative polarity. The positive polarity will be on right hand side while the negative will be in the left-hand side. So, these two key key terms in this study which are an early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost (KT10) and technology development enables the detecting of emotional distress through voice recognitions (KT6). Figure 2 shows the four scenarios that were developed for this research.

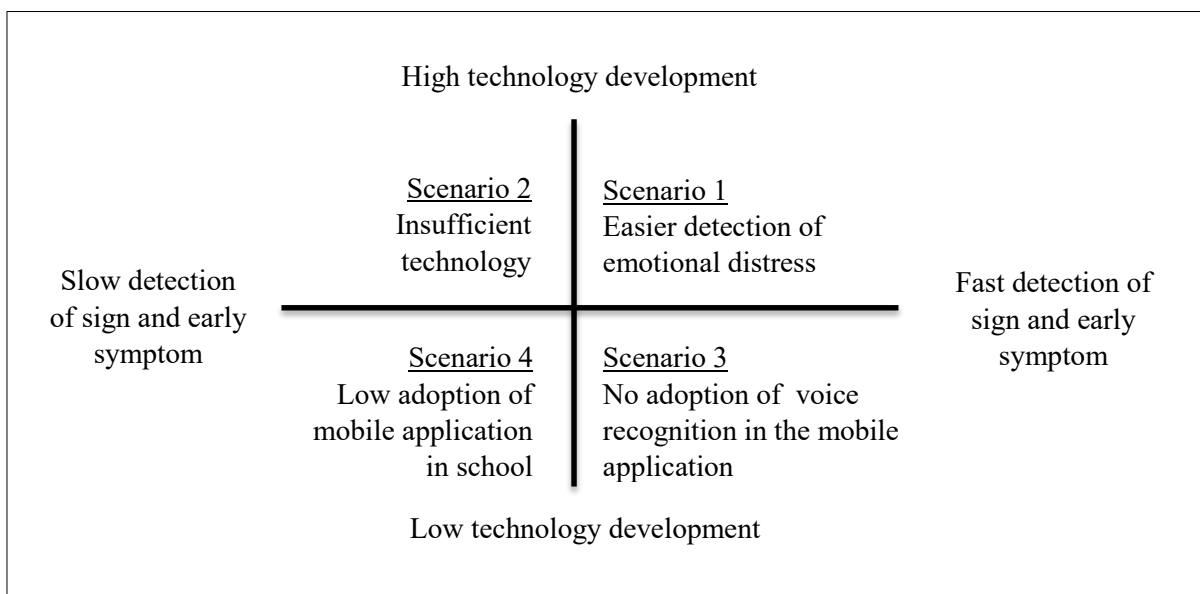


Figure 2: Scenario building

In Scenario 1, the future where people will be able to succeed in the fast detection the sign and early symptoms for students and high technology development enables the detecting of emotional distress through voice recognitions. The advancement of technology for sensing emotions has given rise to a very lucrative potential in the private sector. Many start-ups have arisen in recent years, devoted almost entirely to a particular form of emotional recognition technology. A comprehensive analysis of emerging technology for the identification of human emotions. To this end, we discuss the various origins from which emotions can be read, along with existing technologies that have been built to identify them. As in Malaysia, the research in this is popular but they have started to get the idea of voice are one of the predictors for clinical depression. In 2016, a researcher from Kuala Lumpur stated that, Voice auditory characteristics derived from reading expression showed variable efficiency in estimating psychiatric distress ratings in both men and women. Speech characteristics is extremely predictive of HAMD scores in both men and women. The BDI-II scores for adults, respectively. The technique is possible for diagnostic applications in a range of clinical environments, since it can be applied during a typical clinical interview in a regular closed space and without rigid supervision.

It is vital to develop appropriate framework of the development of the technology. The technology development will produce the result fast. It is because speech data is simple to collect clinically, its correlation with depression has been studied (Pan et al., 2019). For example, nearly 1,000 Chinese females participated in the study of the robustness of voice features in predicting depression. Several separate datasets have been used as a comparison sample. The result are four voice features contributed substantially to depression and that the contribution influence of the voice features alone reached 35.65 % (Nagelkerke's R²). In the classification modelling process, the voice data model has consistently higher predictive precision than the baseline demographic data model when evaluated on different dates. From all of this dataset, it can be combined with the artificial technology in detecting and assisting the emotional distress of students.

Scenario 2 depicts insufficient technology. This is due to slow in detection of early sign and symptom even though high technology develop in voice recognition. To do this, Artificial Intelligence (AI) technology need machine learning algorithm to input a subset of patient data and modify their algorithm to accurately differentiate good versus managed subjects or in the case of care results, non-responsible respondents. The AI will then work out the features in the data can better allow the machine to learn and make sure that their algorithm only includes certain data features, and verify their approach by checking how reliable assumptions can be made for the majority of the patients whose data it does not have. In shorts, lack of datasets can prevent the AI to detect the emotional distress of students.

In Scenario 3, the researcher pointed out towards no adoption of voice recognition in the mobile application as the technology development of voice-recognition are low in future. In other word, there is no implementation in school and the students cannot be passed through voice recognition due to the effectiveness of the technology. Variabilities in acoustic material and speakers influence automated measurement of depression from speech signals influenced the variabilities in acoustic material and speakers (Afshan et al., 2018). Changes in the way people speak represent mood changes, but efforts to use this evidence have not proven scientifically useful so far. Prosodic (rhythm and intonation of a speaker's voice rises and falls) defects the dynamics of vocal tract resonances or formants that related to distress and alterations and experiments. Characteristics of voice consistency have not been effectively extended to Automatic depression diagnosis. One of the key causes, this is the meaning of the word 'quality of speech'. is the level of voice has been described using impressionistic marks, such as tense, rugged, and breathy with distinct meanings. So, in comparison, it is hard to be durable, to extract the aspects of the sound output from the speech signal in order to classify speech source characters (Afshan et al., 2018). This variability (prosodic, voice tone, and spectral characteristics) will outperformed the voice-recognition technology.

Lastly, Scenario 4 depicts a worse scenario as still low adoption of mobile application in schools was forecasted. The current situation is even there are many of dataset have been develop in collecting the voice of patient but there is a stigma how it can be used effectively. For example, David Sontag, an MIT Assistant Professor specialized in machine learning and health care, is sceptical of the relevance of the work. One catch, he notes, is that training data were obtained during an interview with a real clinician, albeit one behind an avatar, so it's not clear whether the diagnosis will be completely automated. He stated that the idea how the technology work is interesting but it is not clear to used clinically. So, the use of mobile health applications may not be adopted if there is no clear line work how it will work and use to the students.

5. Conclusion

In conclusion, the first objective which is to identify issues and drivers that related artificial intelligence application through voice-recognition to detect and assisting emotional distress of secondary student in Malaysia Therefore, the two key drivers with the highest impact and uncertainty mean were chosen from impact-uncertainty analysis. The chosen key drivers were an early detection system in a mobile application could improve the quality of life in terms of productivity, time and cost and technology development enables the detecting of emotional distress through voice recognitions. Moreover, the second objective is to examine future trends of artificial intelligence application through voice-recognition to detect and assisting emotional distress of secondary student in Malaysia. There are four scenarios on the future trends that were discovered from scenario building, which are student's emotional distress can detect more easier through voice recognition, no adoption of voice-recognition in the mobile application, insufficient technology related to artificial intelligence in the mobile application and low adoption of mobile application in school.

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