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Mutagenesis Analysis of *ABCB8* Gene Promoter of *Danio rerio*

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ABSTRACT

The *ABCB8* is one of the members under the ABCB subfamily of ATP-Binding Cassette (ABC) transporter which possess the ability in regulating the intracellular iron and heme transport. The loss of function mutation of *ABCB8* gene leads to iron and heme accumulation in the cell which is highly toxic to human. However, the information regarding the expression regulation of this gene remains scarce. Hence, the objectives of this project are to determine the transcription factors binding site (TFBS) of *ABCB8* and to identify the transcriptional roles of the *cis*-elements through mutagenesis analysis. To examine this, total genomic DNA was extracted from *Danio rerio* and the promoter sequence was isolated by using specific pair of primers through polymerase chain reaction (PCR). The sample was sent for DNA sequencing and the result showed 98% similarities to the zebrafish DNA sequence from clone DKEYP-87A6 in linkage group 24. Besides, the TFBS was studied in aspect of TFBS abundance, TFBS composition and TFBS distribution. The two most abundant TFBSs based on liver-specific profile were HNF-3β and C/EBPβ, with 38 and 39 binding sites, respectively. The sequence of *ABCB8* promoter gene was mutated through substitution of the AP-1 binding site at location 535 with other nucleotides by using a pair of mutagenic primers (forward primer: 5'-TGGGGGTTTAGATATTGAAAC-3'; reverse primer: 5'-AACTCGC ATACATTTCAGTCATC-3'). This result may benefit the development of new diagnostics and therapeutics for iron-associated disorder.

Keywords: ABC transporter, *ABCB8* promoter sequence, *Danio rerio*, mutagenesis, TFBS

INTRODUCTION

Iron is major element that is involved widely in the metabolic process of human such as transportation of oxygen, synthesis of deoxyribonucleic acid (DNA) and transportation of electron (Dawson, 1988). In human body, iron is found mainly as a cofactor which is bound with the protein to form heme compound such as haemoglobin and myoglobin (Chiabrando, Vinchi, Fiorito, Mercurio, & Tolosano, 2014). Heme compound is important in cardiovascular physiology whereby it is involved in gaseous exchange and mitochondrial energy production. Besides that, it is also commonly associated with the oxygen transportation. Although heme is vital in biological process, but excess of heme compound is highly toxic to human body (Chiabrando *et al*., 2014).

ATP-Binding cassette transporter (ABC) is a huge superfamily which is an example for ATP-dependent pump (Vasiliou, Vasiliou, & Nebert, 2009). ABC transporters that encode membrane proteins are important in exporting and importing wide varieties of substrates and molecules across the membrane (Seguin & Ward, 2018). One of the subfamilies that branched out from ABC superfamily is ATP-Binding Cassette Subfamily B Member 8 (*ABCB8*). According to Vasiliou *et al*. (2009), *ABCB8* gene is vital in transportation of heme, phospholipids or intracellular peptides across the membranes in human.

Transcription factors (TFs) are proteins which consist of the DNA-binding domain that recognizes specific DNA sequence within the promoter region. This feature impacts the transcription regulation of the gene by binding to specific regions of the gene (Gonzalez, 2016). The processes that identify the cell types and developmental patterns are also controlled by the TFs. Transcription Factor Binding Site (TFBSs) analysis is an important way to understand the abundance, composition and the position of the TFs in the promoter region.

To date, the *ABCB8* can be found in many organs such as brain, eye, gill, intestine, muscles, and skin as

detected in teleosts, mice, human and primates (Lim *et al*., 2018a). Although the gene is expressed in many organs, information regarding the expression regulation of this gene remains scarce. It has been identified to be one of the main regulators in heme accumulation within the targeted cells, the exact molecular mechanism has not been studied thus far. Previous studies have indicated that transcription factors such as Sp1, NFY, p53 are all implicated in ABC transporter regulation in general (Seguin & Ward, 2018; Vasiliou *et al*., 2009).

Previous literature has been focusing on the gene functional characterization of *ABCB8* on zebrafish (Newman, Hin, Pederson, & Landelli., 2019). Lim, Chung, Ishak and Waiho (2021) have recently examined zebrafish promoters *ABCB4*, *ABCC1* and *ABCG2* via microinjection coupled with green fluorescence protein detection on zebrafish embryos, but none has place the spotlight on the *ABCB8* promoter to the best of our knowledge, albeit many have proven that gene orchestrators like enhancer and promoter have substantial roles in determining whether and when a gene will be activated (Hernandez-Garcia & Finer, 2014; Lim, Chung, Chong, & Lee, 2018b; Lim, Chung, Chong, & Lee, 2019a; Lim , Chung, Chong, & Lee, 2019b; Liu & States, 2002; Mishra, Dhanda, Siwach, Aggarwal, & Jayaram, 2020; Wang, Cheng, Li, Wu, & Zhao, 2018). The verification of the involvement of these transcription factor in feedback regulation of *ABCB8* needs to be determined by using the site-directed mutagenesis. Therefore, this study is to determine the TFBSs and the roles of these *cis*-elements through mutagenesis. Through mutagenesis, it is expected that the gene expression of the *ABCB8* gene in zebrafish will be inhibited. This study forms the foundation to the development of new diagnostics and therapeutics for iron-associated disorder in human, especially when knockout experiments on this zebrafish promoter and its mutant show promising outcomes in the future.

MATERIALS & METHODS

Total Genomic DNA Extraction

The fish care and fish tissue collection were performed following the authorization and standard operating procedures set by the Animal Ethics Committee, Universiti Malaysia Sarawak (UNIMAS/TNC(PI)-04.01/06-09(17)). The whole *D. rerio* was sliced finely on ice and transferred into 1.5 mL of microcentrifuge tube prior to the total genomic DNA extraction procedures emulating that of Chung (2018) as well as Lim, Chung, Lau, Aziz and Gan (2021).

Gradient PCR

A pair of primers for *ABCB8* of *D. rerio* (forward primer: 5'-ATG GTA CCG TTA AAT CAA GGA CAA GCG T -3'; reverse primer: 5'-ATG AGC TCA GAA ACG ACA GAG TGA TGA AA -3') were optimized in terms of annealing temperature using T100^{TM} Thermal Cycler (BIO-RAD, USA), procedures were done as described by Lim, Chung, and Hasnain (2020) with a few amendments. The optimal temperature of the primer was calculated and then the temperature obtained was applied for the following PCR reaction. Next, 10 µM *ABCB8* forward and reverse primer were diluted before continuing with the preparation of the PCR master mixtures. A 10x dilution was performed to obtain a 10 µM primer solution from the 100 µM of primer stock. The PCR master mixtures solution was prepared by adding 10X *EasyTaq* buffer with (Mg^{2+}), 2.5 mM dNTPs, 50ng/µL zebrafish genomic DNA, 2.5 units *EasyTaq* DNA Polymerase, 10 µM *ABCB8* forward and reverse primer respectively, with the remaining volume topped up with double distilled water. Then, 20 µL of master mixture was transferred into each PCR tube. After that, the mixture was subjected to thermal cycling for 35 cycles. The cycling conditions were initial denaturation at 95˚C for 3 mins, denaturation at 95˚C for 35 sec, annealing between 58˚C to 65˚C for 30 sec and extension at 72˚C for 1 min 30 sec. Agarose gel electrophoresis was done after the PCR to check on the PCR products.

Restriction digestion and cloning

The restriction digestion mixtures for digesting pGEM-T and pGL 3.0 vectors were prepared separately. The digesting mixture for pGEM-T mixture was prepared by adding 4 µL of DNA (0.5-1.0 µg/µL), 2 µL of 1X Tango Buffer, 2 µL of *KpnI* restriction enzyme, 1 µL of *SacI* restriction enzyme, and 11 µL of nuclease-free water. While the digesting mixture for pGL 3.0 vector was prepared by adding 10.2 µL of DNA (0.5-1.0 µg/µL), 2 µL of 1X Tango Buffer, 2 µL of *KpnI* restriction enzyme, 1 µL of *SacI* restriction enzyme, and 4.8 µL of nuclease-free water.

The mixture was incubated at 37˚C overnight, followed by incubation at 80˚C to inactivate the enzymes. The inactivate mixture was analysed on 1% agarose gel electrophoresis at 90 V for 40 minutes. The cloning process was conducted in accordance to that portrayed by Jee *et al*. (2017).

Transcription factor binding site (TFBS) analysis

The consensus sequence was used to perform transcription factor binding site (TFBS) analysis by using MATCH tool to determine the TFBS abundance, TFBS composition and TFBS distribution (Kel *et al*., 2003). The overall TFBS was identified by inserting the *ABCB8* sequence as an input and the TFBS frequency per nucleotide was calculated and recorded.

Mutagenic primer design and synthesis

Mutagenic forward and reverse primers for *ABCB8* were designed, emulating that of Yeaw, Lim and Chung (2020) as well as Md Yusni, Lim and Chung (2020). The AP-1 binding site was mutated by substituting the nucleotide in core binding site with another nucleotide. After that, suitable forward and reverse primers of 20 to 25 mers were selected on the region of the conserved domain. The primers were screened for melting temperature, self-complementary, presence or absence of secondary structure and GC content by using the OligoCalc tool. After that, the selected primers order was sent to First BASE Laboratories for primer synthesizing.

Site-directed mutagenesis

Mutagenesis experiment was conducted by using KOD Plus Mutagenesis Kit (Toyobo, Japan) according to the manufacturer's protocol. The mutagenesis reaction mixture was prepared by adding 10× buffer for iPCR, 2 mM dNTPs, 50 ng/ µL pGL 3.0 with mutated *ABCB8* insert, 1 µL KOD -Plus- DNA polymerase, 10 pmol/ µL *ABCB8* mutagenic forward and reverse primer respectively, with the remaining volume topped up with PCR grade water. After assembling the mixture, the reaction mixture was subjected to a PCR cycle for 10 cycles. The cycling parameters for inverse PCR were initial denaturation at 94˚C for 2 min, denaturation at 98˚C for 10 sec, followed by primer annealing between 45˚C and 52.3˚C for 30 sec, extension at 68˚C for 7 min and holding at 12˚C.

Following the PCR cycle, 2 µL of *Dpn* I restriction enzyme (10 U/µL) was added to the 50 µL PCR reaction mixture. After that, the mixture was mixed thoroughly by pipetting and incubated at 37˚C for 1 hour to digest the plasmid. Then, a total of 15 µL ligation mixture was prepared by adding 2 µL of *Dpn1* treated PCR product, 7 µL of ddH_2O, 5 µL of ligation high and 1 µL of T4 Polynucleotide kinase. Next, the DNA that was treated with 1 µL of *Dpn* I was transformed into the XLI-Blue *E. coli*. The transformation reaction mixtures were plated out on LB-ampicillin agar plates and incubated at 37˚C for 16 hrs.

RESULT

TFBS analysis

The *ABCB8* promoter gene sequence was analysed by using MATCH tool to identify the overall TFBS frequency per nucleotide. Based on the result obtained from MATCH tool, the frequency of sites per nucleotides based on liver-specific profile is 0.099785.

$$\text{Frequency of sites per nucleotide} = \frac{139}{1393} = 0.099785$$

The composition of the transcription factor binding sites were identified based on liver-specific profile. Based on Figure 1, there are 12 TFBSs detected on the promoter region of *ABCB8* gene. The TFBSs detected were GATA-3, HNF-1, HNF-3β, C/EBPβ, AP-1, CHOP-C/EBPα, USF, HNF-4, USF, CREB, YY1, NF-1 and TATA. Based on the data obtained, C/EBPβ had the highest amount which hits 39 binding sites in the promoter region.

The TFBS distribution of the 1.5kb promoter region of *ABCB8* was analysed at every 100 bp and each of the TFBSs were plotted in the Figure 2. Based on the Figure 2, the 12 TFBSs detected in the promoter sequence (GATA-3, HNF-1, HNF-3β, C/EBPβ, AP-1, CHOP-C/EBPα, USF, HNF-4, USF, CREB, YY1, NF-1 and TATA)

were plotted in a 100 bp interval format. The C/EBPβ and HNF-1 clustering is one noticeable observation on the distribution pattern of these TFBSs, while the other TFBSs were found scattered across the promoter region.

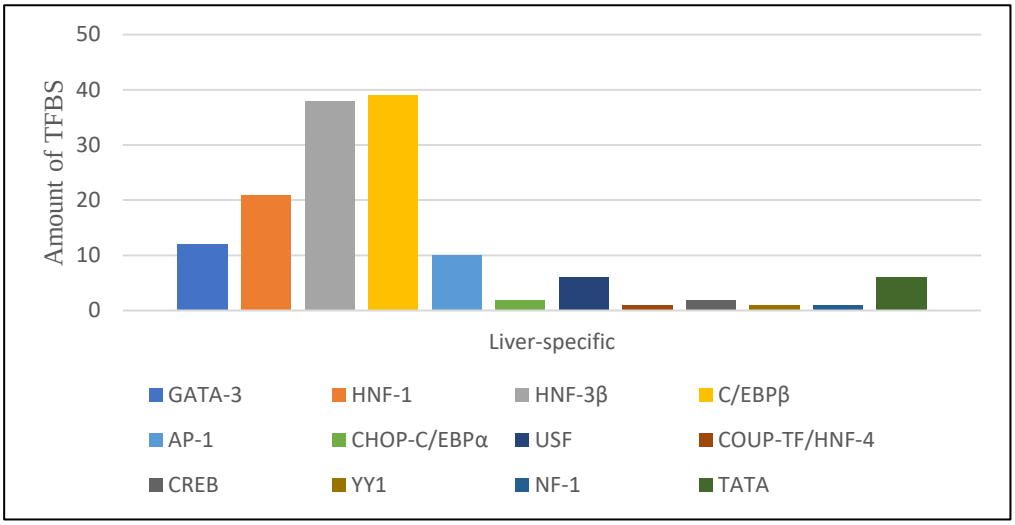

Figure 1. The predicted TFBS composition in the promoter sequence.

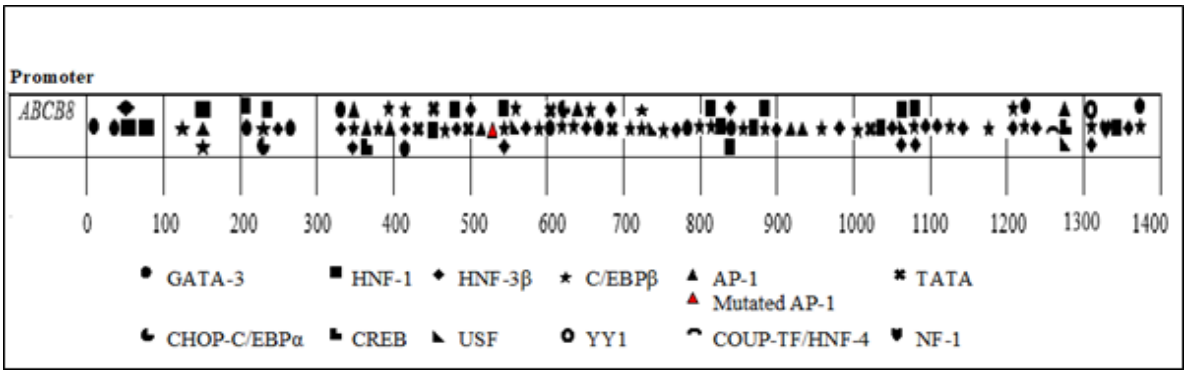

Figure 2. The TFBS distribution pattern per 100 bp interval of the *ABCB8* promoter region. The stacking TFBS represent the overlapping TFBS sites.

Mutagenic primer design

Both the mutagenic forward and reverse primers of promoter region in *ABCB8* were designed based on the region of AP-1 transcription factor. The characteristics of the mutagenic forward and reverse primers for *ABCB8* were shown in Table 1.

Table 1. The parameters of *ABCB8* mutagenic primer pair synthesis.

Primer	**Forward**	**Reverse**
Sequence (5' – 3')	TGGGGGTTTAGATATTGAAAC	AACTCGCATACATTTCAGTCATC
Length	21 bp	23 bp
Melting temperature, Tm	50.0˚C	53.2˚C
GC content	38.1%	39.1%
Oligo amount	20.3 nmoles	27.3 nmoles

Mutated *ABCB8* gene promoter analysis

After the site-directed mutagenesis, the *ABCB8* gene promoter region was cultured and sent to sequencing at First BASE to verify the identity of the gene insert. Based on Figure 3, the sequence had reached 91% similarities with the sequence from *Boechera divaricarpa* GSS (clone B25-01-F_J06). The gaps obtained were 1% (2/139). Hence, this indicated that the plasmid does not contain the promoter region of *ABCB8* gene.

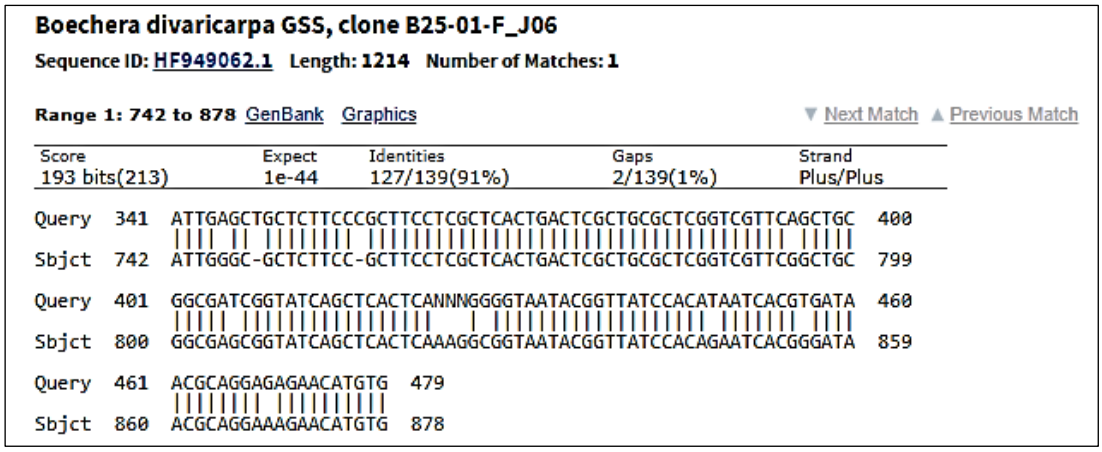

Figure 3. BLASTn analysis of the sequencing of the pGL 3.0 with mutated *ABCB8* insert.

DISCUSSION

ABCB8 is one of the subfamilies that categorized under the ABC transporters superfamily. According to Vasiliou *et al*. (2009), *ABCB8* is involved in transportation of heme, peptides and phospholipids. Besides that, *ABCB8* also is the member of the multidrug resistance (MDR) subfamily which plays a major role in chemoresistance of numerous melanoma cells (Elliott & Al-Haji, 2009). Hence, in this study, the TFBS of the *ABCB8* was analysed specifically under the liver-specific profile using MATCH (Kel *et al*., 2003). Based on the result obtained from MATCH in this study, the frequency of the TFBS found per nucleotide was 0.099785, and a total of 139 TFBSs were found in the zebrafish *ABCB8* gene promoter.

Among the TFBSs found in the promoter region of *ABCB8* gene, the AP-1 (Activator Protein 1) binding site was chosen for the mutation to take place. This is because the transcription factor AP-1 is important for the transcription regulation in *MDR1* (Daschner, Ciolino, Plouzek, & Yeh, 1999). AP-1 transcription factor which consists of dimers Jun (c-Jun, JunB and JunD) and Fos is important in the development of the liver (Trierweiler, Blum, & Hasselblatt, 2012). The c-fos also acts as a fundamental factor which controls the transcription of mRNA, protein expression of the downstream gene, cell proliferation and apoptosis (Li *et al*., 2018). The AP-1 proteins c-jun and c-fos are highly expressed in the MDR human tumours and cell lines (Daschner *et al.*, 1999). According to Trierweiler *et al.* (2012), the dimer c-Jun also functions as an oncogene in the human hepatocellular carcinoma (HCCs). In addition, the adriamycin treatment of human T-cell leukaemia had shown the activation of the c-Jun N-terminal kinase which was involved in the signalling pathway that leads to MDR (Daschner *et al.*, 1999). The AP-1 TFBS was chosen as mutation site because it is deemed as one of the most powerful contributors towards the liver function regulation by *cis*-regulatory elements (Lim *et al.*, 2019b). Mutation induced in the binding site of AP-1 leads to the conformation changes of the binding site and exerts hinge effects (Kim, Zhao, Lu, & Zhao, 2017). Besides that, mutation at the binding site also influences the binding affinity of the transcription factor to the binding site (Kim *et al*., 2017). According to Lim *et al*. (2019b), the AP-1 pairing has more influence on the liver enhancer activity as compared to the individual ones. The AP-1 site selected for mutation in this study is one of the AP-1 pair found within the zebrafish *ABCB8* promoter (Figure 2), hence it is interesting to see how the promoter activity is affected by this mutated AP-1 in future.

In this study, the TFBS that had the highest composition (39 binding sites) is the C/EBPβ or also known as nuclear factor-interleukin-6 (NF-IL6). C/EBPβ is one of the family members of CCAAT/enhancer-binding protein, which regulates the large amount genes in different functions such as acute phase response, hematopoiesis, immune function, tumour invasiveness and solid organ development (Pal *et al*., 2009). The lipopolysaccharides (LPS), interleukin-1(IL-1), interferon-gamma (IFNγ) and interleukin-6 (IL-6) are the stimuli that induced the upregulation of the C/EBPβ mRNA levels from acute phase response to inflammatory stimuli in the liver and hepatic cells (Takiguchi, 1998). Besides, complexes formed through the homodimerization and heterodimerization of C/EBPβ with other C/EBP family or with other basic leucine zippers (bZIP) protein family members able to repress and activate the transcriptional activity (Takiguchi, 1998). For example, the heteromer that formed by the complex C/EBPβ with AP-1 family member represses the transcriptional activity because the complex formed cannot bind to the C/EBPβ binding site (Takiguchi, 1998). Interestingly, the HNF-1 TFBS was also found in relatively high abundance (21 binding sites). Looking at Figure 2, the clustering of C/EBPβ and HNF-1 TFBSs occurs very frequently, especially at 400-500 bp, 800-900 bp and 1000-1100 bp regions. This phenomenon echoed the observation by Lim *et al.* (2019b) on one of the enhancers isolated. According to Lim *et al.* (2019b), this cooperative TFBS clustering strongly orchestrated the enhancer activity investigated as the deletion of this region had resulted in at least 2.7-fold drop in enhancer activity in the liver cells. Therefore, it can be postulated that the role of this C/EBPβ and HNF-1 clustering in ABCB8 zebrafish promoter may be pivotal in liver regulation and metabolism.

From the result obtained, a sum of 38 HNF-3β binding sites were found within the promoter region of the zebrafish *ABCB8* gene. According to Lau, Ng, Loo, Jasmen, and Teo (2018), HNF-3β or the forkhead box protein A2 (FOXA2), is highly expressed in the epithelial cells of the developing liver, pancreas and other tissues in the body. HNF-3β is very important during the fasted state of the organism because this transcription factor activated the transcriptional regulation of lipid metabolism and ketogenesis (Wolfrum, Asilmaz, Luca, Friedman, & Stoffel, 2004). Based on Figure 2, the HNF-3β binding sites scattered quite evenly across the *ABCB8* zebrafish promoter region. In other words, no significant HNF-3β clustering was observed. This is essential to note because Lim *et al*. (2019b) discovered that HNF-3β TFBS clustering had resulted in a drastic plunge in liver enhancer activity. The absence of HNF-3β clustering in the zebrafish *ABCB8* promoter in this study may indicate that there is no presence of any *cis*-regulatory element activity disruptor.

CONCLUSION

In this study, the sequencing result of pGL3.0 containing the promoter region of *ABCB8* gene was 100% similar to that of the *D. rerio* clone DKEYP-87A6 linkage group 24 from GenBank database. Through the TFBS analysis of the sequence specifically in liver-specific profile, the TFBSs for HNF-3β and C/EBPβ were abundantly found in the promoter region of *ABCB8*. Besides, the clustering of some TFBSs like the C/EBPβ and HNF-1, is believed to play major roles in the liver development and lipid metabolism in *D. rerio*.

Further study should focus on investigating more transcription factors in the promoter region of *ABCB8* gene. Besides that, transfection of the mutated gene into cell lines can be done to determine the regulatory activity of the transcription factor. Furthermore, the MDR mechanism of *ABCB8* in cancer cell could be unraveled by mutating the promoter region of *ABCB8*. A comprehensive review consolidating all the related researches (Lim, Chung, Hussain & Bujang, 2019c; Lim & Chung, 2020; Lau, Lim, Ishak, Abol-Munafi & Chung, 2021) would be of great benefit to those pursuing this similar line of research in future. This result may benefit for the development of new diagnostics and therapeutics for cancer and iron-associated disorder, following the promising results obtained from zebrafish knockout experiments using this promoter and its mutants in the future.

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e-Nelayan the Fishery Marketplace App

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ABSTRACT

Smartphones have become an essential device that not only acts as a communication media, but it is also able to assist its user to do multiple tasks. A fisherman is an example of a community member that uses a smartphone. If a smartphone is fully utilised, it can be a huge help for the fishermen to sell their catch and fishery products. However, there is no proper medium, such as an mobile application, for this group of people to sell their catch. Hence, the e-Nelayan Marketplace App is introduced. This app enables the fishermen mainly in Kota Samarahan to sell their catch and other fishery products more effectively. The functionalities of this app include the ability to advertise the catch and let customers and fishmongers know the type of fish being sold. In addition, an interactive graphical user interface was designed to display the output of each functional module. In order to evaluate the user acceptance towards the app, several tests were conducted, such as the performance, portability, compatibility, and usability testing. With the development of this project, it is hoped that the application will benefit not only fishermen but also customers and fishmongers.

Keywords: Fishermen, Kota Samarahan, Marketplace mobile application, Mobile Application, Marketplace

INTRODUCTION

The Marketplace App for the e-Nelayan project is conducted to help the fishermen, mainly in Kota Samarahan with their fish trading activities. The usage of smartphones is now in the mainstream; however, there is no available mobile application that can be used by the fishermen, specifically in Kota Samarahan, that can aid such fish trading activities. Thus, the presence of a mobile marketplace application can be an excellent platform for the fishermen to sell their fish to buyers in Kota Samarahan. Targeted groups of users for this mobile application are the fishermen in Kota Samarahan, customers and fishmongers. With regard to the targeted groups, several essential features would be present in this mobile application.

The outcome of this project is a mobile application that can help fishermen to improve their business. This mobile application acts as a marketplace for the user community of fishermen, sellers and costumers. The first group, which is the fishermen, will be able to post their catch using the application together with information about the said catch. They can make advertisements to target buyers. The fishermen can also set the price of the fish differently for different types of users. The sellers can provide two types of options to purchase the fish: self-pick-up or cash upon delivery. Finally, customers can post their demand for specific types of fish, which can then be commented on by sellers or the fishermen themselves.

A. Problem Statement

Mobile apps in fisheries are becoming common in developed countries. However, it is still unexplored in Malaysia, which becomes a limiting factor in the evolution of the fisheries industry, especially in Kota Samarahan. The fisheries industry in Kota Samarahan only practises the conventional method of supplying fish to the customer from fishermen. Apart from that, there is also a lack of a platform, such as mobile applications, to allow fishermen to sell their catch in an easy and quick way.

B. Objectives and Scope

The goals of the project were generally to support fishermen in Kota Samarahan to increase their sales and improve their revenue. In order to accomplish this, three goals must be achieved:

i. To investigate the current manual system of fish trading activities.
ii. To develop a mobile application with embedded features that could help the fishermen to calculate their income easily.
iii. To support the fishermen to market their catch without the need for a middle person.

This project is aimed to develop a fully functional mobile application for the fish marketplace that can be used by the local people in Kota Samarahan, primarily fishermen, fishmongers, and customers, to perform fish trading transactions. The scope of this project is as follows:

i. This mobile application will be accessible using the user's Android devices only.
ii. This mobile application will not be available on any personal computers with an operating system such as Windows and macOS.
iii. The target users for this mobile application are the fishermen, fishmongers, and customers in Kota Samarahan.
iv. This mobile application acts as a marketplace for user's fish trade in Kota Samarahan.

LITERATURE REVIEW

A. Evaluation of the Existing System

There are three existing systems that have similar functions or features as the proposed application. The existing systems are *Fish.me* (Inc, 2018), *OneFarm* (Plt, 2017), and *Farmers e-market* (Limited, 2017). These systems were reviewed to obtain their strengths and weaknesses in order to produce the best solution for the proposed application. Table 1 summarises the comparison between the existing systems and the proposed application.

Table 1. Comparison between three existing systems and proposed application

Evaluation Criteria	Fish.me	OneFarm	Farmers e-market	Marketplace App for e-Nelayan Kota Samarahan
Login system	√	√	√	√
Categorisation of products	X	√	√	√
Purchasing method	Cash upon delivery only	Depending on the seller	Self-pickup	Self-pickup & cash upon delivery
Search features	X	X	√	√
Type of user	Customer & fishermen	Hybrid-type user	Hybrid-type user	Customer, fisherman, & seller
Ability to view the same seller's product	√	X	X	√
Account Management	√	√	√	√
Cart feature	√	X	X	√
User interaction	X	√	X	√
Shareability	X	X	√	√

The strengths of the existing systems will be reviewed and adopted; meanwhile, the deficiency of the existing systems would be analysed and enhancements designed in the proposed application. Firstly, the proposed

application will be included with a login system that is able to differentiate different types of users. There will be three types of users for this app which are fishermen, fishmonger, and customer. The proposed application will also include the categorisation of products. Next, the proposed application allows fishermen or other sellers flexibility in determining payment choices. Fishermen may choose whether to use cash upon delivery, self-pickup, or both. Apart from this, the app also provides a search function that will make it easy for users to find products. The proposed application's user interface would be rendered as simple as possible, thus maintaining its usability. The choice of colour, type, and size of font and placement of images are some of the essential aspects to take into consideration. It will also allow the user to manage their accounts, such as changing phone numbers or addresses.

Furthermore, users will also be able to add the products they want to buy to the cart while continuing to shop for other products. The proposed application will also be built with a function where customers can post their demands so that fishermen or other sellers can comment on the said posts. The seller also can write a post to notify that they have added new products.

MATERIAL & METHODOLOGY

The methodology that was chosen for this project is Extreme Programming (XP). Extreme Programming is one of the methodologies available in the Agile method. XP is a software development methodology that allows the improvement of software quality to fully satisfy the needs of the clients (Powell-Morse, 2017). By using the XP method, the quality of this mobile application can be adjusted periodically according to the user's satisfaction level (Shafiq & Minhas, 2014). Planning, designing, coding, testing, and listening are the five phases of the Extreme Programming (XP) software life cycle (Sergeev, 2016). Besides, the feature of the mobile app can be frequently updated since there is a specified timeframe for each software cycle to meet the requirements of the targeted users. As the cycle progresses from one iteration to another, the quality of the mobile application is increased. There are five main principles requiring consideration when utilising the XP technique which consists of simplicity, contact, suggestions, respect, and bravery. These principles must be followed to maintain the efficacy of the development process.

This section mainly covers the software methodology processes from the analysis and design of requirements up to the testing of the e-Nelayan Marketplace app. Requirements needed for the application were listed and discussed in detail, while the user interface, database, and application's architecture were properly designed.

There were several tasks that have been done for each phase in the Extreme Programming (XP) methodology. Each phase contained a unique list of tasks. Table 2 summarises the tasks that have been completed for each of the methodology's phases.

A. User Requirement

For the user requirements, interviews and questionnaires were used to obtain user's views and opinions on the proposed application. Semi-structured interview was used to gain feedback from the fishermen. The questionnaires were disseminated to the customers and fishmongers.

The interviews were conducted in Kampung Muhibbah, Kota Samarahan. The total number of active fishermen in Kampung Muhibbah was around 13 people, where a total of five respondents had been interviewed to obtain their opinions and suggestions on the proposed application. Based on the interview outcomes, most of the respondents agreed that the proposed application would benefit them. Table 3 depicts the respondents' views of the proposed application.

Table 2. Summary of tasks for each phase in the XP methodology.

Phase	Tasks
Planning	1. Interviewing the fishermen, LKIM* officers and fish dealers. 2. Distribute the questionnaires to fish customers and fishmonger in Kota Samarahan. 3. Estimating and drafting the project completion schedule. 4. Listing the requirements for the proposed application.
Design	1. Reviewing three existing systems that have similar functions as proposed application. 2. Draw different types of UML diagram that serves a specific purpose for the proposed application.
Coding	1. Coding of features to be made accessible in the proposed application based on the requirements and design from planning and design phases. 2. Divide features of the proposed application into a smaller part. 3. Codes each part of divided features of the proposed application. 4. Revised the completed codes after tested with users.
Testing	1. Test each part of the completed code with the target users. 2. Record the results of the tests to improve each part of the codes
Listening	1. Record feedback from the users to revise the requirements of the proposed application. 2. Repeat phase design, coding, testing, and listening for next iteration if any changes should be made. If no changes, the iteration ends at this phase.

* Lembaga Kemajuan Ikan Malaysia Negeri Sarawak or known as Fisheries Development Authority of Malaysia

Table 3. Fishermen's opinion on how the proposed application would help.

Respondents	How the proposed application will help
1	Will make it much easier to sell the fish directly to the customer and at the same time able to increase income since more people are using mobile devices
2	Easy to sell fish because sometimes it took a long time to wait for dealers to come
3	Can put a better price rather than a lower price from the fish dealers
4	Easier to understand the fish market price
5	Able to understand the needs and demands of the consumer

For the fishmongers, a total of 21 respondents responded to the questionnaire. Questionnaires were administered to the fishmonger in Kota Samarahan mainly in Market Basah Bandar Riyal and fish market near Asajaya. Out of 21 respondents, 13 had their fish supplied directly from fishermen. This showed that most of the fishmongers get their fish stock from the fishermen. It also implies that fishermen were the most important parties in the supply of fish stock to the fishmongers.

For the customers, the questionnaires were disseminated randomly to the residents in Kota Samarahan. 36 respondents had responded whereby 62% of the customers bought fish directly from the fishermen. This is because they believe that the price is much lower than the one sold by the fishmonger. By using this mobile application, it will be much easier for these customers to get fish directly from the fishermen because the fishermen are the main users of this application. The fishermen can directly advertise their catch while the customer will be able directly buy the fishermen's catch using this mobile application. This will help to satisfy the customer's preference while at the same time able to clear the fishermen's catch in a faster manner.

B. Application Design

Among the other steps, the design phase is the most critical since a device blueprint enables developers to avoid all misunderstandings about the app including users. In this section, two types of design which are the module design and user interface design were used to design the features and functionalities.

In module design, overall modules of the proposed application were designed using a use case diagram visualised in Figure 1. Each module has different actors associated with it. For example, the login module serves customers and sellers, which is the generalised actor for fishermen and fishmongers.

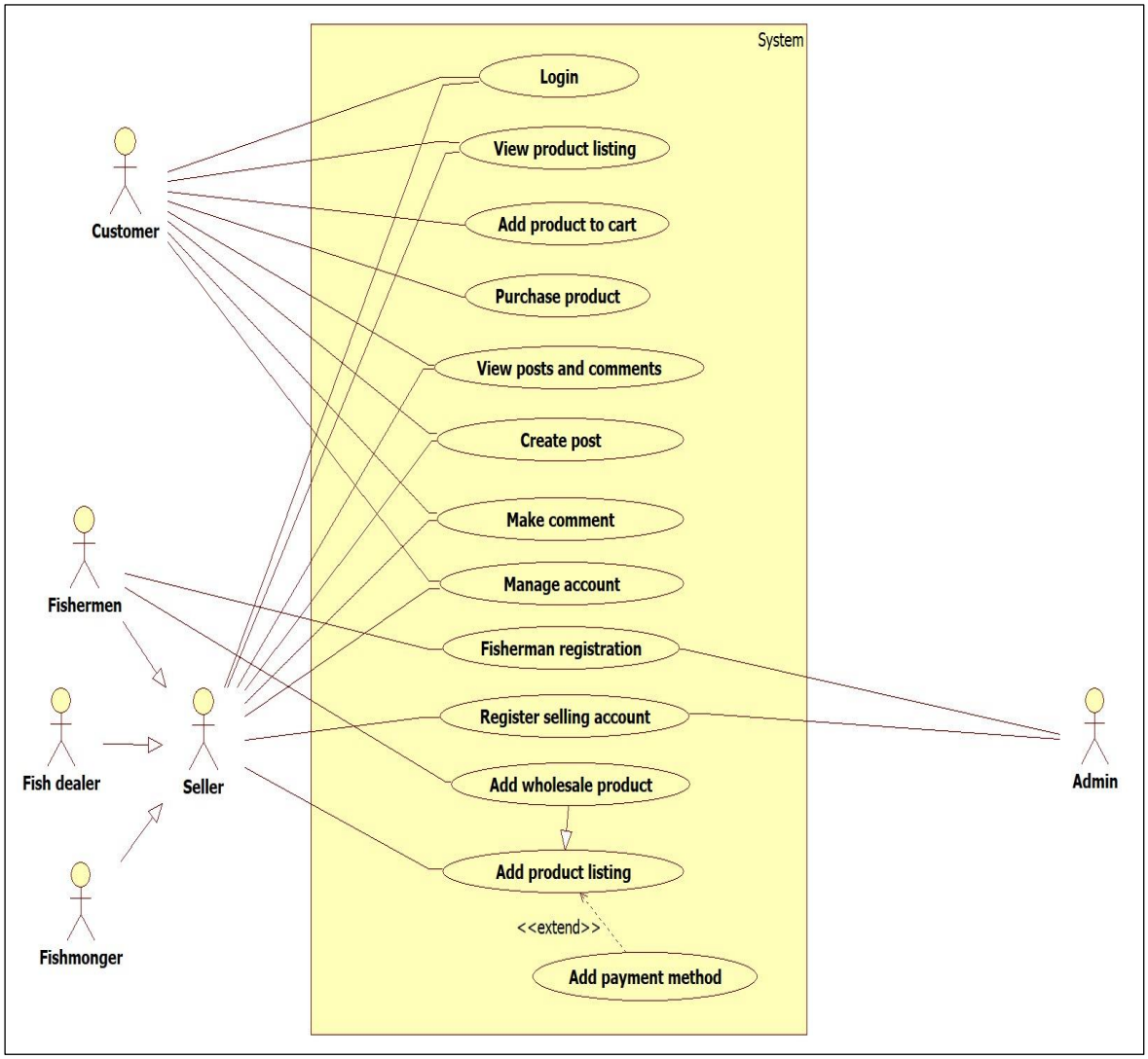

Figure 1. The use case diagram of Marketplace Apps for e-Nelayan Kota Samarahan.

Meanwhile for the user interface design, Adobe XD was used to create the wireframe of proposed application. It was created to visualise user interface of the proposed application. The user interface design for homepage of the proposed application is displayed as in Figure 2.

C. Implementation

This section focuses on the implementation of the proposed application. First of all, the development configuration will be discussed in detail. It also includes the details of the tools used and how they play crucial roles in the development phase. In addition, the roles of each type of user utilising this application are also addressed. Finally, this section will also discuss the developed prototype of the application.

i. Installation and Configuration of System's Components

In order to successfully develop the proposed application, several tools and system components were installed. The tools and components are crucial to ensure that the development process can be conducted and that the required features for the application can be obtained. Android Studio, an integrated development environment, is the most important tool utilised in this project that was used to write the codes of the application. It was used to apply the designs and functions of the proposed application.

The database system that has been chosen for the app was Firebase. More specifically, the components used in this application were Firebase Realtime Database, Firebase Storage, and Firebase Authentication. Firebase Realtime Database was used to store any type of data inside the application such as the products and user account. The data stored inside the Firebase Realtime Database is in JSON format. The Firebase Storage was used to store images used in the application, such as the user profile image and product image. Firebase Authentication was used for storing user credentials depending on the type of authentication chosen. For this application, the authentication method chosen was email and password.

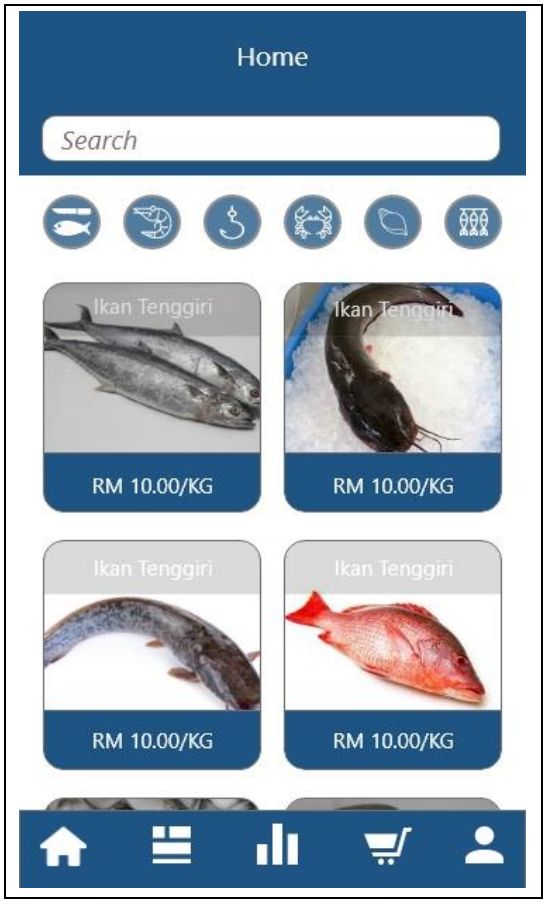

Figure 2. Wireframe for the homepage of Marketplace for e-Nelayan Kota Samarahan.

ii. Introduction to Role-Based Access

There are various roles for each type of app user. Table 4 represents the roles for each type of user in more detail.

Table 4. Summary of roles for each type of user in Marketplace App for e-Nelayan.

Tasks	Admin	Customer	Seller	Fishermen
Approve seller account application	✓	✗	✗	✗
Approve fisherman account application	✓	✗	✗	✗
Login into the application	✗	✓	✓	✓
View product listing	✗	✓	✓	✓
Add product to cart	✗	✓	✓	✓
View cart items	✗	✓	✓	✓
Purchase product	✗	✓	✓	✓
View posts and comments	✗	✓	✓	✓
Creating posts	✗	✓	✓	✓
Making posts	✗	✓	✓	✓
Register selling account	✗	✓	✗	✗
Register fishermen account	✗	✓	✗	✗
Add product listing	✗	✗	✓	✓
View customer purchase list	✗	✗	✓	✓
Add wholesale product	✗	✗	✗	✓

iii. Modules for Marketplace App for e-Nelayan Kota Samarahan

Every module that has been designed was implemented into a working prototype. The modules were *Start Page Module, Login Module, Register Module, Cart Module, Product Module* and *Account Module*. For example, in the *Product Module*, the product that has been listed by the fisherman or seller will appear at the homepage of the application. This page will be displayed to all types of users except the admin since admin will have a separate application. The homepage is integrated with a search function to make it easier for customers or the sellers to search for their products. The list of products is displayed in a grid view which has been chosen by target users during the needs analysis process of the application. In the homepage, the users will only be able to view the product's name, image and price per kilogram. In order to view the details of the products, the users need to click on a selected item and the details of the products will be displayed, together with the seller information. Figure 3 to Figure 6 illustrate the developed features of the Marketplace App for e-Nelayan.

Figure 3. Home page of Marketplace App for e-Nelayan

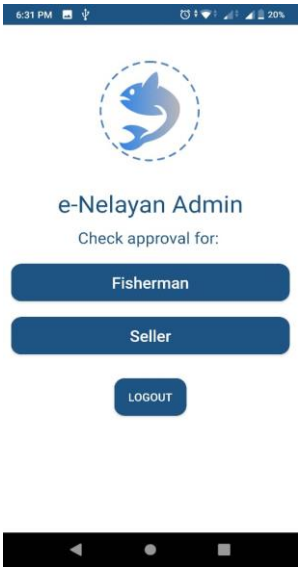

Figure 4. Home page of e-Nelayan Admin application

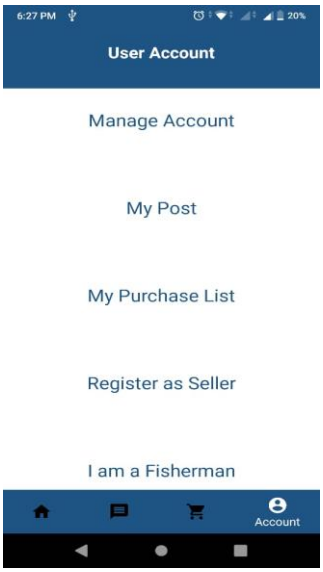

Figure 5. Account page for customers

Figure 6. Customer purchase list page

D. Testing

This section will discuss the testing conducted for Marketplace App for e-Nelayan. Two types of tests were conducted which are functional test and non-functional test. The functional testing was done to ensure that the application is working as expected before proceeding to the non-functional testing. Non-functional testing on the other hand is the test that is not related to the application's function and was conducted to obtain user's feedback and level of satisfaction for the application.

Functional testing was conducted to test whether the application behaves as it should. This type of testing is conducted by the developer without the need for participation from target users. Functional testing is very important because it will test whether the functions of the application are ready to be tested. There will be two types of functional testing conducted which are unit testing and system testing.

Unit testing was conducted to test each module or unit of the application. The goal of this test was to ensure that each module of the application is working as expected. Every module was tested according to the test plan. This test was conducted on both the main application as well as the admin application. Every tested unit shows the expected result.

System testing was conducted to test the overall functions of the application. This test was performed to ensure that the developed app satisfies all requirements. Based on the system testing findings, the application performs well and is ready to be tested with targeted users.

Non-functional testing is a type of testing that is performed to test the non-functional components of the application. There were four types of non-functional testing conducted in this project which are performance testing, portability testing, compatibility testing, and usability testing. Due to the current pandemic situation, the usability testing was conducted with users around Matu and Kampung Penipah in Pulau Bruit instead of users in Kota Samarahan. The reason is that the researcher is from Pulau Bruit and during the lockdown period, the state government imposed restrict inter-district movement in Sarawak. A total of 40 respondents participated in this test where 20 of them are customers, ten are fishermen and another ten are fishmongers. Tables 5 until 10 display the results of the non-functional testing.

Table 5. Test case for performance testing. Objective: To test the overall performance of Marketplace App for e-Nelayan

Test ID	Test Case	Expected Result	Actual Result	Pass /Fail
PT1	The application must be able to respond to a user action in less than 30 seconds for any type of action	The application should be able to respond to user action below 30 seconds	The application was able to respond within 30 seconds but this depended on the user's internet connection speed	Pass

Table 6. Test case for portability testing. Objective: To test the portability of Marketplace App for e-Nelayan

Test ID	Test Case	Expected Result	Actual Result	Pass / Fail
PP1	The application is portable and installed on Android devices	The application should be able to be installed on any portable Android devices	The application can be installed on any portable Android devices	Pass

Table 7. Test case for compatibility testing. Objective: To test the compatibility of Marketplace App for e-Nelayan

Test ID	Test Case	Expected Result	Actual Result	Pass / Fail
CT1	The application is only compatible with Android version 4.4 and above	The application should be compatible with any Android devices with version 4.4 and above	The application is compatible with any Android devices with version 4.4 and above	Pass

Table 8. Results of usability testing for Marketplace App for e-Nelayan user interface.

No	Test elements	1	2	3	4	5
1	I think that it is very easy to understand and use this mobile application	0	0	3	0	37
2	I think that the size of the font used for this application is suitable	0	0	0	0	40
3	I think the color chosen for this application is suitable and attractive	0	0	1	6	33
4	I found that the products are displayed in a very pleasing and organised way	0	0	0	0	40
5	I found that the post and comments page is very well organised	0	0	0	1	39
6	I found out that the account section is very understandable	0	0	0	0	40

Note. 1 = Very unsatisfied, 5 = Very satisfied

Table 9. Results for user overall evaluation of Marketplace App for e-Nelayan.

No	Test sample	1	2	3	4	5
1	How satisfied are you with the experience of using this application?	0	0	1	2	34

Note. 1 = Very unsatisfied, 5 = Very satisfied

Table 10. Suggestions and opinions about Marketplace App for e-Nelayan.

No	Suggestions
1	Add the option to switch to the Malay language
2	Add online payment method
3	Add promotion
4	Add iOS version of the application

CONCLUSION AND FUTURE WORK

This paper described our work in developing an Android mobile application to help the fishermen to sell their catch and fisheries products called Marketplace App for e-Nelayan. The mobile application has met all the required features and functions as well as achieved all the project objectives. Thus, the application is now ready to be used as a platform for fish trading activities for targeted users which are fishmongers, customers, and fishermen in Kota Samarahan. However, the application can be further developed to increase its usability and user acceptance.

The limitations of Marketplace App for e-Nelayan can be solved in the future to increase its usability and user acceptance. For future enhancements, Marketplace App for e-Nelayan should be added with the Malay language option. This is because some targeted users are unfamiliar with English. Furthermore, the application should be compatible with either Android and iOS platforms, and should be published into Google Play Store and Apple App Store in the future so that the sharing function can be enabled. This will support a better performance of the application while allowing the fishermen to share their products more easily.

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Web-based Digital Agreement System for Freelancers: Case Study in Bangladesh

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ABSTRACT

Nowadays, many people are interested in working as a freelancer because it gives opportunities to people to choose their work according to their convenience. Currently, the people of Bangladesh are using a bidding or direct booking system for buying and selling freelance services. There are very limited opportunities for freelancers to promote their work. Therefore, the purpose of the proposed system is to provide a platform where freelancers can promote their skills and at the same time customers can post job offers and create an agreement with the freelancer. This agreement will create a bridge between the customer and the freelancer. It is hoped that the proposed system will provide a more convenient way for freelancers in Bangladesh to promote their skills and find freelance jobs.

Keywords: Agreement, freelancer, project bidding, web-based development

INTRODUCTION

Digital technology has become a part and parcel of our daily life. Computers, laptops, software, mobile devices and calculators are the most common digital gadgets that we use in our daily life. Today it is unimaginable to spend a single day in the world without technology. To keep up with other countries, the government of Bangladesh has taken an initiative to develop Bangladesh as a digital country by 2021 (Tasneem, 2019). It is the nation's dream to see Bangladesh as a digital country. Digital Bangladesh signifies that a step has been taken to integrate Information and Communication Technology in every aspect of life.

In today's world, most of the people are familiar with the term 'freelancer'. A freelancer is a person who sells work or services online by the hour, day or job to different companies and clients according to their convenience. It provides the opportunity to start earning from home by freelancing a skill that one already has. To be a part of this Digital Bangladesh vision 2021, a web-based agreement system for freelancers of Bangladesh would help them to enter into an online agreement with the customers for buying and selling services of different categories such as graphic design, web, video and animation, photography, writing and translation. In Bangladesh, people can use this platform and start earning money, as long as they have an internet connection. The ultimate objective of Digital Bangladesh is to make more and more digitalised services available at the doorstep of the people where possible.

Unemployment is one of the major problems in Bangladesh. According to Bangladesh Bureau of Statistics (BBS), currently, the percentage of unemployed people is 4.17 (Neazy, 2019). A major portion of this unemployment is attributed to educated youths. About 41% of the youths of Bangladesh were unemployed in 2013 (LFMEAB, 2019). Now, it has increased to 46%. To overcome this problem, a goal has been set by the Bangladesh government to train 13,000 unemployed people in three specific ICT fields such as graphic design, web design and development, and digital marketing under the Professional Outsourcing Training Program. There are around 11,920 people who have already completed their training from the targeted range (Islam, 2018), but

there is not enough job opportunity to employ them immediately. However, freelancing systems can provide the facility to utilize the skills that they have learned so that they can start earning money.

There are a few available Bangladeshi freelance websites (Touch IT Solutions, 2019, Hypertag Solution Ltd, 2015). Some of them are using a bidding system or direct order system for buying and selling services like other freelance websites that are available worldwide. People have problems using international freelancing platforms in Bangladesh because of some limitations such as not having permission to access PayPal and high foreign transaction fees. The proposed system will provide an agreement system to the users of Bangladesh where the freelancer and customer can interact directly. Thus, the challenge is to find a way to overcome all these difficulties and provide a system where people of Bangladesh can work according to their convenience.

The objective of this project is to design and to develop a web-based digital agreement system in which freelancers can sell services of different categories, besides to promote their skills. In addition, this system will enable a digital agreement for hiring freelancers or buying services.

This project will provide an agreement based freelancing system where freelancers can communicate with their clients and update the progress of their work through a digital agreement. It will facilitate the users with the opportunity to post job advertisements (AD) for hiring freelancers and at the same time to post service AD to promote freelancers' skills. This digital agreement helps the freelancers and customers to feel safe while buying and selling services, and both parties can also exchange feedback using the agreement. This system will keep a record of all agreements.

Overview of Freelancers Digital Agreement System

Web-based digital agreement system is an online system for the people (freelancer) of Bangladesh where users can post jobs and services from a single account (Bonar, 2010). A freelancer will be required to create an account to use this system. They will need to create an account by adding a username, password, and a valid phone number. After that, they can sign into the system and verify their phone number to become a valid user. Freelancers will not be able to post an advertisement or apply for a job without signing into the system. He or she will be able to provide other account details such as Google, Facebook on this account. In addition, the freelancer will be able to create their portfolio by adding their expertise and, work experience. Clients who want to hire freelancers will be able to post a job advertisement and freelancers who want to provide a service will be able to post a service advertisement. They also will be able to search for jobs or services by keyword or category.

After finding the freelancers or service, the client will create an agreement. To complete the agreement payment, users will be asked to verify their account and inform the administrator. On this agreement, the client and freelancer will be able to communicate with each other, monitor the progress of the work and exchange feedback. The system will keep a record of the posted advertisements and agreements. Clients and freelancers will also be able to communicate in the comments section. In addition, the clients will be able to claim a refund if the agreement is not completed. There will be a proper guideline for the users (clients and freelancers) so that the first-time users can easily use this system.

MATERIALS & METHODS

Requirements Analysis

In order to develop a system which, fulfil user needs, gathering requirements are essential (Fitzgerald & Russo, 2002; Gomaa, 2011). As shown as in Table 1, there are ten (10) requirements provided as a basis for the construction of the system. These requirements were collected from a series of discussions with freelancers and clients in Bangladesh via emails. Based on this list, both freelancers and clients should be requested to register in order to use the system. In addition, depending on the skills and services that they can provide, the freelancers can find related jobs by browsing the advertisements and, communicating with the clients until both parties agree with the terms. In addition, clients can rate the service provided by the freelancer while the freelancer can rate and send a feedback on the clients' facilities.

Table 1. List of requirements for the Digital Agreement System

Req ID	Requirement description
R01	User should be prompted with login.
R02	The system should be easy to use.
R03	Enable users to find freelance jobs easily.
R04	Enable clients to hire a freelancer.
R05	Enable freelancers to promote their services.
R06	Create a bond between clients and freelancers.
R07	Providing clear guidelines about the system.
R08	Agreement document should be enabled.
R09	Facilitate the users with easy communication way within the system.
R10	Provide an opportunity to give feedback on the service.

System Design

Modelling the system before it can be implemented is to assist both designers and developers to understand the physical and logical designs of the system to be developed. This design includes a context diagram, data flow diagrams, and entity relationship diagram (Howcroft & Carroll, 2000).

A. Context Diagram

The general overview of the system is shown in Figure 1. The client needs to login to the system to use this system as shown in the diagram. Then the *Client* can post advertisements, search for services by keyword, create an agreement and gets request to complete payment and inform the *Administrator*. The *Freelancer* also needs to login to the system to use the system. After that, they can post advertisements, search for jobs by keyword, send job applications and send request to release their payment. Furthermore, both the *Client* and *Freelancer* can exchange feedback. Lastly, the *Administrator* will work at the backend in which he (or she) will get the agreement details. Once the agreement is created, the *Administrator* will be able to approve the payment and at the same time, to maintain the system.

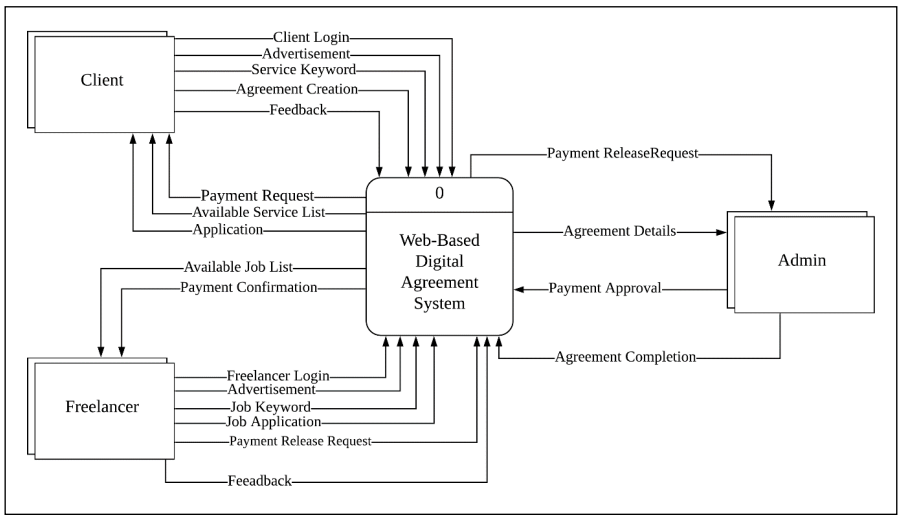

Figure 1. Sample of context diagram of the system

B. Data Flow Diagram

The detail of all processes required for making sure the system is running smoothly is presented through Data Flow Diagrams. As shown in Figure 2 for developing Digital Agreement System for Freelancers, there are three (3) types of entities involved including *Client* who require the service, *Freelancer* who provide the service, and *Admin* who acts as a backend for getting the agreement details, to approve the payment and to maintain the system. In addition, there are seven (7) major processes to achieve the objective of the system, including *Login*, *Post an AD*, *Find Job*, *Find Service*, *Send Application*, *Create Agreement*, and *Give Feedback*. All the related data are stored in different five (5) data stores, such as *Users*, *JobADs*, *Services*, *Applications*, and *Comments*. As shown in Figure 3, the process *Post an AD* is decomposed into the next level. This decomposition process involves five (5) processes, including *Select AD Option*, *Post AD for Hiring Freelancer*, *View Job AD*, *Post AD for Giving Service*, and *View Service AD*. Furthermore, this decomposition is connected to two (2) data stores including *JobADs* and *Services* data stores, respectively.

C. Entity Relationship Diagram

The Entity Relationship Diagram (ERD) represents a conceptual database as viewed by the end-user. ERDs depict the database's main components which are entities, attributes, and relationships. Three main entities are involved in the proposed system. They are *Client*, *Freelancer* and *Admin*. The detail of attributes for each data store is shown in Figure 4. There are five (5) data stores, which are consistent as presented in Figure 2 previously. Each data store is connected to each with different ordinality and cardinality, including zero-to-one, one-to-one, one-to-many, and many-to-many cardinality. Ordinality refers to the minimum number of times an instance in one entity can be associated with an instance in the related entity, while cardinality refers to the maximum number of times an instance in one entity can relate to instance of another entity. Each data store has a primary key to present a unique identity for each instance. As an example, a user who is a *Client* can post many job advertisements. Each job advertisement consists of *jobid*, *title*, *posterid*, job *description*, *location*, and *budget*. However, each job only can be done by one user (who is a *Freelancer*).

RESULTS

The Digital Agreement System for Freelancers was implemented using Sublime Text 3 as a code editor and XAMPP tool for web application development. This web application development server comes pre-installed with Apache web server, MySQL database, PHP, and Perl which helps to build an offline application with desired features and functions. It works perfectly on multiple platforms such as Linux, Windows, and Mac OS. As for this development, XAMPP phpMyAdmin has been used as relational database management system (Apache Friends, 2020).

System Hierarchy

The overall interfaces of Digital Agreement System for Freelancers are presented as in Figure 5. Based on this figure, there are sixteen (16) interfaces available including the *Main Page*, *Create an account*, *Sign in, Post an AD*, *Find services*, and *Find jobs*. For the *Sign in* module, the user will be required to verify their account. As for *Post an AD*, the *Client* (who is hiring) can accept the application from the *Freelancers* (who is giving a service) to book for a service. After a series of communications between *Client* and *Freelancer*, the agreement will be produced and signed by both type of users. In addition, both users can rate each other in a feedback which will be a future reference for other users. The *Clients* can view services posted by the *Freelancers* and book for the services which fulfil their requirements, while the *Freelancers* can send applications for the jobs posted by the *Clients* thru the advertisement.

Agreement

When the client accepts any job application or book any service, the agreement will be automatically created with a unique agreement ID, the current status of the agreement, agreement details, client's name, client's phone number, freelancer's name, freelancer's phone number, charge of the agreement, and summary of the agreement (Figure 6). The agreement will be added to the agreement list of the corresponding *Client* and *Freelancer*. After

the payment has been made by the *Client* (depending on the amount of agreed), the agreement will be activated, and the *Freelancer* will start performing the job scope.

Feedback

Another important feature in this system is to allow both Client and Freelancer to rate each other. As shown in Figure 7, the *Freelancer* can rate the *Client* facilitation in score format ranging between 1 (very poor) until 5 (excellent). Without giving a score, the *Client* would not be able to release the balance of money to be paid for the *Freelancer*. At the other hand, the Client's score to the Freelancer is essential in order for the money to be received by the Freelancer. This is to make sure that both types of users exchange their feedback in order to complete the agreement.

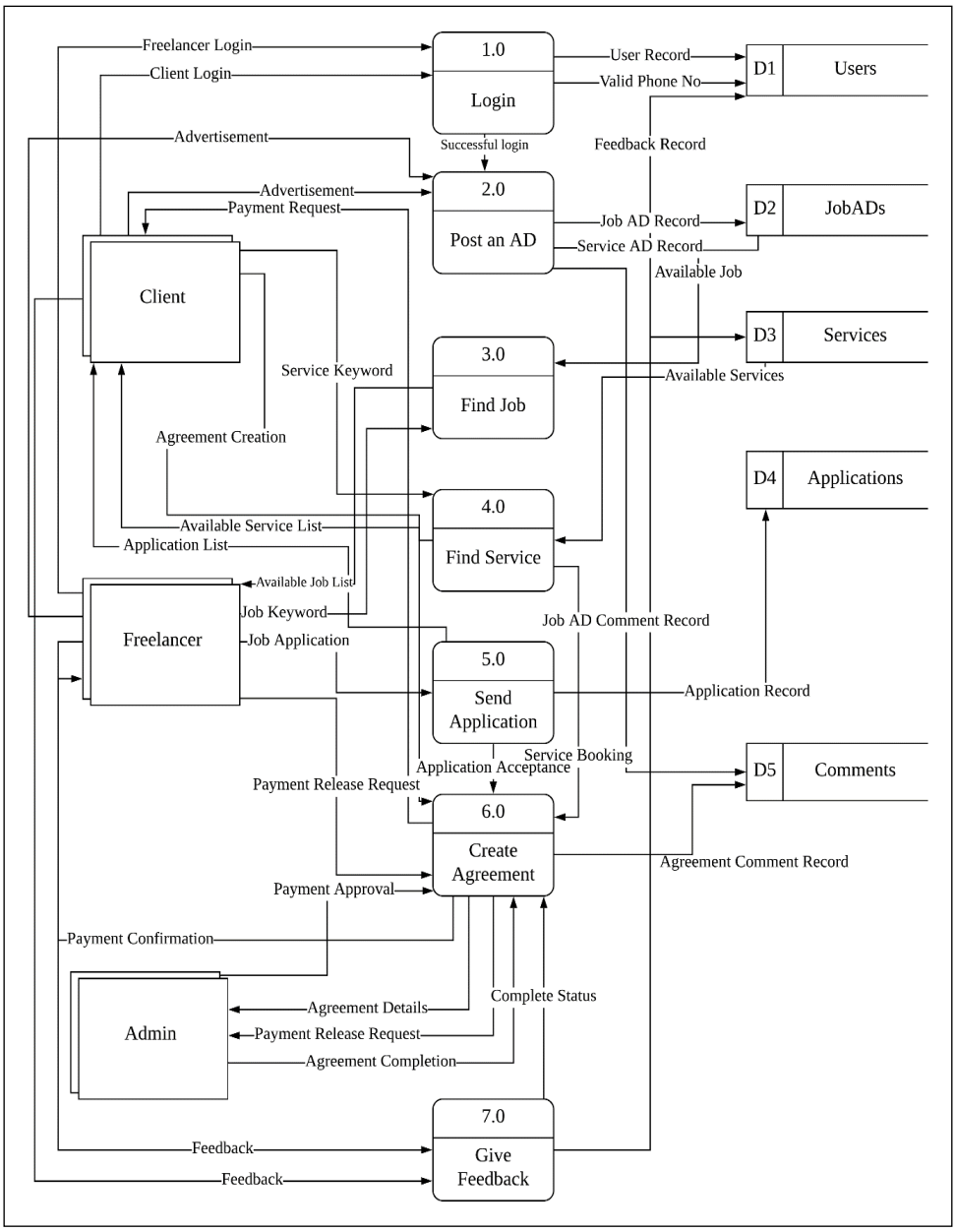

Figure 2. Sample of level-0 data flow diagram.

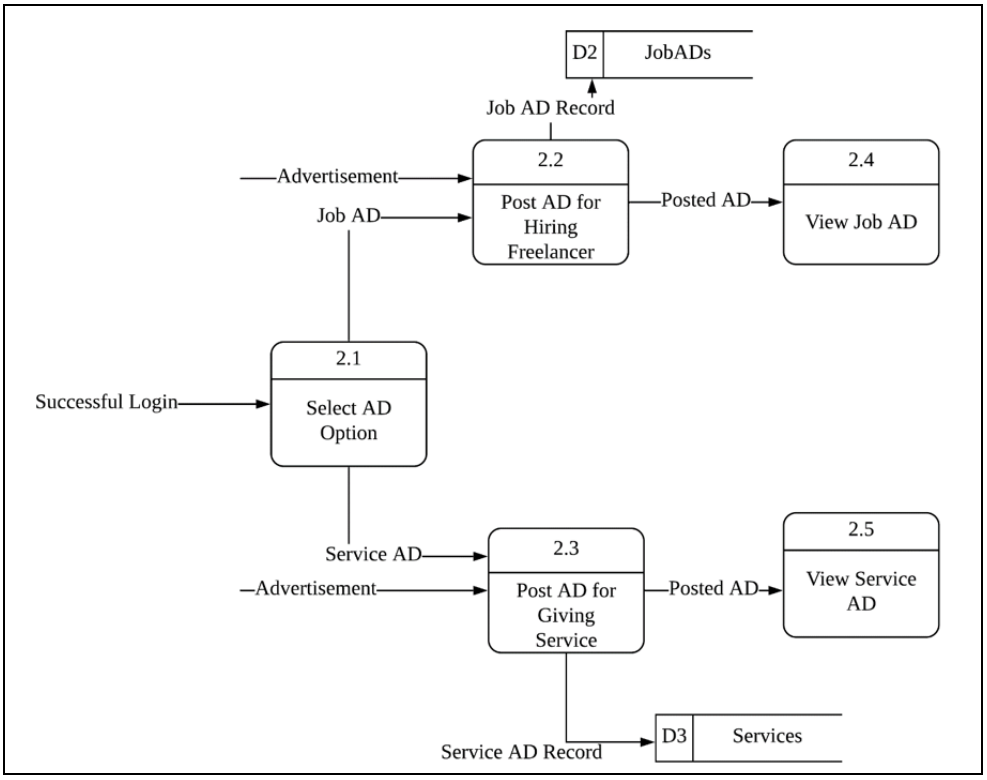

Figure 3. Sample of level-1 sub-process Post an AD

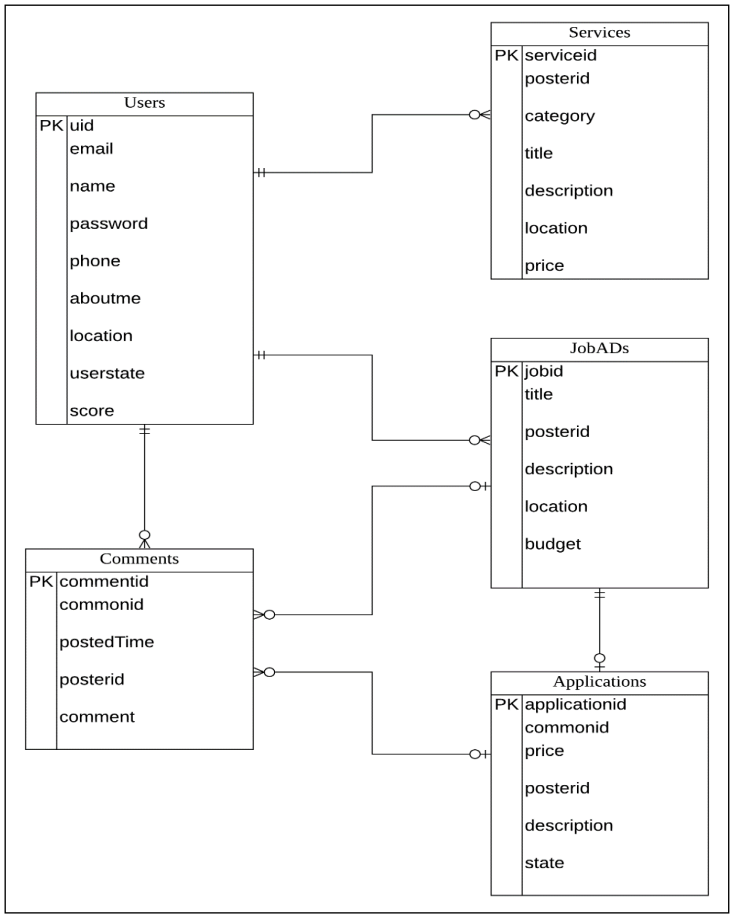

Figure 4. Sample of entity relationship diagram of the system.

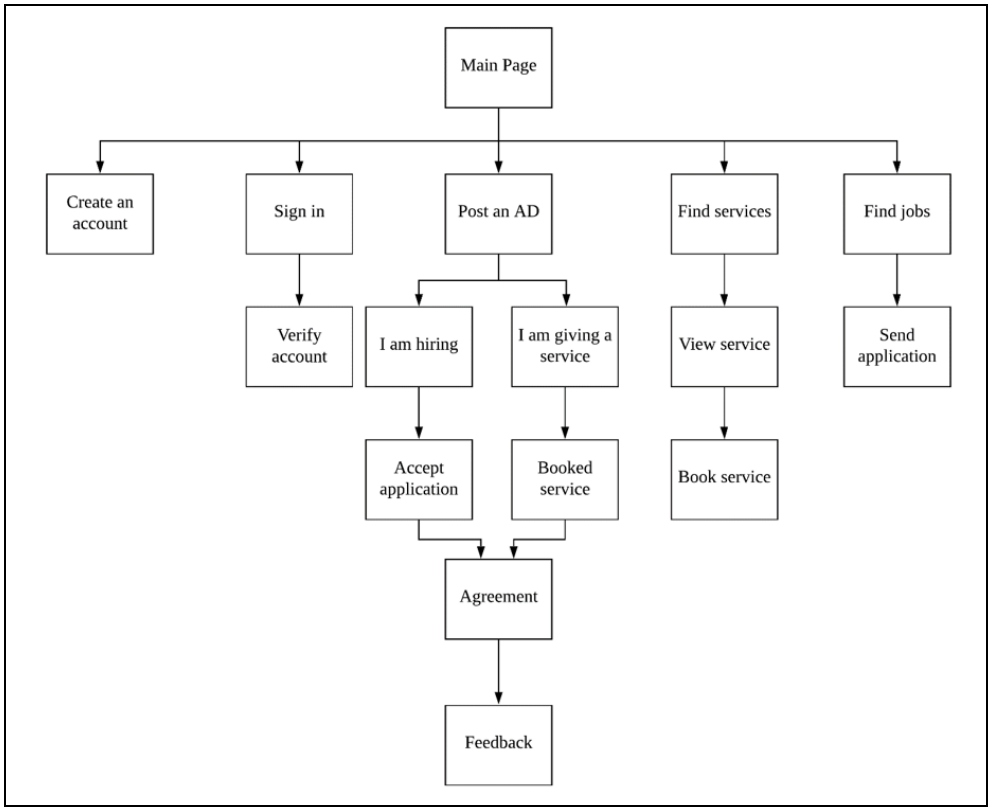

Figure 5. Hierarchical structure of the system

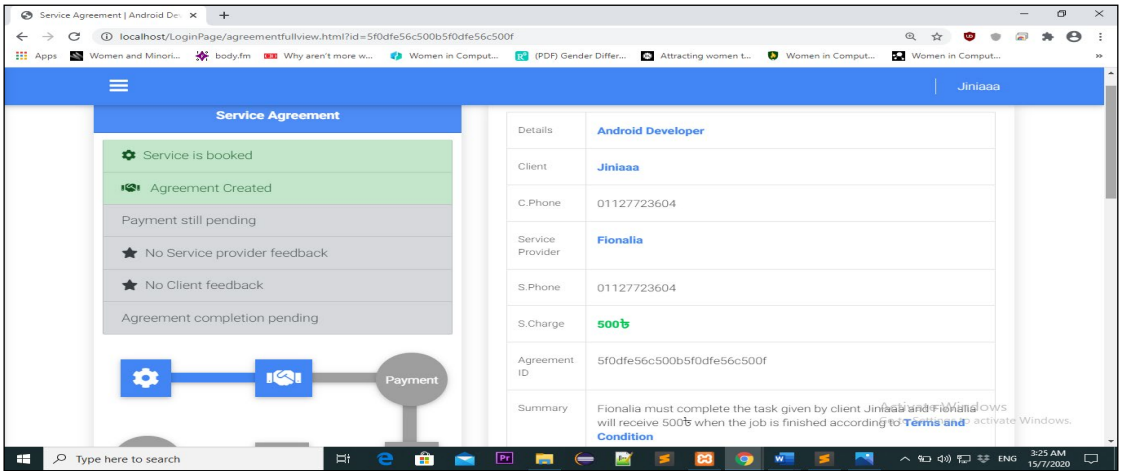

Figure 6. Sample interface for the agreement

DISCUSSION

The Digital Agreement System for Freelancers has been developed to facilitate the freelancers in Bangladesh to buy and sell services of different categories such as web, graphics and design, video and animation. In this system, users can book services or give services from the same account. If the user is *Client* which means he needs services, then he can post a *Job AD* or he can look for the required services in the *Find Services* option. If the user is a *Freelancer* which means he wants to provide services, then he can Post a Service AD or look for job in the *Find jobs* section. By posting a service AD they will be able to promote their skills to *Clients*.

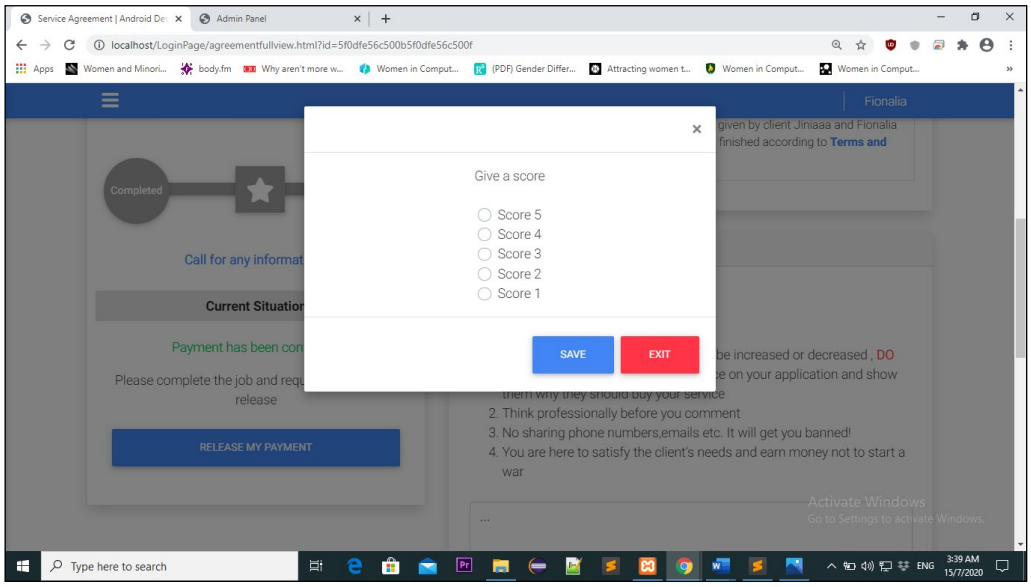

Figure 7. Sample interface for Freelancer to rate the Client.

When the *Freelancers* find any suitable job, they will be able to send an application for that job. Then the *Client*, who posted that job advertisement will be able to see the list of applications in the "People applied for this job" section. After that, if the client wants to accept any job application he can click on the "accept" button and the agreement will be created automatically. On the other hand, if the *Client* wants to book any service from the service advertisement, he can click on the "Book This Service" button and the agreement will be created automatically. Once the agreement is created, the *Client* will be asked to make payment and inform the *Admin*. The *Admin* will check the payment and activate the agreement and the Freelancer will start working on that job. After finishing the work, the customer and freelancer will exchange feedback and complete the agreement. Along the process, the *Client*, *Freelancer* and *Admin* will be able to see the current status of the agreement. By this procedure, the users will be able to buy and sell services in this system.

User Acceptance Testing

The "Web-based Digital Agreement System" was tested on 10 respective Bangladeshi clients in order to ensure the effectiveness and satisfaction of using the system. They were asked to explore the system from the start until the end with the questionnaires to be filled in. As shown in Figure 8, five elements were tested for effectiveness including, *background canvas*, *font color and size*, suitability of the *icons and images used* and *button*. Based on the result, on average, all respondents rated the effectiveness of the system to be either *"Excellent"* or *"Good"*. In addition, all of them were satisfied with the availability of the system.

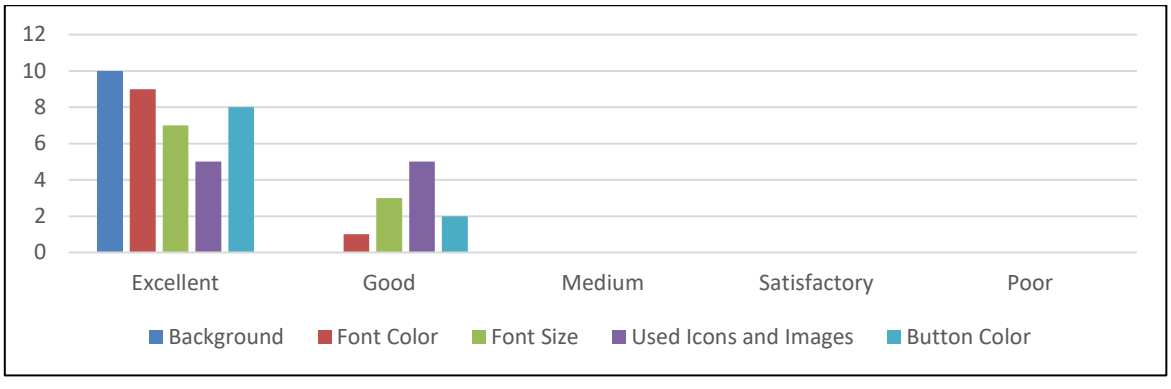

Figure 8. Evaluation chart for effectiveness of the system.

CONCLUSION

As a conclusion, the development of this system, could help the freelancers of Bangladesh to buy and sell their services in an easy and convenient way. It offers the freelancers to give services in eight different categories such as graphics and design, web, video and animation, photography, digital, writing and translation, computer and mobile, and printing and digital media. Freelancers can also give services in categories other than that given. For any services which are not mentioned, the respective freelancers need to choose the category as 'other'. In addition, this agreement system will create a relationship between the client and freelancer whereby both parties will be able to communicate easily.

However, this system has some limitations. Firstly, the interface of the admin page has lack of facilities such as to edit or to update data directly from their page. At the moment, the admin has to log in using the different site (using phpMyAdmin) in order to access and to maintain the system. This is not feasible and requires a lot of works. Secondly, the currency that is used in this system, is Taka (Bangladesh currency) which limits its use. Different currencies can be added to this system to expand the use of this system worldwide. The other limitation of this system is in the matter of payment. At the moment, the payment needs to be approved manually which might slow down its working process.

In order to improve and to expand the use of this system widely, first and foremost, it is important to design a more effective admin page from where they can easily maintain the system. In addition, the scope of the system should be increased by implementing more related functions like creating notification module, direct messaging within the system and a login option for administrator. Secondly, in order to facilitate freelancers worldwide, the system should be able to allow currency exchange, such as in Dollar, Euro or other currencies. This will attract and create more jobs with relevant skills and services. Finally, since the Freelancers Digital Agreement system is developed for buying and selling services online, adding an online payment gateway is also possible in future system upgrades. If a payment gateway is added, the agreement can be automatically activated by using the unique agreement ID and this will reduce the administrative workload.

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AirXorcist: Raising Awareness About Air Pollution through Narrative Storytelling in Computer Game

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ABSTRACT

Air pollution has been on the rise and poses a severe problem that needs the public's attention and action. There is an urgency to raise awareness about air pollution among the people. Computer games can be used as a medium to raise awareness about topics of interest, such as air pollution. We have conducted an online preliminary survey among public members through random sampling to study their awareness level on air pollution and general opinion about a computer game. From the survey, we have found that the public has inaccurate knowledge about air pollution, and some of them were not aware that they have directly contributed to air pollution as well. The survey has also revealed that there is a need for role-playing game (RPG) educative games for the public. Thus, an edutainment RPG computer game entitled "AirXorcist" was developed using the Agile methodology to raise awareness about air pollution. We have also employed a story-telling method in the game to educate players about air pollution. Two tests, namely pre-game and post-game tests, were conducted to determine whether the game can raise public awareness about air pollution. From the analysis, we obtained the t-test statistics = -7.072 and p-value = -0.000002. The result shows sufficient evidence to suggest that the AirXorcist game has successfully helped relay information and raise public awareness about air pollution.

Keywords: Air pollution, awareness, computer game, edutainment, story-telling

INTRODUCTION

Air pollutants, which are foreign particles in the atmosphere, are usually the products of both natural and human activities such as volcanic eruption, forest fire, fuel combustion, factory emissions and many more. Household appliances such as cooking stove, oven and air conditioner also contribute toward air pollution by emitting chemical gases to the air. There are also cases where air pollution spread from one place to another, known as transboundary pollution. As an example, Malaysia experiences transboundary haze annually, which is caused by the open biomass burning from its neighbouring country, Indonesia (Othman, Sahani, Mahmud, & Ahmad, 2014).

According to Nel (2005), over 500,000 deaths caused by toxic particles in polluted air are estimated annually. However, Nel's research has underestimated the magnitude of the effects of air pollution. In 2015, air pollution caused approximately 6.4 million deaths around the world (Landrigan, 2017). Thus, air pollution does contribute to the loss of human life. Most of the time, air pollutants are invisible to the naked eye such as carbon monoxide, sulphur dioxide and nitrogen oxide, which are chemicals emitted from the combustion of fossil fuels (Rothschild, 2019). These air pollutants are harmful to human's health and may cause various kind of cancers and disorders, such as vascular, respiratory, and allergic disorders (Mannucci, Harari, Martinelli, & Franchini, 2015). However, the invisible chemical gas emissions are hazardous as they are hardly noticeable and may cause death due to their poisonous traits (Walters, 2014).

The air pollution visibility depends on the cause of pollution, which is the air pollutant. To be more precise, there are a lot of factors that affect air visibility such as air temperature, pressure, relative humidity and average wind speed (Hao, Zhang, Yang, Xingtai, & Handan, 2017). If the visibility in a particular area is high, this indicates that the concentration of air pollutants is low in the area. Even so, these pollutants or gases are

hazardous to the human body if inhaled excessively. One of the air pollutants from which Malaysians suffer annually is the haze. Haze is a phenomenon when external particles are suspended in the air, causing a disturbance in the human's visibility (World Meteorological Organization, 2017). According to Eldridge (1969), the haze can be transitioned into mist and fog when there is a change in the aerosol distribution of the suspended particles in it. This assertion is probably accurate considering that haze, mist and fog are similarly defined as air with suspended particles. The World Meteorological Organization (2017) has even stated that the visibility arrangement of air in ascending order is fog, mist and haze.

In their study on air pollution in Peninsular Malaysia, Chin, De Pretto, Thuppil, and Ashfold (2019) found that the public has perceived that motor vehicle emission contributes to the primary source of air pollution, followed by industrial emissions and various burning sources. However, only a minority of them chose to reduce their driving time to curb the air pollution that was caused by vehicle emissions. Suffari, Zain, Majid, and Tazilah (2019) emphasised on the need to educate the public, especially school children, on topics like air pollution so that they would be more environmentally aware and responsible for the earth.

In view of the foregoing, there is a need to educate the public so that they are aware of the air pollutants and what they can do to combat and reduce air pollution. In recent years, computer games have been used to educate on various topics even though they are usually made for entertainment purposes (Brezovszky *et al*., 2019; Hamari & Keronen, 2017). We have designed and developed 'AirXorcist', an edutainment game to raise awareness about air pollution. Edutainment is a combination of education and entertainment (Aksakal, 2015) where we want to educate the public about air pollution (education) through a computer game (entertainment). Research in edutainment games has used different design approaches such as board games in educating the public about *Zakat* (Rahman, Sahrir, Zainuddin, & Khafidz, 2018), augmented reality hidden object game in educating school kindergarten and primary school students as an alternative teaching aid (Keat, Wahid, Murli, & Hamid, 2018) and pedagogical content for teaching elementary mathematics (Bouzid, Darhmaoui, & Kaddari, 2017).

Storytelling has been used in games to help learners understand about various topics such as earth sciences, physics and chemistry (Maraffi & Sacerdoti, 2018). This method can engage learners to see themselves as the protagonist in the game where they can remember the story better and able to respond to the content accordingly (Raybourn, 2014). In a narrative game design, Aarseth (2012) suggested four elements: world, objects, agents and events. The world element refers to a linear (single path of gameplay throughout the game), multicursal (multiple paths of gameplay) or open (players can explore the games freely). The object element refers to avatars, weapons and buildings, for example, that can either be created by players or game developers. The agent element refers to a character with a detailed narrative or a bot that have a simpler narrative. The event element can be a full, playable, multipath or contain no story at all in the game. Following the approach of Aarseth (2012) in designing a narrative game, AirXorcist uses a linear, playable character with a detailed narrative in a full story game. After having embedded the story into the AirXorcist, we then investigated the effectiveness of raising awareness through storytelling in the game using pre-game and post-game tests (Supplementary 1).

We employed the Agile methodology to develop the game for its flexibility in responding to changes in the developmental plan. The Agile methodology comprises seven stages, which are requirement gathering, analysis, design, coding, testing, delivery of partially incremented software and feedback from customer (Sharma, Sarkar, & Gupta, 2012). Although the methodology was traditionally used for software development, agile methodology has been widely used for game development for its flexibility and practicality (Aurisch, Ahmed, & Barkat, 2019; Kasurinen, Palacin-Silva, & Vanhala, 2017). We have incorporated facts about air pollution through narrative storytelling into the game to ensure smooth and seamless gameplay.

METHODOLOGY

Participants

In this study, 18 participants were recruited via opportunity sampling during the requirement gathering stage. These participants were recruited through an advertisement posted in Whatsapp groups with the message looking

for participants to play a computer game on air pollution. Due to the COVID-19 pandemic, we need to adhere to the government's directive for Movement Control Order. As a result of these samplings, there were 18 participants, aged between 13 to 63 years old. Majority of the participants were teenagers (44% aged 13-18) and young adults (38.9% aged 19-30). The remaining participants are aged 31-50 years old (11.1%) and above 51 years old (5.6%).

Material

AirXorcist is a 2-dimensional (2-D) action and platform game for computers. The game uses a narrative storytelling method to relay information about air pollution to its players. Examples of this information include "the smoke produced by closed burning is polluting the air" and "the air conditioner pollutes the air if there is a leak in the refrigeration pipe". This storytelling approach informs players on the objective of each of the game stage that they are playing. From this method, players would know what to do to clear the game stage. Moreover, the storytelling approach can engage players in the game and sustain their participation so that they can continue engaging with the game (Jupit, Minoi, Arnab, & Wee, 2012).

AirXorcist uses "hack and slash" for its action element. "Hack and slash" refers to a combat style that utilizes hand-to-hand combat, primarily with "slashing" weapons such as swords as opposed to gun (Thomas, 2015). The game was developed using Unity, a popular game engine for 2D and 3D multiplatform games. The Audacity software was used to edit sounds while PaintTool SAI and Paint software were used to design the 2D sprites for the images used in the game. After we have gathered the requirements as outlined in the agile methodology, we then design the game flowchart (Figure 1) to visualise the flow of the gameplay in AirXorcist.

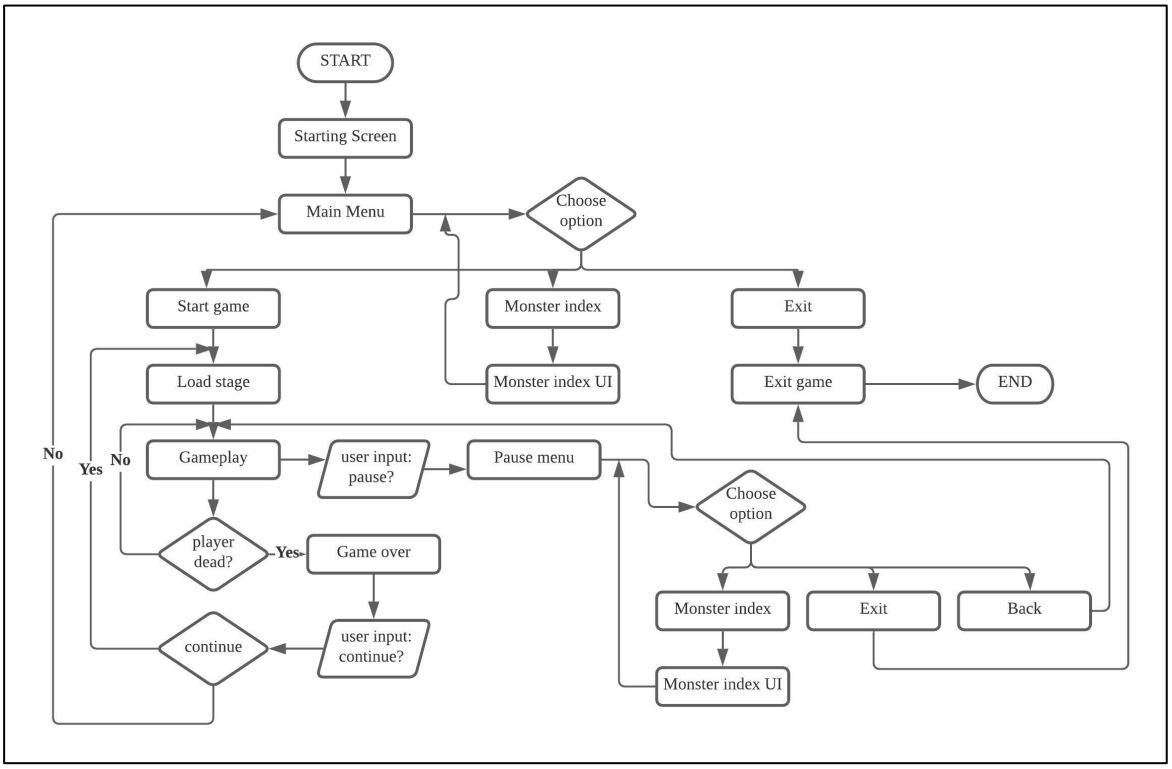

Figure 1. Game design for AirXorcist overall gameplay

Figure 2 shows the general flow of the game stages during the AirXorcist gameplay after the players select a stage. At the starting of the stage, a prologue story event is used to narrate the game's story and objectives to the players. After the prologue ended, the players are to explore each game stage to search and defeat the boss monster, a computer-controlled character stronger than the usual opponents. The players will need to hack and slash the monster while the health bar is still available (Figure 3). Whenever the players through their character

gets wounded, its health bar will decrease. If the health bar is empty, the players lose the battle and consequently the game. When the players defeat the boss, the epilogue story will be displayed to conclude the story of the stage, which also signifies that the players have cleared the game stage.

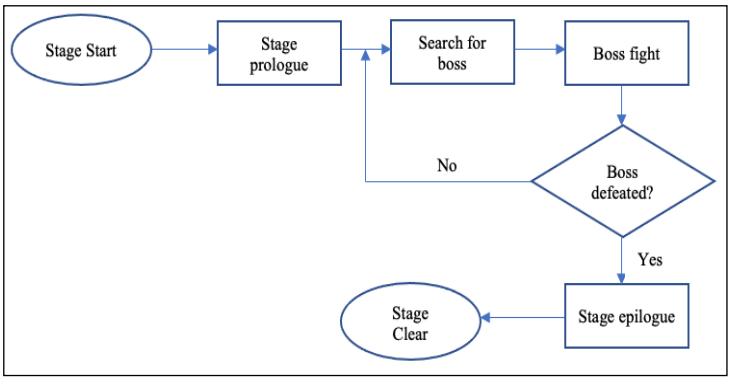

Figure 2. Game flow of the stage in which players will fight with the boss monster.

In the first stage of the game, the players enter Saniedion Woods, an unexplored area that is said to have a deplorable air condition. There, the AirXorcist discovers an inhabited house. The air around the house appears to be heavily polluted. Suspecting that the house is the source of the haze, the AirXorcist ventures into the house only to discover that the interior is swarmed with pollutant monsters. These monsters take the form of home appliances such as the refrigerator and cooking stove. The house owner forgot to switch off these appliances before abandoning it, which caused the appliances to turn into pollutant monsters. There is another monster with a firewood appearance, that is probably caused by the owner who did not put out the fire. While exploring the house, the AirXorcist discovers an air conditioner that has turned into a pollutant monster. The monster grows too powerful and releases cold air in the form of snowflakes. After killing the air conditioner monster, the AirXorcist realises that the air conditioner monster is not the cause of the haze. Thus, the AirXorcist ventures deeper into the woods in search of the real cause of the haze.

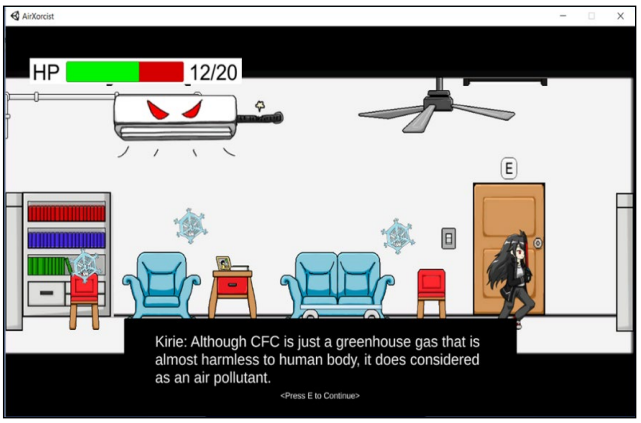

Figure 3. The player exploring the house with a pollutant monster that released snowflakes in the house.

In the second stage, the AirXorcist encounters more air pollutant monsters as she ventures deeper into the woods, Hazferr Kingdom. There, the monsters look like land vehicles, specifically cars and motorcycles. There is also a cow-like monster that produces gas-like pollutant through its farts. Finally, the AirXorcist discovers a powerful tree monster that is burning continuously. This monster is a cursed tree which is then transformed into a monster (Figure 4). The AirXorcist then starts to fight with the tree monster and is able to defeat it. Once the tree monster is destroyed, the heavy smoke around the area begin to clear, and the curse of the burning tree is

lifted. Thus, Hazferr Kingdom regains its beautiful nature, and its citizens become healthy again with the haze gone. The AirXorcist continues with her journey to eradicate air pollution in other parts of the world. To further educate players about air pollution, we have added a monster index in the game to display details about the monsters which were designed based on air pollution-related facts.

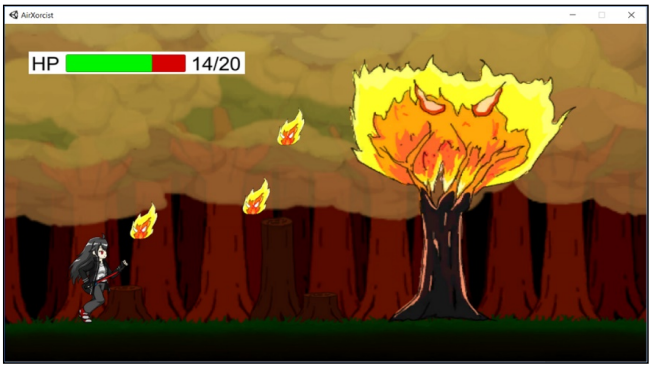

Figure 4. Player battling with the burning tree monster, which is the cause of the haze in Hazferr Kingdom.

Procedure

Before the study started, participants were asked to read and sign a consent form detailing the purpose, procedure, risk and confidentiality of the study. Participants were assured that they can withdraw from the study at any time and to withdraw their permission on the collected personal data. After having signed the form, participants then proceed to a pre-test that will test their knowledge about air pollution. After having answered the questions in the test, participants then play the game "AirXorcist" for approximately 10 minutes. Then, the participants proceed to answer air polluted related questions in the post-test. The questions in both tests comprised both common and uncommon knowledge as well as misinterpreted information about air pollution.

RESULTS

There are nine questions in each test, which means the maximum score in each test is nine. The participants' scores from both pre- and post-tests are then collected by summing up the total correct answers individually. These scores were then used to determine the effectiveness of the game AirXorcist in raising awareness about air pollution. The scores were recorded and tabulated, as shown in Table 1.

As the data is dependent, a paired sample t-test was used to analyse the data to determine whether there is a difference between the pre- and post-game test scores. At 95% confidence interval for the difference, μ, is given by $\overline{x_d} \pm$ E,

$$\text{where } E = t\left(1 - \frac{\alpha}{2}; n\text{-}1\right)\left(\frac{S_d}{\sqrt{n}}\right),\ \alpha = 0.05 \text{ and } n = 18.$$

From the table, the critical value t = 2.110 for the degree of freedom, df = 17. The interval can be obtained as:

$$\mu = -3.389 \pm 2.110\left(\frac{2.033}{\sqrt{18}}\right)$$

$$\mu = (-4.4, -2.378)$$

The hypothesis testing was then carried out with having the hypothesis as:

Null hypothesis; H_0: μ = 0 (The score shows no improvement after playing AirXorcist)
Alternative hypothesis; H_1: μ ≠ 0 (The score shows improvement after playing AirXorcist)

Table 2 shows the results of calculations. From the table, the value of the t-statistic, t = -7.072 and p-value = 0.000002. Since the *p*-value is less than significance level (α = 0.05), the null hypothesis is rejected. This shows sufficient evidence that the AirXorcist game has improved the participants' scores. This also means that AirXorcist has indeed successfully helped to relay information and raise public awareness about air pollution. Note that the confidence interval which is (-4.4, -0.288) as previously calculated. This shows that there is sufficient evidence to support that the mean difference does not lie in the interval.

DISCUSSION

This study used the narrative storytelling approach in the game AirXorcist to create awareness among the public about air pollution. Using the narrative storytelling approach in games is not new and has been used in mainstream games, for example, Assassin Creed, Mass Effect, The Witcher and Final Fantasy series. Researchers have used games to educate the public about topics of interests such as bullying (Calvo-Morata, Alonso-Fernández, Freire, Martínez-Ortiz, & Fernández-Manjón, 2020), environmental (Gardeli *et al.*, 2017) and cross-cultural awareness (Jupit, Minoi, Arnab, & Yeao, 2011; Jupit *et al.*, 2012; Maraffi & Sacerdoti, 2018).

Understanding how storytelling in games can help in raising awareness about topics of interest is essential to engage learners not just for the entertainment aspect but learners' education as well. The effect of this engagement can be seen in the results, where there is a difference in the mean scores before and after playing the AirXorcist game. Even though AirXorcist is a simple game that centred on the issue of air pollution, this shows that games can be instrumental in educating and engaging learners. One participant suggested for more facts on air pollution to be added into the game. The suggestion showed that the learner wanted to continue engaging with the game and to learn more of the topic. Schoenau-Fog (2011; 2014) described those who wanted to continue engaging with the game are enthusiastic about their gameplay and that this contributed to a successful gameplay experience. Considering that storytelling in games can create awareness about topics of interest, investigating players' recounted experiences using qualitative methods such as interviews will add value and knowledge in further understanding of narrative storytelling in games.

Table 1. Pre- and post- test scores.

Participants, Pn	Pre-game	Post-game	Difference, $\overline{x_d}$
P1	5	9	-4
P2	4	6	-2
P3	4	9	-5
P4	2	9	-7
P5	5	7	-2
P6	6	5	1
P7	6	9	-3
P8	5	9	-4
P9	5	9	-4
P10	4	8	-4
P11	5	5	0
P12	2	9	-7
P13	5	8	-3
P14	5	9	-4
P15	3	6	-3
P16	2	5	-3
P17	3	8	-5
P18	6	8	-2
Mean Scores	4.278	7.667	-3.389

Table 2. Paired samples test.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation, sd	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test - post-test	-3.389	2.033	0.479	-4.4	-2.378	-7.072	17	0.000002

CONCLUSION

This paper investigated the effectiveness of using storytelling in games about a topic of interest, air pollution. Through the method of storytelling, the paper reported that games could be a useful tool to create and promote awareness among the public on topics that are of interest. By interweaving air pollution facts into the storyline, games do help to engage learners to learn about air pollution facts while enjoying themselves. There is room for further design and development to promote learners' continual engagement with the game in which more levels can be added to incorporate more air pollution facts. This future work is vital for further research on usability and validation as we wanted to involve various stakeholders such as schools and community in using games for education.

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Supplementary 1

Pre-test questions

1. Using the air-conditioner and refridgerator will surely pollute the air because they release CFC upon use.
   O True
   O False

2. Greenhouse gases are air pollutants.
   O True
   O False

3. Forest fire causes air pollution.
   O True
   O False

4. Closed burning (burning in a closed space) helps in reducing air pollution.
   O True
   O False

5. Switching from petroleum engine to diesel engine will reduce air pollution.
   O True
   O False

6. Cooking with a gas stove does not pollute the air.
   O True
   O False

7. Cow's fart is an air pollutant.
   O True
   O False

8. Which of the following is/are air pollutant?
   □ Methane
   □ Carbon monoxide
   □ Chlorofluorocarbon
   □ Haze

9. Which of the following does not help in reducing air pollution?
   O Clean your gas stove periodically
   O Switching from petroleum to diesel engine powered vehicle
   O Reduce the use of fire
   O Periodical maintenance of appliances that uses cooling agent (refridgerator, air-conditioner, etc)

Post-test questions

1. Forest fire can cause haze.
   O True
   O False

2. Methane is not an air pollutant.
   O True
   O False

3. Air-conditioner and refridgerator only causes air pollution if there is a leakage in the refridgerant pipe.
   O True
   O False

4. Cows contributes to air pollution by breathing.
   O True
   O False

5. CFC is an air pollutant that causes global warming.
   O True
   O False

6. A gas stove without proper cleaning may lead to incomplete combustion and worsen the air pollution.
   O True
   O False

7. Open burning is legal.
   O True
   O False

8. Which of the following helps in reducing air pollution?
   □ Carpooling
   □ Open burning
   □ Use public transportations
   □ Closed burning

9. Which of the following is NOT a cause of air pollution?
   O Open burning
   O Pipe leaking in refridgerant appliances
   O Forest fire
   O Carpooling

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Smart Ambulance Traffic Control System

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ABSTRACT

The traffic lights control system is broadly implemented to track and control the flow of vehicles through the intersection of multiple roads. Nevertheless, the synchronization of traffic light system at adjacent junctions is an intricate issue given the different parameters involved. Existing traffic light control systems do not control many flows approaching the same junctions. This results in traffic jams and congestion at urban areas or major cities with high volume traffic consisting of various types of vehicles. This includes emergency ambulances travelling on the same traffic junction during peak hour traffic. Thus, an enhanced traffic light control system is imperative to provide a smooth and free flow for an ambulance on the way to its destination. The Smart Ambulance Traffic Control System proposed in this paper is an integrated system of traffic light control for emergency ambulance service. The traffic lights can be controlled in a timely and efficient manner every time an emergency ambulance is approaching. The Radio-Frequency Identification (RFID) is used as an instrument to communicate with traffic lights during traffic congestion. The emergency ambulance driver needs to activate the RFID tag to allow the detection of RFID readers to control the traffic light operation at the upcoming traffic light junctions. The traffic lights in the path of the ambulance are forced to be green to allow the emergency ambulance to pass through the junction with top priority. Immediately after the ambulance has passed the junction, the control system will reset and return to normal operations.

Keywords: GPS, IoT, RFID, smart ambulance, traffic signal

INTRODUCTION

Traffic lights, built since 1912, are a light signal system that regulates the flow of the road traffic at road junctions, between highways, pedestrian crossings, railway trains, and other areas. The traffic signals are comprised of three universal colours; the green light permits the traffic to continue in direction marked, the yellow light alerts cars to prepare for a short stop and the red signal denies any traffic from continuing (Kham & New, 2014). Many nations are suffering from traffic congestion issues that affect the transportation system. Despite the use of traffic controllers and programmed traffic light systems, the optimization of heavy traffic jams is still challenging, particularly with many road intersections (Isa, Shaari, Fayeez, & Azlin, 2014). The exponential growth in the number of vehicles and expansion of new roads and highways are not fully supported by efficient infrastructures to facilitate the easy flow of traffic. In some cases, partial solutions were proposed such as opening of new highways, building of flyovers or bypass roads, and creating rings. However, because of the presence of different variable, the traffic problem is very complicated.

Firstly, the traffic flow depends on the time of the day i.e., during peak hours, traffic in the morning and afternoon, during all working days and on weekend where there is usually less traffic on the road. There is usually dense traffic from cities to the outskirts and in the reverse direction for Mondays and Fridays respectively. Secondly, the traditional traffic light system is schemed with hard coded delayed where the lights changing interval time is fixed at a predetermined period of each direction of the traffic flow. It does not rely upon the ongoing volume of the traffic stream. Thirdly, the condition of a single light at a junction affects the traffic flow at the nearby junction. Likewise, the traditional traffic system does not consider various conditions such as accidents, roadworks, and vehicle breakdowns that contribute to a worsened traffic congestion, which then has a significant negative impact on emergency vehicles. This includes emergency vehicles of higher priorities such as

ambulances, rescue vehicles, fire service and police cars. In addition to the above, pedestrians who are crossing the roads are likely to be a contributing factor too. A new traffic light control system is required so that high priority vehicles do not get stuck in severe traffic and are able to save lives during emergencies.

An ambulance is a highest priority vehicle when it is in service, but traffic congestion can result in patients not taken to the nearest hospital in time and this may lead to fatality. The Straits Times on 13th September 2019 reported that patients died as Manila traffic jams block ambulances (Anonymous, 2019). The cost of traffic congestion is high in some developed countries. For example, in the UK it reached USD20.5 billion in 2014 and it is predicted to reach 33.4 million USD by 2030, while in the US it was recoded as USD124 million in 2014 and predicted to reach USD186 million by 2030 (Davis, Joseph, Raina, & Jagannathan, 2017). Similar studies by Chakrabartty and Gupta (2015) in India's highly congested cities like Mumbai, New Delhi, and Kolkata showed an increase of 1.73 percent to 11 percent in terms of number of cars in these cities which caused the delay in arrival of the emergency services. Hence, there is a need to utilize a smart traffic control system targeted at emergency ambulance services, which will help to minimize the response time of the emergency ambulance services, and to take the patients to the nearest hospital as fast as possible. The proposed project attempts to ensure that traffic along the route taken by the ambulance is cleared and congestion is eased with the help of an integrated system between traffic lights and the ambulance. This can be achieved by signalling the nearby traffic light every time there is an emergency ambulance approaching.

Moreover, Radio Frequency Identification (RFID) tags will act as instruments placed in the ambulance and will communicate with traffic lights as it approaches the nearest traffic light in the congested area. RFID is a technology used for automatically recognizing an individual, package or item using radio signals. RFID tags are small transponders (using electromagnetic fields) which transfer identity data over a short distance when required. Hence, during an emergency, the driver of an ambulance only needs to activate an RFID tag that will be detected by RFID readers and the traffic signals are then switched (Mustapha & Nik Hashim, 2016).

Related works

Pol, Gupta, Rahatekar, and Patil (2016) proposed a Smart Ambulance System which is an application that gathers information about location using the Global Positioning System (GPS) hardware and uses Google Map Application Programming Interface (API) to plot the information of the ambulance on Google Maps. Moreover, similar function can be applied for the other module that allows user to find the hospitals with the number of services provided. Communication between the smartphone and the centralized database are coordinated using Representational State Transfer Application Programming Interface (REST APIs). The platforms utilized are capable of molding into different services that are applied. In fact, these technologies can produce a revolutionary work in public GPS if used correctly.

Ramani and Jeyakumar (2018) introduced a Smart Ambulance Guidance System using the concept of Internet of Things (IoT) and Arduino to implement a traffic signal controller. The Smart Ambulance Guidance System provides solutions to the traffic congestion problem by alerting or controlling the traffic signal before an ambulance reaches the traffic signal. This system utilizes a main server to monitor and control the traffic controllers. With the help of web applications, the ambulance driver requests the traffic controllers to force the traffic light to green following the route of the ambulance. The implemented system is capable to reduce the number of deaths due to traffic congestion at the traffic signal. Since web is accessible from any platform, this system will be useful in emergencies.

Similarly, Ahir, Bharade, Botre, Nagane and Shah (2018) proposed an Intelligent Traffic Control System for Smart Ambulance, where the traffic congestion is cleared by changing all the red lights to green along the path of the ambulance, and subsequently assisting in clearing the traffic and giving directions along the way to its destination. In this system, an Android application is developed to enrol the ambulance on its network. If an occurrence of crisis arises and ambulance is halted on its way, the application will send an emergency command to the traffic signal controlling server. In addition, it will direct the ambulance wherever it needs to go with the help of GPS. The system will identify nearby traffic signals and force the lights to green until after the ambulance

passes by. Soon after, it regains its actual flow of traffic signal control. This system consists of two modules. The first module is an Android application. The ambulance driver will upload the patient's information in the Android application. The information of the patient is sent to the nearby hospital's server and thus the hospital staff will be able to prepare the requirements needed. This module operates on the principle of IoT with the help of REST APIs. This system also uses Arduino for the traffic signal controller. Wi-Fi modules are used to capture information from the server. Based on Wi-Fi modules, the Android application will directly be connected to the traffic signal controller.

Mukkawar, Rathod, Gawai, and Magar (2019) invented a Smart Ambulance with Traffic Ability using a combination of both hardware and software. The hardware is divided into two units of transmitter and receiver. The transmitter is comprised of node-MCU (micro controller unit), and the Arduino Uno consists of various health sensors such as temperature and heartbeat sensor. The sensors will sense the patient body parameters and will send the data to the cloud and thus the nearby hospital will prepare early for further treatment. When the ambulance reaches the location of an accident, the driver will get the basic information sent over the cloud. Hospital management will be able to assess the patient information through web applications to check the history of the patient. With the help of Google Maps API, the ambulance assembled with nod-MCU will transmit Wi-Fi signals continuously. The signal sensed by nod-MCU installed on the signal platform will turn green as soon as the ambulance reaches, and other signals turn red until the ambulance passes the signal.

Udawat, Tombare, Chauhan, Hadke, and Waghole (2017) proposed a smart ambulance system using IoT. As the vehicle reaches within 100m, the traffic light signal will change from red light to green; General Packet Radio Service (GPRS) will perform the communication between the vehicles and the cloud. By automatically monitoring traffic signals on the ambulance road, the system ensures a speedy response to emergency. Dunka and Sah (2020) introduced a Smart Ambulance Traffic Management System – a support for wearable and implantable medical device. It is a traffic management solution for ambulance using sensors and GPS technology. The data received from the sensors are sent to assigned stations. It is then processed, and modified information is sent to the ambulance system.

OUR PROPOSED METHOD

Our proposed Smart Ambulance Traffic Control System (SATCS) uses RFID as a main core of communication between the ambulance and the traffic light junction. The RFID consist of scanning antenna, RFID reader and RFID tag which contains the information of the traffic signal (Jagadeesan, Azhagiri, Maheshraj, Sanjay, & Srikanth, 2019). RFID Transmitter (Tx) in an ambulance will send a signal to RFID Receiver (Rx) placed at the nearest upcoming traffic lights junction. Once the signal is received at the traffic light junction, the Near Field Communication (NFC) module and microcontroller will perform a quick check first to identify the route of the upcoming ambulance and will freeze the current flow of traffic if the ambulance is on a red lane. Then, traffic control will change the traffic lights to green along the ambulance path. Figure 1 shows the communication process between traffic light and ambulance via RFID signal. Immediately after the ambulance has passed the traffic light junction, the control unit will restore the previous traffic flow according to their priority. Figure 2 shows the block diagram that forms a fundamental design of our proposed system.

Figure 3 illustrates the process flow of the oncoming ambulance route in our SATCS. The SATCs is activated by the oncoming ambulance RFID Tx to facilitate the traffic light control. Once the signal is received from the oncoming ambulance RFID Tx, the microcontroller at traffic light will perform a check on the oncoming ambulance lane. If the oncoming lane is red, the signal will then be forced to change from red to green to allow traffic flow in front of the ambulance to clear the path to give way to ambulance to pass through. All other lanes will be in red light to stop the traffic flow. Once the ambulance pass through the junction, the microcontroller then will reset to normal operations.

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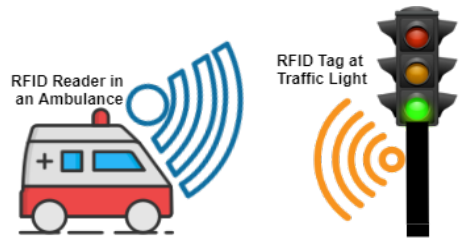

Figure 1. Ambulance and traffic light communication via RFID signal in SATCS.

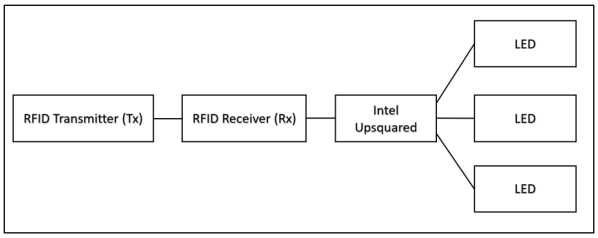

Figure 2. SATCS block diagram.

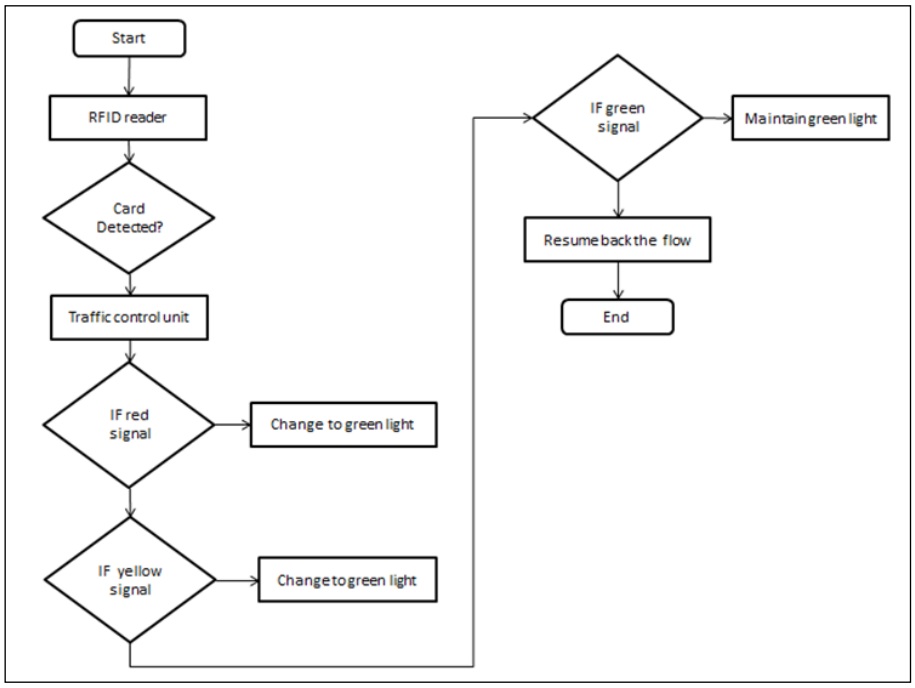

Figure 3. SATCS flow chart diagram.

Figure 4 shows the full-integrated SATCS prototype system that has been assembled. The grove NFC sensor is placed exactly 10 cm away from the traffic light. When the grove NFC module sends a Rx signal from the Tx of the oncoming ambulance, it will temporarily change the current lane signal into red and give priority to the oncoming ambulance by changing the ambulance lane to green. Once the ambulance has passed through the junction, it will change back to red and will resume the flow of the pre-set traffic signal.

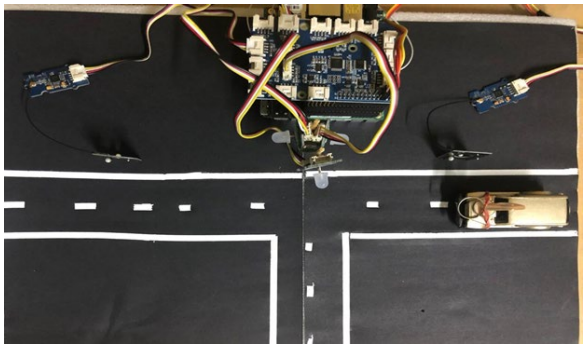

Figure 4. Top View of Proposed SATCS Prototype

RESULTS AND DISCUSSION

In this paper, the authors have reviewed four existing systems with traffic lights control specifically for ambulance and emergency services and compared them to our proposed system. Based on our review, Smart Ambulance System, Smart Ambulance Guiding System, Intelligent Traffic Control System for Smart Ambulance and Smart Ambulance with Traffic Control Ability have no offline availability, server-less deployment, and RFID technology. Our proposed system is designed to provide offline support and does not require a server to run the system. The proposed SATCS developed uses RFID technology so that the cost of implementation is relatively cheaper compared to similar existing systems. The proposed system also consumes less power than other existing system as shown in Table 1. This is important as the ambulance vehicle is equipped with plenty of medical tools and machines that already consume a lot of power. Thus, considering this factor, it is crucial to implement a proposed system with low power consumption.

The authors have conducted functional test namely Traffic flow test and RFID detection test as part of the testing phase. This is essential to ensure the proposed system complies with and satisfies all the specifications of the prototype and functional aspects as per its goal. Table 2 shows the testing of traffic flow at a busy traffic light junction. Table 3 shows the RFID detection test results at a busy traffic light junction. Based on the test results, our proposed SATCS able to detect the RFID signal from the oncoming emergency ambulance as it approaches the traffic light, and the RFID signal be able to communicate with our SATCS despite the busy traffic. The NFC communication module and microcontroller system assembled at the traffic lights junction then will enable the change of green light to red light at other junctions to halt the traffic flow while giving priority for the lane in which an emergency ambulance passes through. The test verified that our NFC communication module is working well.

Table 1. Comparison metrics of existing and proposed systems.

Metrics Existing System	Offline Availability	Server-less Deployment	RFID Technology	Cost	Power Consumption
Smart Ambulance System	No	No	No	High	High
Smart Ambulance Guidance System	No	No	No	High	High
Intelligent Traffic Control System for Smart Ambulance	No	No	No	High	High
Smart Ambulance with Traffic Control Ability	No	No	No	High	High
Our Proposed System	**Yes**	**Yes**	**Yes**	**Low**	**Low**

Table 2. Testing of traffic flow at busy traffic light junction.

Test case type:	Traffic Flow
Test case description:	To test the flow of the traffic lights
Test priority:	High

Test Description	Expected Result	Result
Connect the grove chainable RGB led to grove pi+	Light up once connected	PASS
Follow the correct flow of the traffic lights	Follow the sequence of GREEN, YELLOW then RED light when changing from GREEN to RED	PASS
Follow the time interval of traffic lights	Successfully follow the time interval	PASS
Follow the correct phases or lane of the traffic lights	Successfully follow the phases of the traffic lights	PASS

Table 3. Testing of RFID detection at busy traffic light junction.

Test Case Type:	RFID Detection
Test Case Description:	To check that the grove NFC module can detect the RFID signal
Test Priority:	High
Preconditions:	• Grove NFC module connected to the grove pi+. • Turn on the Intel Upsquared board. • Run the Python script.

Test Description	Expected Result	Result
Detect the RFID signal	Successfully detect the RFID signal from the ambulance	PASS
Communicate with traffic signal	Successfully communicate or control the traffic flow at the busy/stall traffic light junction	PASS
Change the current GREEN signal to RED and give priority to ambulance lane.	Successfully change from GREEN to RED signal and give priority to ambulance lane	PASS

CONCLUSION AND FUTURE WORK

The proposed Smart Ambulance Traffic Control System has been designed and successfully tested. The prototype has achieved its functional test. The advantage of the proposed prototype is that it is not solely dependent on internet access but able to work on a standalone basis as well. The system can communicate with the oncoming emergency ambulance and traffic light using available Intel Upsquared and simple RFID technology. However, there is room for improvement. We propose that this work can be extended and tested at in the real-world environment. Since this is a Final Year Project and due to limitations, the authors developed this project as a proof of concept. Active RFID operating range is up to 100 meters or slightly more, and as such future works can focus on using cloud computing to test it in real traffic lights, for different distances between the ambulance and traffic lights, and for different ambulance speeds.

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Complaint Management System for Sarawak Rural Area Water Supply Department

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ABSTRACT

This Complaint Management System is developed to manage the complaints received by the Corporate Communication Unit of the Sarawak Rural Area Water Supply Department. This system was developed to solve the current problems faced in managing, retrieving and updating data using the manual method by the Department. Users of the system are the administrative staff and division water engineers. Users are able to add, update and delete complaint records, as well as view information in graphical format such as pie charts and graphs. Rapid Application Development (RAD) was used to develop this system, consisting of four phases: analysing user requirement, develop a prototype, construction and cut over. The feedback received from the Department's staff is positive and showed that the users are satisfied with the system developed.

Keywords: Complaint management system, Rapid Application Development, Sarawak Rural Water Supply Department

INTRODUCTION

The Sarawak Rural Area Water Supply Department, formerly known as Jabatan Kerja Raya Water Supply Authorities was launched on 1st of September 2015 where this department had been operating for the last five years (Sarawak Rural Water Supply Department, 2020). This department is under the purview of the Ministry of Public Utilities. The Permanent Secretary of the Ministry of Public Utilities has assigned as the State Water Authority under the provisions of the Water Ordinance 1994 which allowed the establishment of various Water Supply Authorities under Jabatan Kerja Raya to supply drinkable water. The Corporate Communication Unit is a unit under the Corporate Communications and Digitalization Department at Sarawak Rural Area Water Supply Department (Headquarters). This unit is also known as the Public Relations Unit since the unit is as an intermediary between Sarawak Rural Area Water Supply with their customers. The Corporate Communication Unit receives complaints every day regarding water supply problems via telephone calls from customers all over Sarawak. Every complaint received will be written on paper and then typed into Microsoft Excel.

A report will be generated for each complaint received and the report will be sent to the Division Water Engineer or Assistant Division Water Engineer for further action. Other than that, for yearly report, they have to present statistics for complaints that they received since the beginning of the year. Web-based system is a system that uses web technologies to improve customer service and keep customer data in a centralized location. Managing complaints for different cases and locations is quite difficult due to the manual way of doing this (writing on paper), with no centralized web-based system to manage the workflow. These problems inspired the department to have a new complaint management system which will be more convenient to use. This system allows all complaints data to be keyed in and stored in a web-based system for systematic managing and handling of the complaints. Since the establishment of Sarawak Rural Area Water Supply Department, the Corporate Communication Unit does not have any proper computer-based system for the complaints received. Every complaint received will be recorded manually on a Customer Complaints Form and will be simply converted into Microsoft Excel which is then rearranged according to division. Then, they have to create another Excel to create the yearly report and sort the cases by case category. Problems arise when forms are misplaced and this can affect

the result of the statistics for the yearly report. Complaints' case category that is not recorded in a proper way will also affect the statistics. Human error and data redundancy can also happen when complaints are done manually. Any complaints received regarding water issues via telephone is directed to 082-263000, but the info is not sent directly to the Division Head Office; the Corporate Communication Unit has to do a report about the complaints and then inform the Division Water Engineer through text messages or WhatsApp. Problems arise when most of the information is misread by the engineer. The water supply problem may continue as sometimes the officer might forget to remind the Division Water Engineer due to other commitments; and subsequently the customer may get angry and post about the issue on social media and in press statements. This could ruin the organization's reputation.

The Complaint Management System is proposed to manage the complaints according to division and cases. This system is able to add, edit, delete and search cases. Apart from that this system is also able to display filtered tables and statistics in the form of graphs. The other purpose of this system is to enable the checking of the progresses of complaint cases being reported – from the start of the complaint until the case is closed. The cases can also be filtered by division, therefore the most frequent division that faces water supply problems can be identified. Subsequently, the water supply system for all divisions in Sarawak can be improved. Moreover, it is a more systematic way to manage complaints, retrieve data and obtained results for the recorded data by the department staff.

METHODOLOGY

The methodology that has been chosen to develop this system is Rapid Application Development (RAD). There are four phases during to develop this project using RAD, which are Requirement Planning, User Design, Construction and Cutover (Miller, 2018). The tasks, tools, and techniques used during the RAD phases are shown in Figure 1.

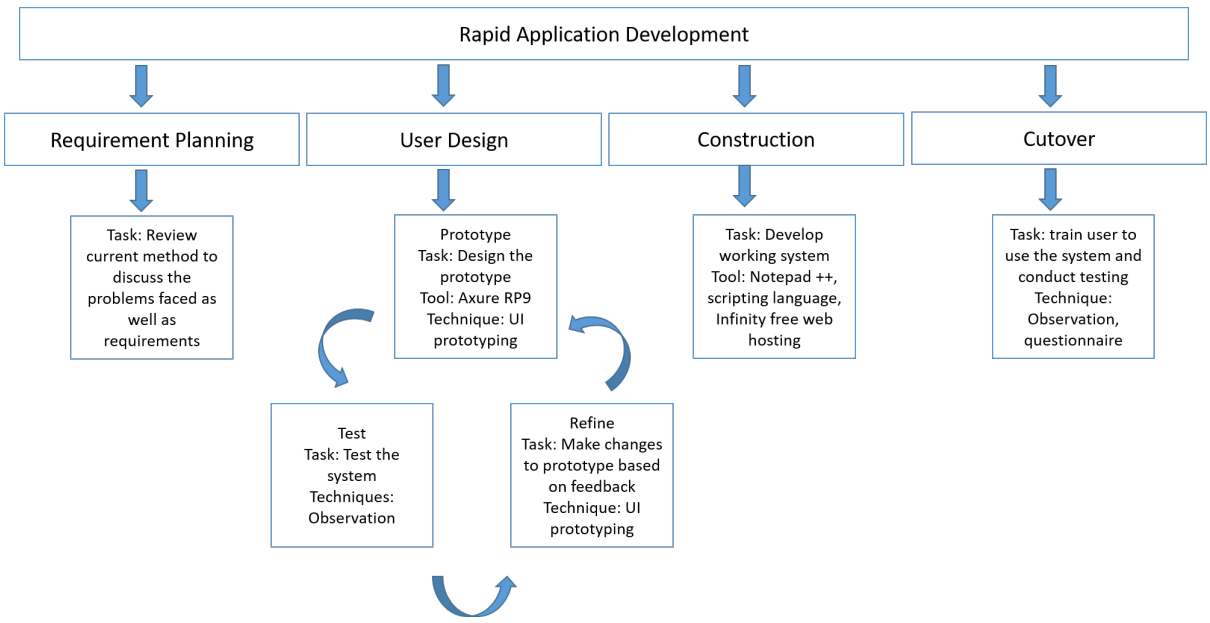

Figure 1. Project methodology diagram (Luat, 2020)

i. Requirement Planning

This phase is for the developer and client to create the project vision that will become the inspiration and gives focus or guidelines for the entire project. During this phase, the current method was reviewed to know the problems that are faced by the Corporate Communication Unit on managing complaints. In order to gather information, a survey questionnaire was distributed to the client (Corporate Communication Unit staff) focusing on their constraints in using the current method and to discover the features that an online complaint management system should have. Survey results were revised to obtain the user requirements for the complaint management system. The Corporate Communication Unit needs a web-based system where complaints that are reported will be stored and managed. The system is also able to display graphs for cases by month according to division and analysis, as well as case progression monitoring. At the end of this phase, the client and developer need to have goals and expectations for the project which include all the user requirements.

ii. User Design

The User design phase is where the developer and client work together to ensure the goal and requirement meets users need. The developer has to design a prototype with features that are needed by the client. The features and requirements obtained from the previous phase were designed during this phase. The User Design phase consists of three tasks which are prototyping, test and refine.

Prototyping

The developer designed the prototype based on the features and requirements that users need. The prototype will become the guideline for the developer to develop the real system. This prototype was tested by the client who gave review and feedback.

Test

Clients tested the system and noted any new ideas or changes if there were any features and requirements that needed to be included in the system. The prototype flow was discussed to ensure the system was easy to use.

Refine

During refining, changes will be made according to the feedback received to ensure that the system meets user requirements and expectations. If the client is satisfied with the changes, the next phase will start immediately.

iii. Construction

Construction phase is the development phase where the real system will be built. The prototype that was built in the previous phase was used as a guideline to develop the working model. Changes and new ideas could still be added to the system during this phase. The developer begun scripting for the system based on the prototype. This scripting process was to create the interface for HTML and PHP using Notepad ++. Database was constructed using Xampp. Cascading Style Sheets (CSS) was used to design the interface. At the end of this phase, the system should be able to be used, which means it is a complete system and that it is ready to be deployed. The system was tested to make sure all the requirements were included.

iv. Cutover

For the final phase, user training will be conducted before the system is used. Users were trained to make sure that they were able to adapt to the system and to avoid confusion. The existing data that were recorded in the Excel documents before this system was developed, was loaded into the new system. Another round of testing was conducted to make sure that the system worked as expected. After this, the system was ready to be deployed to the users.

RESULTS

The Complaint Management System for Sarawak Rural Area Water Supply Department is a web-based system that was developed using scripting in PHP, HTML and CSS. All the PHP files were connected to the MYSQL for

storing data to the MYSQL Databases. There are two types of user using this system, which are the Corporate Communication Unit staff (known as Staff user) and Division Water Engineer (known as Engineer user).

Once the user has successfully accessed the system, the user will directly enter the main page as in Figure 2 below. There are eight options of action the Staff user can perform in the system, as shown in Figure 2. The Profile button will navigate the user to their profile page that will display user information, Add User button will navigate user to the Register New User page, the Add Complaint button will navigate user to the Add New Complaint page to register new complaint to the system, the Manage Complaint button will navigate user to the Manage Complaint page to manage complaints recorded, the Reminder button will navigate the user to the Create Reminder page for staff to give reminder to the Division Water Engineer, the Case Status button will navigate the user to case status page that will display case status in the form of a pie chart (Figure 3), the Complaint Summary button will navigate the user to the Complaint Summary page which displays records in tables with filter function and lastly, the Graph Analysis button will navigate the user to the Graph and Analysis page that will display complaint records in the form of a graph. This page also has a logout button for the user to exit the system.

Figure 2. Main Page for Staff (Luat, 2020)

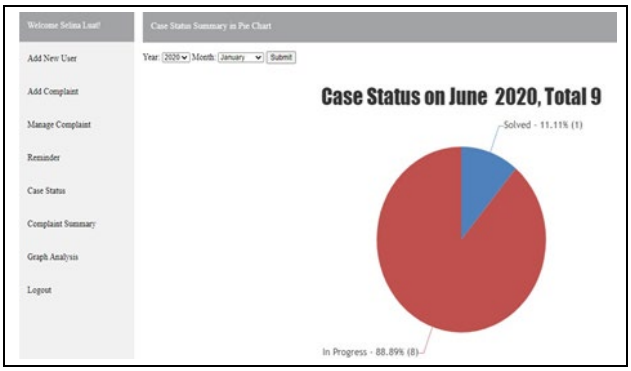

Figure 3. Information in graphical format – pie chart (Luat, 2020)

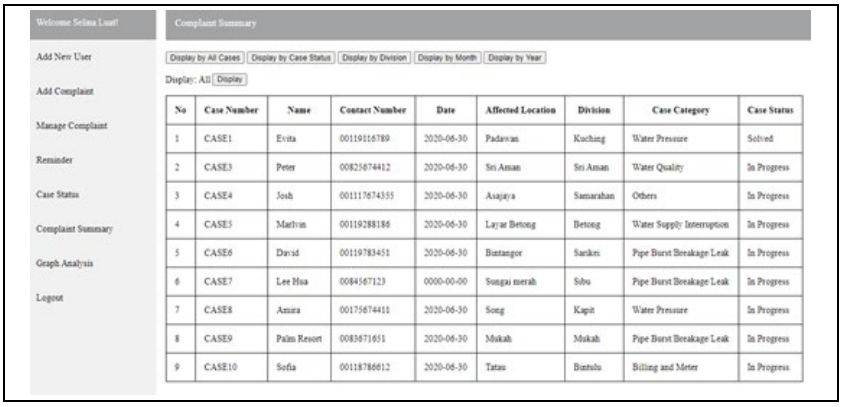

Figure 4. Complaint cases table (Luat, 2020)

If a user holds a position as Division Water Engineer, the system will navigate the user to Division Water Engineer's main page. Figure 5 shows the main page for Division Water Engineer which contains all the action that can be performed by the engineer. The Profile button will navigate user to the user profile page. The Update Complaint button will navigate the user to the update complaint page, the Notification button will navigate the user to the view notification page (Figure 6), the Case Status button will navigate the user to the case status page,

the Complaint Summary will navigate the user to the complaint summary page and the Graph Analysis button will navigate the user to the graph and analysis page (Figure 7). The logout button on the top of the option will exit the user from the system.

Figure 5. Main Page for Division Water Engineer (Luat, 2020)

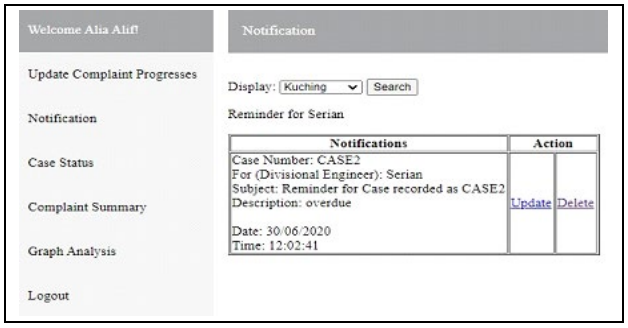

Figure 6. Reminder notification page for division water engineer (Luat, 2020)

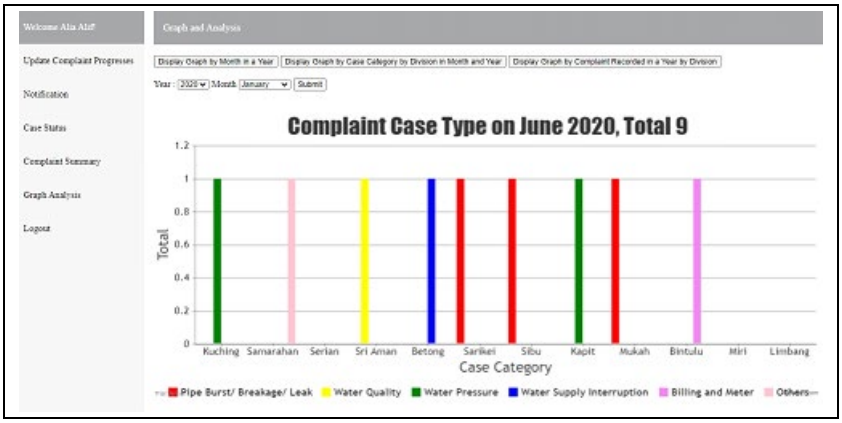

Figure 7. Total cases graph by division (Luat, 2020)

DISCUSSION

The Complaint Management System for Sarawak Rural Area Water Supply Department can be useful for staff in adding, viewing, updating, deleting and managing complaints. Besides, this system is also able to generate tables and graphs to summarize the complaints reported by division and month. Other than that, the system can also generate analysis for the progress of the complaints for every division by month using pie charts; it is also able to display a graphical analysis by division and month according to cases that were reported. Cases that are mentioned are pipe bursts, water quality, water pressure, water supply interruption, billing and meter. This system is also able to remind the engineers on their case progress so that issues will not be overlooked. With this system, cases that frequently happen at the same place can be studied to determine the cause and further improvements can be made. This system helps to improve the efficiency of the department in providing water supply.

User testing was carried out by asking five respondents who are staff (both administrative and engineer) of the Department to test the system and answer the questionnaire after testing the system. Users were asked to rate the system's design, functions, ease of use, reliability, and consistency. Users were also asked on whether they felt their current problems were solved, willingness to change to the new system, if they need assistance

when using the system, ease of managing complaints workflow, and if they saved more time using the system as opposed to using the old manual way of managing complaints. A scale of 1-5 (1 being strongly disagree to 5 strongly agree) was used as rating. Responses given by users were mostly positive in the sense that most (more than three respondents) if not all users gave ratings of 3-5 for the questions asked. In addition to this, users were also asked to provide their suggestions to further improve this system in the future. Suggestions given were to have better instructions on how to use the system, as well as improve the interface design. From the results obtained, it can be concluded that the users were satisfied with the system and most importantly they felt that the system could help them to improve their work compared to the manual way of doing things.

CONCLUSION

Through this system, the Corporate Communication Unit staff and Division Water Engineer are able to record and manage complaints at any time. Problems that they faced before can be reduced through the use of this system. The most important role of this system is to track the area or any place that faces serious water supply problems so that the water supply at certain divisions can be investigated and improved. This will be a better web-based platform to manage complaints compared to the current way of manually doing the complaint management and using Microsoft Excel to create tables and graphs.

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FCSIT WhatsApp Chatbot

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ABSTRACT

WhatsApp is currently one of the most widely used communication mediums among students in tertiary education in the form of both personal messages and group messaging chats. Currently, the practice in most Malaysian Universities is that students need to consult the faculty staff or search through the faculty's website to obtain information related to their academic studies. However, the process of obtaining needed information can take some time ranging from minutes to hours and at times are not consistent as the queries are answered by different staff members. There are WhatsApp chat groups for students to interact with faculty staff, but the chat group can be overwhelmed by questions due to the huge number of group members hence causing important messages to be overlooked. In an attempt to overcome these challenges, we developed a FCSIT (Faculty of Computer Science and Information Technology) WhatsApp chatbot to solve these problems by offering a centralized platform of communication for both faculty staff and students to carry out information sharing through WhatsApp messages. Communication is in the form of personalized messages between the chatbot and the user thus solving the problem of overwhelming messages posed by group chats. Agile Kanban methodology was used to develop the system which promotes the use of a Kanban board to visualize the development stages. A questionnaire was distributed to lecturers, faculty staff and students to test the system and to gather opinions and suggestions from targeted users, which is the FCSIT community, in order to assess whether the system fulfils its objectives.

Keywords: Chatbot, Kanban Methodology, Natural Language Processing, WhatsApp

INTRODUCTION

WhatsApp is an instant messaging application which serves the purpose of replacing SMS (short message service) with a cross-platform mobile messenger application that works whenever devices are connected to the internet (Yeboah & Ewur, 2014). In the university setting, WhatsApp is widely used as an informal communication between students for discussions about various projects or assignments, as well as information sharing among lecturers, faculty staff and students (Joicy & Sornam, 2018). In order to further improve the efficiency of the current workflow being employed in the faculty, we leveraged the use of new technology such as the chatbot application. A chatbot is used to simulate human conversation in the form of text and sound to reply to a user query. Companies nowadays such as Spotify and Sephora utilize the chatbot as their virtual assistant to answer customers' queries and learn the behaviour of every customer based on conversations from time to time (Kim, 2018). The presence of a chatbot supports the automation of replies for similar queries, allowing human resources to focus on more important and qualitative tasks while improving the business with the least effort. Reply to queries can be received within seconds and is no longer restricted to office hours.

This project integrates both the use of WhatsApp which is a popular communication tool among staff members and student and a chatbot by creating a FCSIT (Faculty of Computer Science and Information Technology) WhatsApp chatbot application to support the teaching and learning ecosystem. The chatbot serves the purpose of providing a centralized communication platform to answer queries and delivering messages to users via the FCSIT WhatsApp chatbot. This project also includes the development of a website that provides a medium for the faculty administrative staff and lecturers to create the knowledge base for the chatbot, such as

changing query's answer, delivering messages to related users and modify the chatbot's reply upon receiving new input.

Problem Statement

In today's world, technology has enabled us to communicate faster and more efficiently. Repetitive tasks can be done by machines that are no longer constrained by working hours; thus it is essential that we adopt new technology to remain relevant in today's fast changing world and to maximize productivity. Students as stakeholders of the university would want to obtain the latest and relevant information from the faculty or university with the least amount of time. However, in terms of providing services to student, the time taken to reply to student queries can be long and inconsistent replies could be given by different staff members. Apart from that, replies to queries are constrained by working hours. Also, faculty staff had to give the same reply to the same questions posed by different students, and at times queries were made after office hours. Efforts have been made to improve communication between faculty staffs and student by using WhatsApp chat group but due to information overload in chat groups, most users have trouble keeping track of the latest information shared in the group chat, and there exists a huge number of unimportant messages which causes important information to be overlooked. Currently WhatsApp is one of the most widely used communication platform among the FCSIT community. We attempted to leverage on one of the most common communication tools used by FCSIT community and integrate it with an online chatbot technology to create a personalized WhatsApp chatbot. The chatbot will simulate the actions and response of faculty staff to deliver accurate information in the form of WhatsApp personal messages in order to solve the problem of missing out on important messages caused by overwhelming messages in a chat group. It also allows students who are not keen to participate in group chat to communicate via personal messages.

A Google Form questionnaire was distributed to FCSIT students to determine the most used messaging application that is used by students for academic purposes and the result is shown in Figure 1. Based on Figure 1, WhatsApp was found out to be the most used messaging application by FCSIT students. In Figure 2, most students that participate in WhatsApp group messages agreed that one of the problems with group WhatsApp messages is that important messages tend to be overlooked when there are too many messages from members in the group chat. Based on the feedback received from the respondents in Figure 2, we further refine the question as in Figure 3. A total of 94.2 percent of FCSIT students agree with having a chatbot that they can interact with and have messages directly sent to them from the chatbot.

Objectives

In this paper, we proposed a WhatsApp chatbot that can reply to a student query automatically in real time. We also developed a website that allows authorized users to create the knowledge base for the chatbot. The requirements of the system were obtained through interview sessions conducted with students and faculty members. Students can pose questions to the Whatsapp chatbot and the system shall reply based on the information that is available in the knowledge base. In the event that the Whatsapp chatbot produces a wrong answer, the system provides a feedback page where students can make a report to the system administrator. The administrator would then be able to view the report and make changes to the knowledge base of the system in order to further improve the system.

MATERIALS & METHODS

The software methodology used to develop the system was the Agile Kanban methodology. Agile Kanban methodology is an evolutionary and non-disruptive method that promotes gradual improvements to the project development process. Through the use of Kanban methodology, the system respects several important principles. The entire workflow is visualized in a Kanban Board, and the Kanban board can be in the form of physical or virtual board. The board is filled with processes in different states such as requirements, design, development, testing done and product backlog. Work in Progress (WIP) will be limited to ensure that new tasks are started after the previous tasks are fully completed. Limiting WIP can help in analysing the work progress, thus improving the workflow and reduce the time taken to complete each task. Workflow of the project can also be improved as

Kanban board provides good management of projects by highlighting various stages of workflow and work status in each stage.

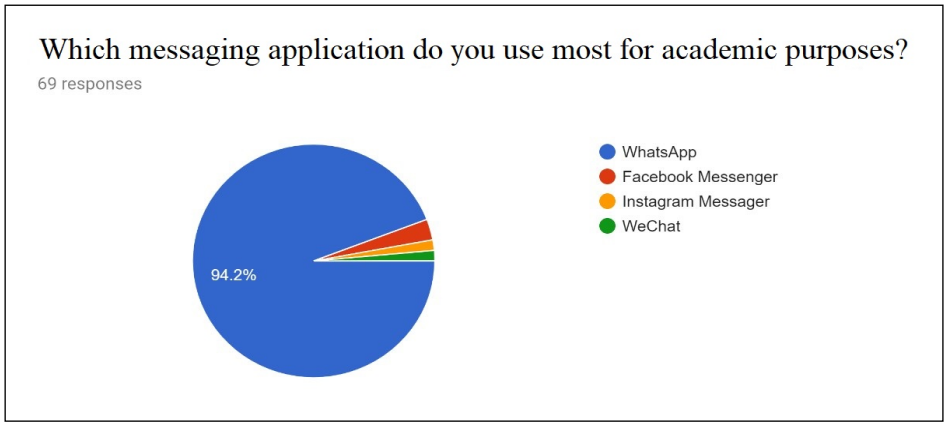


Figure 1. Messaging application used by students for academic purposes.

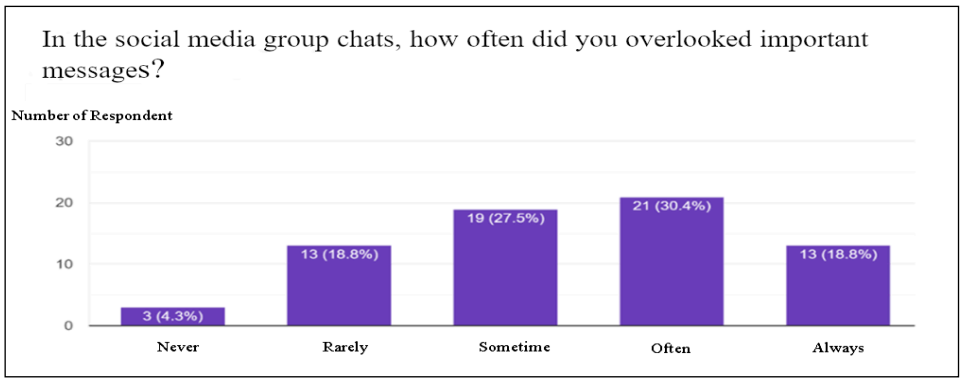


Figure 2. Frequency of overlooked messages in social media group chats.

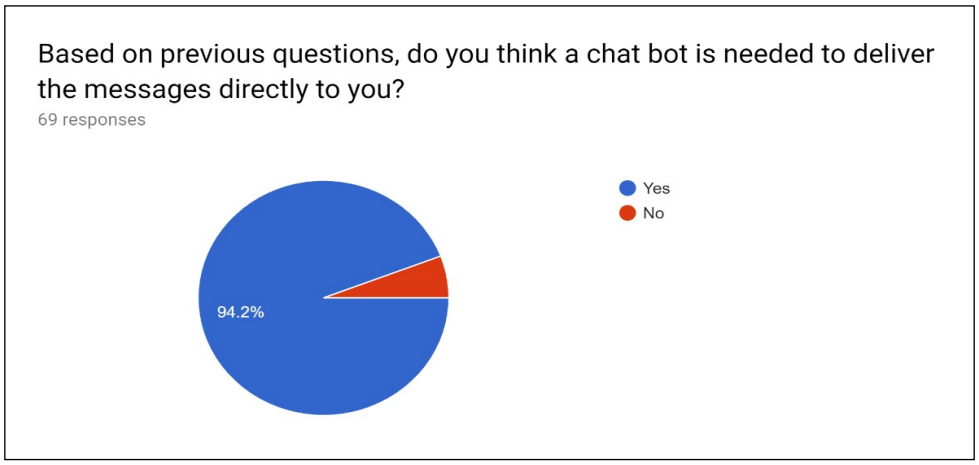


Figure 3. Percentage of students that agree the need for a chatbot as a means of communication.

Explicit process policies can be made visible in the Kanban board as it can help to guide the system to be developed in a correct manner. The Kanban methodology enables developers to predict the deliverables date of features to clients based on the amount of work on the Kanban board. Limiting the work in progress helps a lot in reducing partially done work, extra features, lost knowledge, handoffs, task switching, delays and defect which are considered as seven wastes of lean software development (Straube, 2017).

Table 1. Phases and Activities in Agile Kanban methodology.

Phases	Activities
Requirements	Questionnaire Functional Requirements
Design	Logical Design Physical Design
Development	Front-End Development Back-End Development
Testing	Prepare Test Case Collect Feedbacks From Testers
Done	Work done
Product Backlog	To-Do list

Due to the nature of chatbot development where the project might undergo significant amount of requirement change, we have selected the Agile Kanban methodology (Table 1). To establish the viability of the system to be constructed, functional requirements are gathered. The logical design is represented as a use case, conversation flow, sequence, activity and class diagram. Physical design is represented by a wireframe design. A high-level design is represented as an architectural design that describes the design structure and the relationship between various modules in the system development.

Requirement Analysis

Requirements are needed to determine the feasibility of the system. Several steps were carried out to determine the complete requirements, including questionnaire and listing out functional requirements. Questionnaire will be distributed to the target users which are the students in FCSIT, UNIMAS to collect opinions towards the existence of chatbots around the faculty. Furthermore, functional requirements are created to provide an overview of requirements to every stakeholder involved in this project. In total there are four targeted users for the system. They are the super admin, faculty staffs/admins, lecturers and students. The functional requirements include requirements for the WhatsApp interface and the web template to program the chatbot (Table 2).

System Architecture

Figure 4 represents the system architecture of the FCSIT WhatsApp chatbot that shows the structure of the system and its relation between the various modules. In the scenario where the chatbot has been triggered by students typing the specific trigger string to the chatbot followed by sending of a message to the chatbot, the message will be captured by the WhatsApp API and the interpreted message will be sent to the DialogFlow agent using an API which connects the WhatsApp API and the DialogFlow agent. The message will then be matched against intents available in DialogFlow which has already been defined by FCSIT authorized administrator through the web template. When an intent is matched, the webhook executes external APIs to query the database for the corresponding response(s). Otherwise, a fallback message will be sent to the student, indicating the chatbot does not understand the input inserted by the student. To create the knowledge base of the chatbot, the super administrator, lecturers and faculty staffs will use a dedicated website to insert knowledge information into the database which in turn is processed by the chatbot when there is a query from a user. The chatbot will act as a medium to aid faculty personnel to deliver messages, as well as answer different queries made.

Use Case Design

Figure 5 represents the use case diagram for our FCSIT WhatsApp chatbot application. There are four actors that will be using the system which are the students, super administrator, lecturers and faculty staffs or administrators. Each use case has a use case description that describes the way the task is performed through the system. Each actor can carry out different operations based on the respective identities. Table 3 shows the breakdowns of the use case diagram.

Table 1. Example of Functional Requirements obtained from requirement analysis process.

Requirement ID	Requirement Description	Priority
	User: Super Admin	
FR.SA01	Login to the proposed system as super admin	High
FR.SA02	Register web template's user such as faculty staffs and set their respective rights	High
FR.SA03	Set frequently asked question by providing keywords and answer	Medium
FR.SA04	Manage faculty events	Medium
	User: Admin	
FR.AD01	Login to the proposed system as admin	High
FR.AD02	Set frequently asked question by providing keywords and answers	High
FR.AD03	Edit and delete the Frequently Asked Question (FAQ)	Medium
FR.AD04	Set and configure details of events happening around the faculty	High
FR.AD05	Edit and delete events through the website	Medium
	User: Lecturers	
FR.LC01	Login to the proposed system as lecturer	High
FR.LC02	Modify class status and add announcements	High
FR.LC03	Add and modify class and enrolled students	Medium
	User: Students	
FR.ST01	Able to carry out conversation with the chatbot through WhatsApp	High

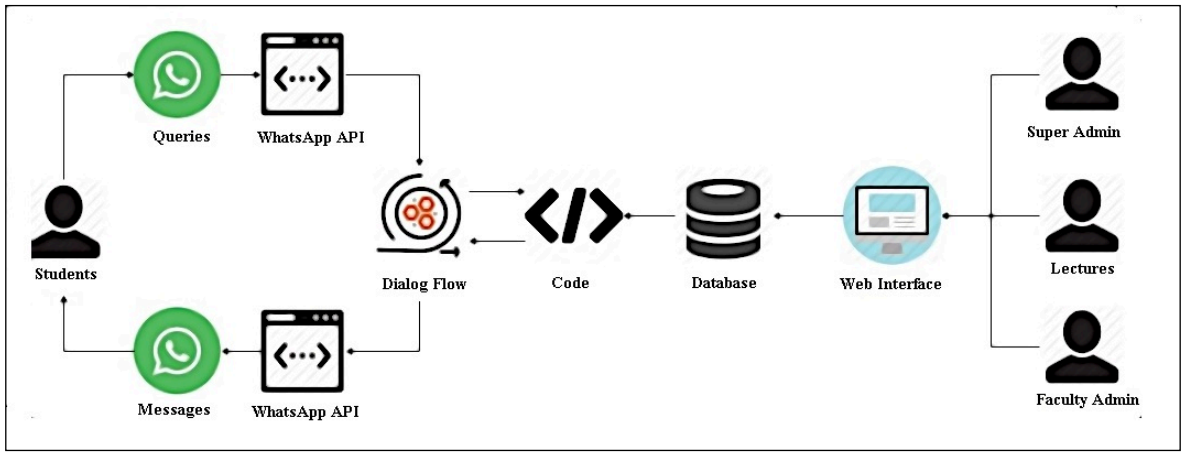


Figure 4. System Architecture Design for FCSIT Whatsapp Chatbot.

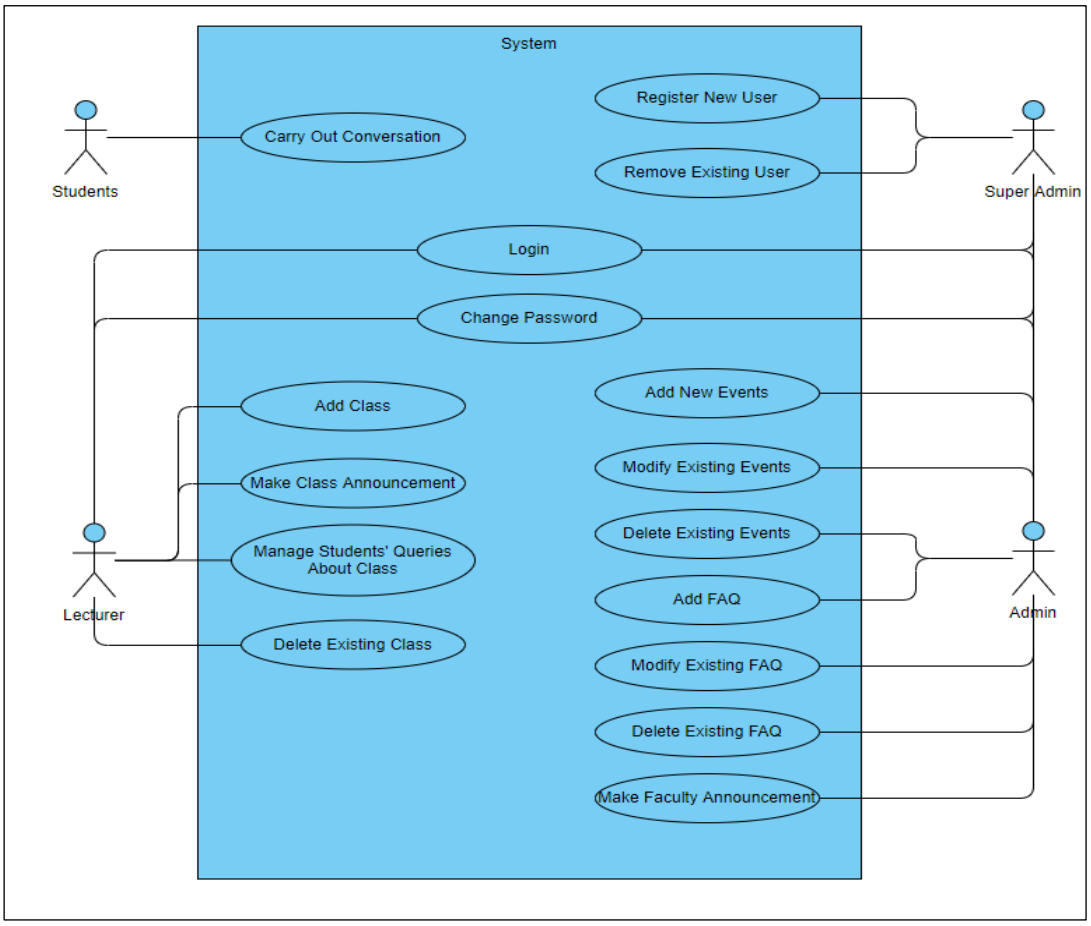


Figure 5. Actors and Use Cases for FCSIT Whatsapp Chatbot.

Table 3. Use Case Design Description.

Actors	Activities
Students	Able to carry out a conversation with the chatbot through WhatsApp Messenger.
Super Admin	Able to register new user such as lecturers and faculty staffs to manage the chatbot.
Lecturers	Able to manage class status by inserting announcements and deliver messages.
Faculty Admin	Able to manage events by adding new events with description and put up new FAQs to the system so that students can view them through the chatbot.

IMPLEMENTATION & DISCUSSION

This project has a web template that allows authorized users to create the knowledge base for the application. The tools that were used in the development of this application are as follows:-

A. Environment Setup

I. Visual Studio Code

Visual Studio Code was used as the main IDE of the project. VS code was chosen as it is more light weight and suitable for web development as it has a rich marketplace of extension.

II. AngularJS 9

Angular 9 was chosen as the framework for developing the web template. AngularJS is supported in most of the modern browser and have a wide variety of support in online forums.

B. NODEJS

NodeJS is one of the most popular JavaScript application runtimes. Node Package Manager makes use of free online libraries to simplify the system development. NodeJS also has the advantage of providing great command line interface to create web applications.

C. Google Firebase

Firebase was chosen as the server to host the website, host back-end functions and database. Firebase was chosen for the project as it provides a wide variety of services that suits the needs of this project such as authentication, real-time database, functions, storage and hosting.

D. DialogFlow

DialogFlow is used as an NLP tools for the faculty administrator to create Frequently Asked Questions (FAQ). A dedicated server-side code was designed for the administrator to create the intent, setting keywords in DialogFlow by using communication between the interface and the server-side codes.

E. ChatAPI

Chat-API (https://chat-api.com/en/?lang=EN) was used for connecting the project to a WhatsApp Messenger. As the official WhatsApp Business API is not available, Chat-API will be used as an alternative until the official WhatsApp API is available for use. Chat-API handles receiving message, sending message and broadcasting messages.

Interface

The system comprises of two categories of interfaces which are: 1) Web interface that allows a user to create the knowledge base and 2) Interface of the FCSIT WhatsApp Chatbot where the user interacts with the chatbot.

A. Web knowledge base home page

Figure 6 is the home page from the super administrator perspective which can either be the lecturer or staff member. The top navigation bar indicates the tasks that can be performed such as managing events, FAQ, and announcements.

B. Web form to add content into knowledge base

Figure 7 is the form where content for the knowledge based is created by the faculty staff member or the lecturer. Content that is created are 1) categorized 2) labelled 3) tagged with relevant keywords and 4) given content. The content created is then used as a knowledge source to deduce answers based on user queries.

C. Web View Content of Knowledge Base

Figure 8 is the faculty administrator view form for FAQ. After clicking “FAQ”, there will be a FAQ table containing FAQs available in the system.

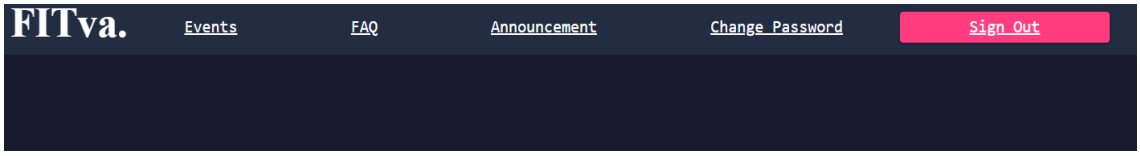


Figure 6. Home page of chatbot knowledge base.

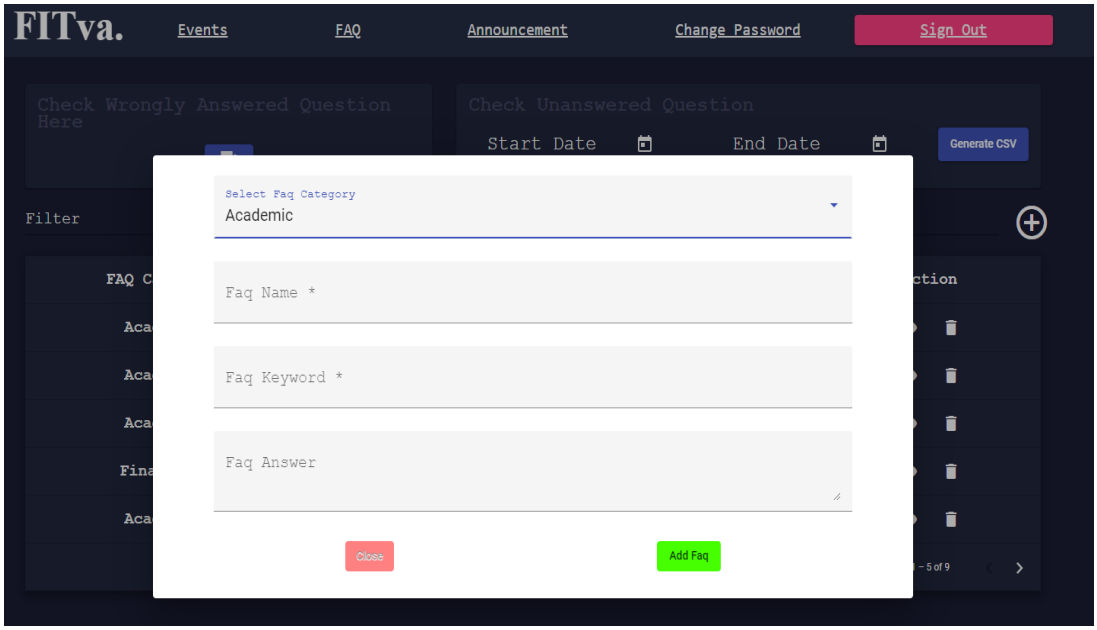


Figure 7. Knowledge base content creation.

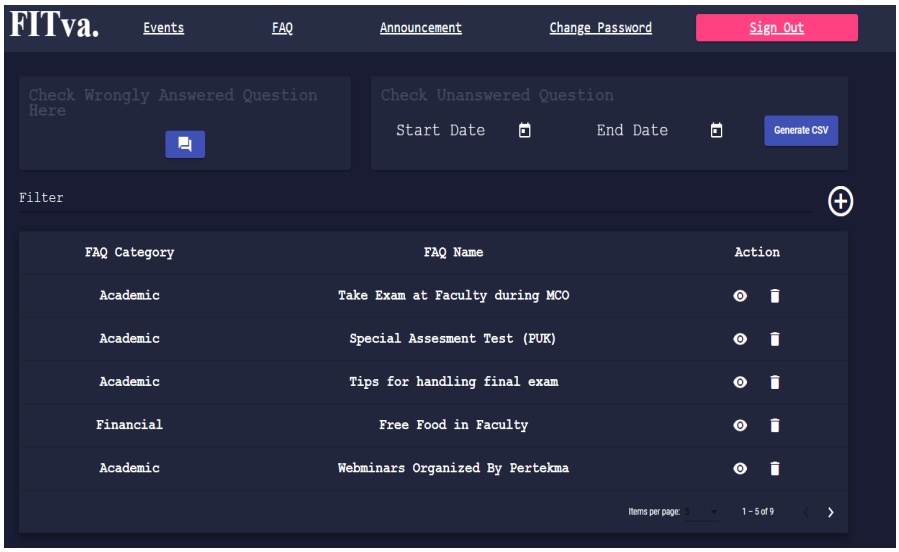


Figure 8. View page of frequently asked question knowledge base page.

D. Whatsapp Chatbot Student Query

Figure 9 is a student query for FAQ. If the chatbot receives the FAQ from the students and a match is found in the database, it will reply to the FAQ answer based on the information that was created by the faculty administrator on the website.

E. Whatsapp Chatbot Failed Query (Unavailable FAQ)

Figure 10 is a scenario of a failed student query for FAQ where the knowledge data is unavailable in the FAQ knowledge base. Since there is no match in the database, the chatbot will reply to a fall-back message, and the query will be stored in the database so that faculty administrator can monitor unanswered questions and make the necessary changes.

F. Web View Unanswered Question

In Figure 11, the user may select to view unanswered questions by selecting the date range. After selecting a range of dates and by clicking the "Generate CSV" button, a CSV file will be downloaded to the user's device and the user will be able to view the unanswered questions. User may then create a new FAQ based on the data in the generated CSV file. Figure 12 is an example of CSV file with unanswered questions.

Testing

Testing is an important process of this project because testing gathers users' feedback and changes for developers before the final release of the product. In this section, various testing such as unit testing, functional testing and user testing were carried out.

A. Unit testing

Unit testing is to make sure that each unit of the project is working as intended. Main units such as input, buttons and validations were tested during unit testing.

B. Functional testing

Functionality testing is carried out to make sure all the functions that are required are developed into the system. Functionality testing is done by the developer using test case to manually verify that the functions are working as intended and to detect bugs or error in the system.

C. User testing

User testing evaluates the system with the user. The purpose of the testing is to collect the feedback and suggestion from the users after using the system. User testing is done by the targeted user which is the faculty administrator, lecturers and students. Testing results are collected through survey question via Google Form which is divided into three parts which are system functionality, user interface design and user recommendation.

User testing was done with three different users namely lecturers, faculty staff and students. The system was tested by two lecturers from the FCSIT and both lecturers agreed that the system has the potential to enhance interaction between the faculty and the students. Testing done with the faculty staff revealed there is potential improvement to the system where it was found out that some processes could be further automated such as the manual work of importing student data to the system, a trigger mechanism that allows a message to be sent to all students and a more detailed categorization of students (into current intake, final year and industrial training students). Testing with ten faculty students was done and we found out that the average time it took to reply/broadcast a message may take 3 to 5 seconds while an announcement with file attachment may take a longer time depending on the size of the file. The result of the testing was on average satisfactory and no bugs or errors were detected at the time of the test. Most users found that the interface was easy to understand and all functionalities met the required objectives.

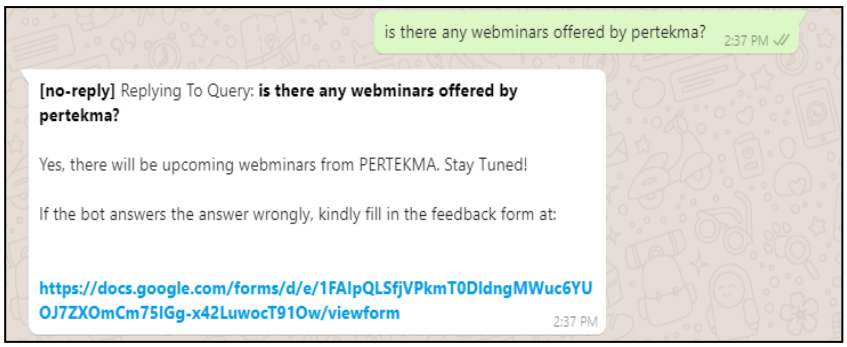


Figure 9. Chatbot responding to Student Query.

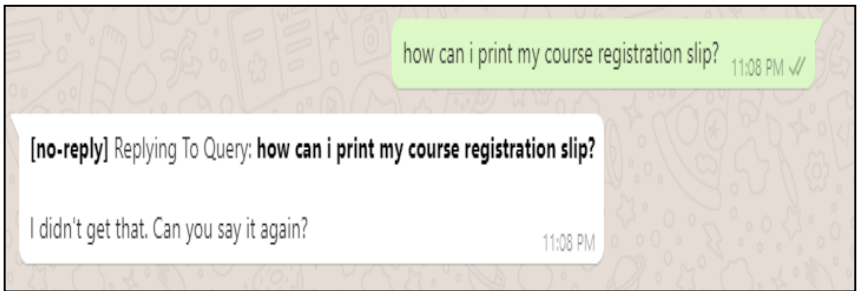


Figure 10. Chatbot responding to a Failed Query.

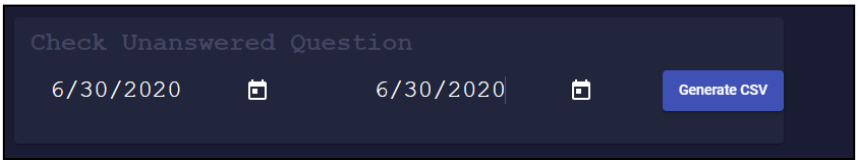
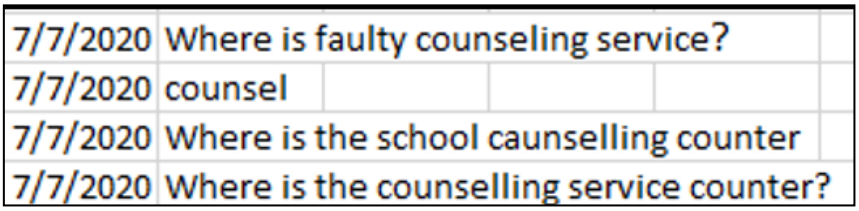


Figure 11. Unanswered Question Form Page.



7/7/2020	Where is faulty counseling service?
7/7/2020	counsel
7/7/2020	Where is the school caunselling counter
7/7/2020	Where is the counselling service counter?

Figure 12. Unanswered Question from user in comma-separated values file format.

CONCLUSION

In conclusion, the project has met its objectives where the chatbot was able to personally reply to queries made by the user in real time. Queries which were not recognized by the chatbot were able to be captured and stored in the database to be reviewed by the faculty administrator. Response from the chatbot was between 3 to 5 seconds; however, any messages with larger file attachments may require a longer reply time.

Future Work

In order to further improve our system, some of the following improvements could be made:-

a. Accepts queries made by the user in other languages other than English.
b. An analytical tool extension that has features that can analyse the most used keywords, most searched topics, incorrect bot replies, etc.
c. Development of a mobile application as an alternative to the web template implementation.
d. Extend the broadcast function of the chatbot where video and/or message recording can be sent by the chatbot to the users, for example video recording that is released by the chatbot based on predetermined time and date.

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Rabies Hotspot Detection Using Bipartite Network Modelling Approach

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ABSTRACT

Despite entering its fourth year, the rabies outbreak in the East Malaysian state of Sarawak has claimed another nine lives in 2020, culminating with a total of 31 laboratory-confirmed cases of human rabies as of 31st December 2020. One of the outbreak control challenges faced by the authorities within a previously rabies-free area, such as in the case of Sarawak, is the lack of information regarding possible starting sources, notably hotspot locations of the outbreak. Identification of potential high-risk areas for rabies infection is a *sine qua non* for effective disease interventions and control strategies. Motivated by this and in preparation for future similar incidents, this paper presented a preliminary study on rabies hotspot identification. The modelling approach adopted the bipartite network where the two disjoint sets of nodes are the Location node and Dog (Bite Cases) node. The formulation of the network followed closely the Bipartite Modeling Methodology Framework. Thorough model verification was done in an attempt to show that such problem domain can be modelled using the Bipartite Modeling approach.

Keywords: Bipartite Network Modeling Framework, BRC, Dog, Location, Rabies, Ranking

INTRODUCTION

An outbreak of rabies has killed 29 people to date and affected dozens of localities throughout the East Malaysian state of Sarawak. Various rabies control efforts have been carried out by the local government, which include canine rabies vaccination, human post-exposure prophylaxis and targeted removal of dogs through culling (Taib, Labadin, & Piau, 2019). Despite entering its fourth year, the disease has claimed another nine lives in 2020 alone and dog bite incidents remain relatively high (State Disaster Management Committee, 2020). As Sarawak was historically rabies-free, rabies surveillance and vaccination practice were not conducted prior to the initial outbreak in July 2017 (Navanithakumar *et al*., 2019). Hence, the government faced some difficulties to control the disease outbreak when it first started out which may be attributable to the lack of information regarding possible hotspots for rabies. Herein we focus on the identification of these possible starting sources or rather, hotspot locations of Sarawak rabies outbreak.

Over the past decades, mathematical modelling of dynamical systems has been a vital tool in analyzing the evolution of disease spread while also offering insights into the most efficient control strategies. According to Siettos and Russo (2013), current mathematical models of dynamical systems generally encompass four different approaches: (1) deterministic models, (2) stochastic models, (3) agent-based models and (4) network models. As such, previous rabies modelling studies mainly investigate the transmission dynamics of rabies using deterministic models (Asamoah, Oduro, Bonyah & Seidu, 2017; Huang, Ruan, Shu & Wu, 2019; Zhang, Jin, Sun, Sun & Ruan, 2012), stochastic models (Cao, Feng, Wen, Zu & Gao, 2020; Dürr & Ward, 2015; Hudson, Brookes, & Ward, 2017; Sparkes *et al.*, 2016), agent-based models (Brookes, Dürr, & Ward, 2019) and network models (Laager *et al*., 2018).

In the case of network epidemiology modelling, individuals or groups of individuals are represented as nodes while the links or rather connections between nodes are known as edges. Disease will transmit from one node to another along the edges. Should the transmission probability along the edge reach a high value, an epidemic is predicted to happen (Craft & Caillaud, 2011). One of the advantages of using this approach is that it could display complex relations of a disease accurately according to real world situations. Another benefit is that this type of modelling generally contains lists of parameters (attributes) associated to nodes and edges. This will allow clear representation of the variations in the between-host or between-edge patterns and relationships. Due to its ability to depict disease transmission dynamics via the nodes and edges while producing accurate results with minimum amount of data supplement, the network-based approach is commonly implemented to model various infectious diseases such as hepatitis B (Chandler, 2017), malaria (Pipatsart *et al*., 2018), HIV (Zhong, Zhang, & Li, 2018) and dengue (Kok & Labadin, 2019).

In spite of a perusal of the works above-mentioned, modelling studies on rabies in the context of Sarawak remain scarce. For instance, Taib *et al*. (2019) developed a deterministic, compartmental model to study the spread of rabies in Sarawak and evaluated the effectiveness of different rabies control strategies (Taib *et al*., 2019). The work however did not focus on detecting rabies hotspots in Sarawak. In this paper, we attempt to identify potential high-risk areas of rabies infection in Sarawak by utilizing the Bipartite Network–Based Modeling Framework (BNB-MF) approach that follows heavily from Liew (2016) and Kok (2018) studies. Additionally, identification of rabies hotspots using bipartite network modelling approach, to the best of our knowledge, has yet to be explored.

MATERIALS & METHODS

This research applies a modified version of Bipartite-Network –Based Modeling (BNM) approach originally used to model habitat suitability of Irrawaddy dolphin (Liew, 2016) and malaria hotspots (Kok, 2018). The two types of nodes considered in our bipartite contact network model are location node and dog node. Liew's study (Liew, 2016) is chosen as our main reference due to the animal attributes involved. To be more specific, dogs have higher similarity to dolphins (Liew, 2016) (in terms of mobility) as compared to mosquitoes (Kok, 2018). The modified BNM approach used in this study is known as BNB-MF which involves three stages as follows:

i. formulation of bipartite graph
ii. development of bipartite rabies contact (BRC) network model
iii. verification of the bipartite rabies contact (BRC) model

Data collection

Information on dog bite cases, location address of exposure, and human rabies positive cases between 1st April 2017 to 31st July 2017 were extracted via online sources such as the official Sarawak Disaster Information website and online news. Records stored on the Sarawak Disaster Information website are actively being updated and maintained daily. This will ensure accuracy of data gathered for this study. A total amount of 17 epidemiological weeks of dog bite cases was collected during the study period with only six cases of dog bites clinically confirmed to be rabies-positive.

Data pre-processing

As location addresses collected were raw data without GPS coordinates provided, the location data were digitized prior to parameters quantification. The distance between different location nodes was also calculated to avoid possible data redundancy appearing in our BRC network. Based on Figure 1, the first step is to manually convert each new location address into GPS coordinates (longitude and latitude), by utilising Google Maps (https://www.google.com/maps). For instance, one of the recorded location addresses read as "Kampung Krait, Jalan Batang Kedup, 94700 Serian, Sarawak". By using the Google Maps website, the value of longitude and latitude of a specific location can be retrieved. As for the location mentioned above, the longitude and latitude are discovered to be 110.660221 and

1.049387, respectively. The second step was to declare each different location identification and record them into the database. The output obtained from the first step was further processed by using a location declaration generator. The generator code was created using R programming and the output created is a distance matrix which records the distance between different location nodes.

Implementation of ranking algorithm

Ranking of the location nodes will be required in order to determine the possible rabies hotspots in Sarawak. As this study only uses two types of nodes (bipartite), Hypertext-Indexed Topic Search (HITS) search algorithm is applied towards the BRC network. In addition, HITS algorithm is justified over Page-Rank search algorithm due to its capability to link both the hub and authority matrices. In this step, the Rabies Contact Strength (RCS) values, which correspond to the link weight values in the BRC network, are used as the input for the HITS algorithm. The output from this algorithm is a pair of principal eigenvectors, which is taken as the location ranking of the BRC network. We labelled this location ranking as the Rabies Hotspot Ranking (RHR), which can also serve as a measurement of dog density.

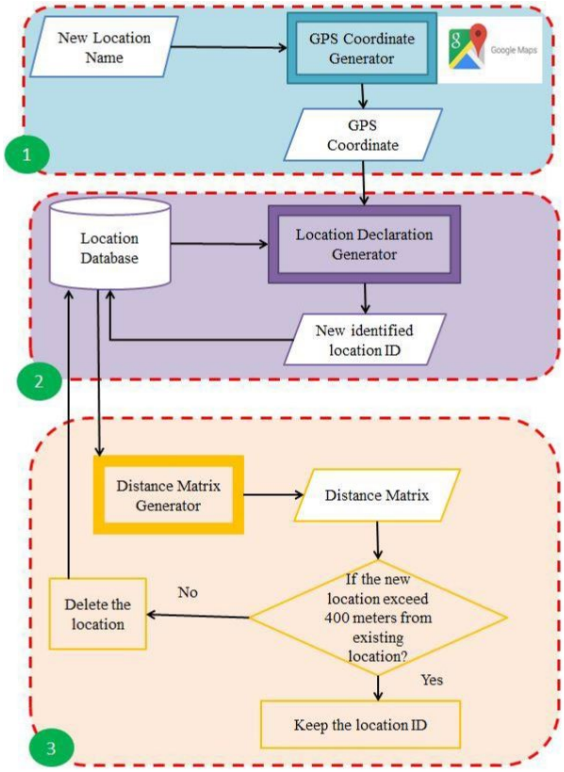

Figure 1. Steps of pre-processing location node data.

Model verification

Two methods of model verification are applied: namely (1) benchmark verification and (2) analytical verification. Benchmark verification is conducted using UCINET 6 in order to compare the results obtained through the BRC network model with that of another benchmark system (Kok & Labadin, 2019). The root-mean-square-error (RMSE) is calculated by comparing the ranking values from the selected benchmark system and that from the BRC network model. When the RMSE does not exceed 0.05, the BRC network model is verified. As location is the primary concern here, UNICET will focus on generating the benchmark ranking values of the location nodes (RHR_B). The location ranking of the BRC network ($RHR_{BRC\ network}$) and the RHR_B are normalized in the range 0 to 1 before proceeding with the calculation of RMSE. The RMSE values for the location nodes ($RMSE_{Loc}$) (between $RHR_{BRC\ network}$ and RHR_B are computed using the formula below, where N_{Loc} = number of location nodes.

$$RMSE_{Loc} = \sqrt{\frac{1}{N_{Loc}}\left[\sum_{i=1}^{N_{Loc}} (RHB_{B_i} - RHB_{BRC\ network_i})^2\right]}.$$

In analytical verification, the degree of closeness between ranking values for each location and dog nodes will be measured. Spearman's Rank Correlation Coefficient (SRCC) is used to verify a network model with small data size which is appropriate in this model. SRCC values usually range from -1 to +1, whereby +1 indicates a very strong positive association between the ranks, whereas -1 signifies strong negative association of the ranks and 0 represents non-existent association between the ranks. Table 1 illustrates a range of values used to interpret SRCC. In this study,

it is hypothesized that there exists a high correlation with a coefficient of more than 0.8 between the RHR of each location node and the hub matrix of edges linked to it. According to Liew (2016), a minimum of 0.7 SRCC between RHR and hub matrix of the location nodes should be acquired to verify the models created in this study.

Parameter significance analysis

Parameter significance analysis is conducted to identify the critical parameters and to determine the relative importance of each individual parameter considered in the BRC network. The analysis involved two types; (1) "leave-one-out" analysis for each individual parameter and (2) "multiple-out" analysis for a combination of more than one parameter. For "leave-one-out" analysis, one parameter from the BRC network model is chosen to be excluded at a time, during computation of RHR and other subsequent processes of BNB-MF. As for "leave-multiple-out" analysis, two or more parameters will be excluded from the BRC model and its subsequent processes. This analysis also requires the calculation of SRCC value.

Table 1. SRCC Indicators

SRCC coefficient (±)	Indicator
±(0.00-0.19)	Very Weak
±(0.20-0.39)	Weak
±(0.40-0.59)	Moderate
±(0.60-0.79)	Strong
±(0.80-1.00)	Very Strong

Formulation of bipartite network model

In order to develop our BRC network model, we first need to define the bipartite graph. In this study, we identified two crucial components in rabies disease transmission – location and host properties. The traditional epidemiological triangle has been modified (Figure 2) to serve as the foundation of our bipartite graph structure. The host component (H) represents an animal or human potentially prone to the rabies disease. Next, the environment component (E) specifies exterior causes that can impact the probability of disease infection or transmission. Since this research is dedicated to locating the hotspots of rabies disease, the location component (L) is essential and cannot be removed from the modified disease triangle. Hence, E is derived into a L. It is also assumed that only stray dogs transmit rabies virus to humans and that all strays are susceptible to rabies.

The bipartite graph structure is made up of a set of location nodes (X), a set of dog nodes (D) and a set of relation edges denoted by R. The edge represents a link created when a dog in set D visits a location in set L. Hence, we can define the bipartite graph to be $G = (D, X, R)$ which consists of two distinct node sets D and X, whereas R represents the edge. Therefore, the bipartite graph G presents the basic building block (Figure 3) for the formulation of BRC network.

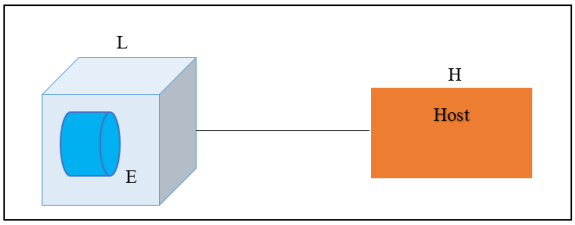

Figure 2. Basic building block of bipartite graph.

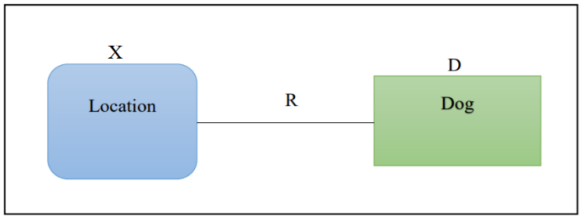

Figure 3. Basic building block of BRC network.

According to graph theory, a bipartite network is a weighted bipartite graph in which the affinity between two nodes is measured based on their link weights (Rayfield, Fortin, & Fall, 2011). To formulate an example of our bipartite rabies contact (BRC) network as in Figure 4, we take the previously defined bipartite graph $G = (D, X, R)$ whereby D and X represent sets of dog nodes and location nodes, respectively, whereas R represents the link edges. Then, let us also assume that set D , the set of dogs (utilizing dog bite cases as proxy) includes these four elements, D = { $D1$, $D2$, $D3$, $D4$}; whereas set X, the set of locations has five elements by which X = {X1, X2, X3, X4, X5};

whereas set R, the set of links in between elements X and D , consists of eight elements R = {$r1$, $r2$, $r3$, $r4$, $r5$, $r6$, $r7$, $r8$}. As a summary, the network can be expressed as {D1X2, D1X3, D2X3, D3X1, D3X4, D4X3, D4X4, D4X5}.

To build a network, the computation of link weights corresponding to each link edge is required. We labelled these link weights as the RCS values. The RCS value is defined as the summation of parameter values for both the location and dog nodes. That is;

$$RCS_{i:j} = \sum \text{location node parameters}_i + \sum \text{dog node parameters}_j.$$

Therefore, suitable attributes or parameters are required to accurately quantify these contact strength values (or link weights) in between the nodes. As seen in Table 2, we have identified a total of five parameters for the location nodes as well as dog nodes set.

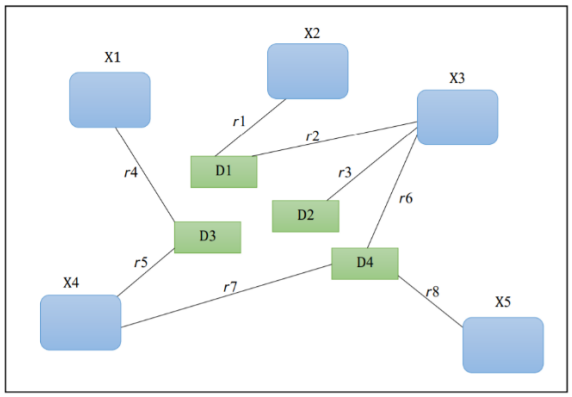

Figure 4. An example of bipartite rabies contact (BRC) network

Table 2. Parameters for location node and dog node.

Parameter	Definition
Location node	
P_d	Dog population density
R_0	Reproduction number
F_l	Number of times a location is visited by a dog
Dog node	
β_c	Dog biting rate
F_d	Number of times a dog visited a location

For the location node parameters, the dog population density parameter (P_d) for a given location node can be written as:

$$P_d = \frac{\text{number of dogs in a given area, } N_d}{\text{area of the location node (km}^2\text{)}}$$

Since we assumed that stray dogs can travel up to 10 km^2, the area of each location node is set to be 10 km^2 therefore we have:

$$P_d = \frac{N_d}{10},$$

Reproduction number (R_0) among the stray dog population measures how factors such as rate of stray dog control and contact rate of rabid dogs among the dog population affects the birth rate of puppies. To align with the assumptions in our study, R_0 from (Asamoah *et al*., 2017) is modified to be:

$$R_0 = \frac{\gamma}{\gamma+\rho},$$

where γ gives the dog rabies incubation period and ρ represents dog vaccination rate. The parameter F_l is created to recognize the effect of dogs visiting a location and is defined as the frequency of a specific location node being visited by any dog node of the BRC network. Also, F_l can be written in terms of a link matrix of the BRC network, $M(X_iD_j)$, where

$$F_{l_i} = \sum_{j=1}^{m} \left[M(X_iD_j) \times F_{d_{i:j}} \right],$$

and

$$M(X_iD_j) = \begin{cases} 1, & \text{if } D_j \text{ is visited by } X_i \\ 0, & \text{if } D_j \text{ is not visited by } X_i \text{'} \end{cases}$$

such that $X_i =$ location node of BRC network and $D_j =$ dog node of BRC network, whereas $i \in (1, 2, \dots, n)$ and $j \in (1, 2, \dots, n)$.
For the dog node parameters, we define the dog biting rate to be:

$$\beta_c = \beta S_H I_D,$$

where $\beta =$ dog-to-human biting rate, $S_H =$ susceptible humans, and $I_D =$ infected dogs. The dog-to-human biting rate can be estimated from:

$$\beta = \frac{\text{no. of confirmed human cases}}{\text{total no. of human in all location nodes}}.$$

The parameter F_d measures the number of times that a dog visited a location and can be represented by:

$$F_{d_{i:j}} = \begin{cases} n, & \text{if } D_j \text{ is visited by } X_i \text{ where } n \in Z^+ \\ 0, & \text{if } D_j \text{ is not visited by } X_i \text{'} \end{cases}$$

Hence, after defining all parameters, the RCS values can be expressed as:

$$RCS_{i:j} = \sum \text{location node parameters}_i + \sum \text{dog node parameters}_j,$$

$$RCS_{i:j} = \sum \left[P_{d_j} + R_{0_j} + F_{l_j} \right] + \sum \beta_{c_j} + F_{d_{j:i}}.$$

The higher the RCS values, the stronger the strength between the two nodes; hence signifying the existence of more attachment between the location node and the specified dog node.

RESULTS

Between 1st April 2017 to 31st July 2017, we have determined 11 location nodes and 10 dog nodes. As shown in Figure 5, the RCS values are calculated based on the quantified concomitant parameters. Next, by using the RCS values as input, results of the RHR are computed via the HITS algorithm. The algorithm ranked the location nodes based on the RHR values which are tabulated in Table 3. In terms of node degree, X3, X4, and X6 had the highest degree of 2 as two dog nodes are attached to X3, X4, and X6 each (Figure 5). Higher-degree nodes are generally inclined to have stronger edges (Pavlopoulos *et al.*, 2018). Based on Table 3 however, the X4 location node has the highest ranking value, hence it is worth noting that the node degree would not indicate the ranking of the location node directly. Therefore, X4 can be considered as a hotspot of rabies based on the BRC network model. This also indicates that X4 could be a possible location with the highest dog density.

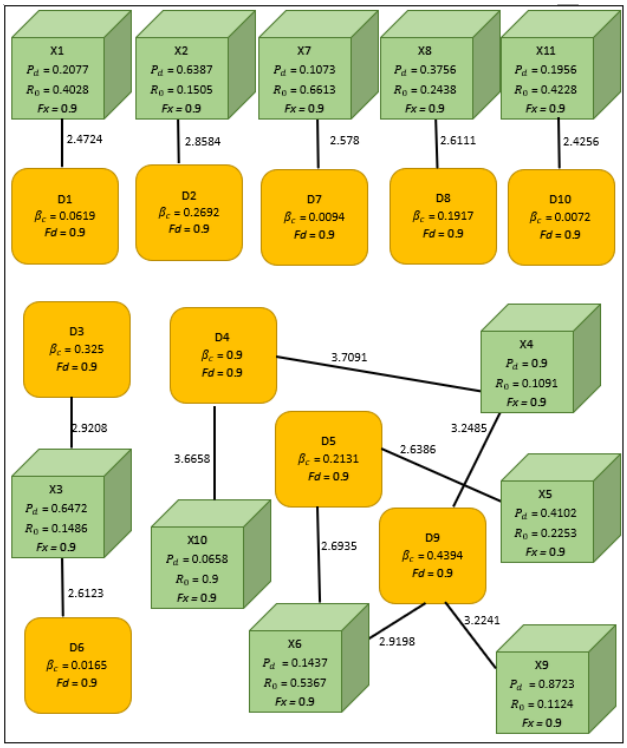

Figure 5. Bipartite Rabies Contact (BRC) network

Benchmark verification was performed by comparing the results obtained with the benchmark system produced by UCINET 6. The RMSE value of 0.02753 (corrected to four significant figures) which is less than the threshold value of 0.05 is obtained from the ranking of location nodes. This verifies our BRC network model. Additionally, analytical verification is performed and findings showed that RHR and hub matrix of the location nodes are correlated as proven by the SRCC value of 0.9818 obtained. The value is very close to 1, putting it at a position far above the threshold value of 0.7. This finding supports the claim made in benchmark verification, which further approves the BRC network model created in this study.

Table 3. Location ranking of BRC network model.

Ranking	Ranked Location	RHR
1	X4	1.000000e+00
2	X6	5.833356e-01
3	X9	5.096758e-01
4	X10	4.807880e-01
5	X5	1.192827e-01
6	X3	1.426934e-09
7	X2	4.723061e-15
8	X8	1.265446e-16
9	X7	7.596613e-17
10	X1	1.425781e-17
11	X11	6.638513e-18

The critical parameters are determined by using two types of analysis which are "leave-one-out" and "multiple-out". The SRCC values are recalculated after one or more parameters excluded from the network, then a comparison between the computed values with the original ranking is done. The SRCC value showed a sudden drop below the threshold value of 0.7 when parameters P_d, R_0 and βc are excluded. This suggests that P_d, R_0 and βc may be significant parameters. The decrease in SRCC value is relatively more when R_0, F_l and F_d are excluded from calculation. It is observed that SRCC values for both location and dog node decreased to 0.6970 and 0.6768 respectively. This indicates that F_l and F_d are essential parameters, due to F_l and $F_d$being the two main parameters that links the location and dog node. Thus, F_l and F_d must be kept in the model. Moreover, the exclusion of both P_d

and R_0 suggests a low correlation to the original location and dog node ranking. When P_d and R_0 are excluded from the calculation, the SRCC value still maintains a value above the threshold value. This possibly indicates that these two parameters are not significant parameters.

DISCUSSIONS & CONCLUSION

This study sought to construct a network model that detects hotspot areas of a rabies epidemic outbreak. To achieve this objective, a network model is proposed to describe the contact between the dog and the location that the dog visited. A modified epidemiological triangle is initially formulated in the first stage of BNB-MF in order to develop the bipartite graph structure. Two main components are identified to be the crucial components in rabies disease transmission – location and host properties

In stage 2 of BNB-MF, a data pre-processing algorithm was developed and deployed to measure GPS coordinate of locations. The data pre-processing algorithm is also used to generate a distance matrix, which can be used to calculate distance between location nodes. Then, parameters for location and dog nodes are quantified, as well as the RCS using a summation rule. Hence, the BRC network consisting of 11 location nodes and 10 dog nodes is formed. Next, to rank each location and dog nodes, an adapted HITS algorithm is applied towards the BRC network to generate RHR value. Based on the results of our BRC network, it can be concluded that X4 is possibly the hotspot for rabies disease transmission. For stage 3 of BNB-MF, UCINET 6 is utilized to verify the BRC model formulated. A parameter significance analysis is conducted to measure the relative importance of each parameter quantified. Results of the analysis support the existence of a link between the parameters of the BRC network model.

Furthermore, due to the fact that this study is the first to ever utilize the bipartite network modelling method in rabies hotspot detection, no direct reference or immediate comparison of results can be done. This work only considers verification and analysis of results to validate the reliability of the model formulated. Also, this study only considers the stray dog population despite the fact that several human rabies cases in Sarawak have reported domestic dogs as the biting animal. As such, F_l and F_d are significant parameters in this study albeit difficult to obtain in real world. One of the possible methods to retrieve the data for parameter F_d is by conducting interviews for the residents in the location. If the location is at micro-level such as a shop lot or a small community, then it is fairly easy to determine the parameter F_d of a dog to the location. Consequently, the parameter F_l can be calculated based on the quantification equation of F_l.

Besides, some other potential parameters that could potentially affect the transmission dynamics of rabies are yet to be tested, not to mention testing these parameters will require an additional set of data specifically recording attributes such as the environmental properties of the research areas (e.g., temperature, rainfall of a location node) or rabies disease state transition period. Hence, a potential future work might be to explore several other parameters and further understand the association link between all parameters involved in rabies hotspots detection study. Other than that, studies for locations other than Sarawak should be conducted so as to test and verify this current modelling approach.

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The Relationship of Stress and Sleep Quality amongst Cognitive Science Students

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ABSTRACT

Stress is a common problem in modern life. Most Malaysian students suffer from high stress levels and poor sleep quality without realising their harmfulness to health and well-being. The major focus of the paper is to examine the relationship between stress and sleep quality among Cognitive Science undergraduate students. This paper also investigates if demographic attributes (gender differences and year of study) affect stress level and sleep quality. The participants of this study comprised 90 Cognitive Science undergraduate students studying at the Universiti Malaysia Sarawak. Data was collected by using the Perceived Stress Questionnaire (Perceived Stress Scale) and Sleep Quality Questionnaire (Pittsburgh Sleep Quality Index). The results of the study showed that there was a weak relationship between stress and sleep quality. Those in the poor sleep category reported higher levels of perceived stress. Moreover, the findings showed that female students had higher stress levels than male students. First year students appeared to experience poorer sleep quality compared to final year students. The study also found no interaction effects between gender and year of study on sleep quality and stress. Further research could be conducted with a bigger population size and in other study programs. Future research could also assess non-demographic factors which might influence stress and sleep quality.

Keywords: Gender, perceived stress levels, sleep quality, year of study

INTRODUCTION

Stress is a common problem in modern life. It affects us in many ways and appears inevitable. Stress is not only a problem that is prevalent amongst working adults but students are also especially vulnerable. University life for many students would mean a period that entail new challenges and adjustments which may lead to increased stress for those who are less able to cope. Most Malaysian students suffer from excessive stress (Hj Ramli, Alavi, Mehrinezhad, & Ahmadi, 2018). Stress refers to the "wear and tear" experienced by the body while it adjusts to pressure or threatening circumstances (Behere, Behere, & Yadav, 2011) which when serious could lead to detrimental outcomes. News about students ending their lives due to academic stress are not unfamiliar in today's society (Yeoh, 2013).

Sleep is one of man's basic needs, important for health and general well-being. Sleep can help revitalise and rejuvenate the body. Lack of sleep will bring about a series of major health issues such as diabetes and cardiovascular disease. However, there appears to be a common misconception that sleep could somehow be sacrificed for work. University students are easy victims to this misguided belief. In trying to juggle many things at once (academic workload, social life, internship, etc), sleep usually becomes an easy trade-off. The University of Georgia reported that on average most university students did not get enough sleep (The Setonian Editorial Board, 2018). If severe, this could lead to mental problems such as anxiety, metabolic disorders such as obesity and cardiovascular disorders such as hypertension and sudden cardiac arrest (Bernama, 2016; Tan, 2018). Accumulated "sleep debt" will occur if university students spend their night with only one to two hours of sleep (Omar *et al.*, 2012), which then leads to excessive daytime sleepiness. A study of sleep quality among university students reported that 67% of students experienced sleep disturbances and poor quality of sleep (Omar *et al.*, 2012). Good sleep quality is important and could enhance cognitive functioning such as attention, decision making, learning and memory (Seun-Fadipe & Mosaku, 2017).

Demographic attributes and stress

Anuradha, Dutta, Raja, Sivaprakasam, and Patil (2017) discovered that female students had higher stress levels. This could be due to higher academic stress faced at the higher education level and a greater likelihood of facing challenges in seeking job opportunities upon graduation (Shah, Hasan, Malik, & Sreeramareddy, 2010). This was supported by Sani *et al.* (2012), which found the highest prevalence of stress amongst females in their second year of study. This increased level of stress indicated a decrease in psychological health amongst students which may diminish learning and performance. However, a study found that interaction between gender and year of study with stress was not significant (Ramteke & Ansari, 2016). Hence, more work needs to be carried out to further clarify the relationship between gender and stress (Anbumalar, Agines, Jaswanti, Priya, & Reniangelin, 2017).

Demographic attributes and sleep quality

Seun-Fadipe and Mosaku (2017) argued that gender and year of study contributed to poor sleep quality. They also reported that female students had better sleep quality compared to their male counterparts. Seun-Fadipe and Mosaku (2017) also found that sleep quality was worst amongst students in their final year of study. This contradicted Correa, Oliveira, Pizzamiglio, Ortolan, & Weber, (2017), which noted the highest amount of sleep problems during students' early study years. Meanwhile, Tsai and Li (2004) showed that female students went to bed earlier, woke up earlier and had longer sleep latency, more awakenings, and poorer sleep quality than male students. Yet Omar *et al.* (2012) showed no gender difference in terms of sleep quality.

Objectives

This study attempts to identify the relationship between stress and sleep quality among Cognitive Science undergraduate students based on gender and year of study at the Universiti Malaysia Sarawak. In particular, the study objectives were:

1. To study the relationship between stress and sleep quality among students;
2. To study if demographic attributes (gender and year of study) affect sleep quality;
3. To identify if demographic attributes (gender and year of study) affect stress level.

MATERIALS & METHODS

The present study is a correlational study conducted at the Universiti Malaysia Sarawak. The sample consisted of 90 Cognitive Science undergraduate students. These students were randomly selected from the pool of Cognitive Science students at the Faculty of Cognitive Sciences and Human Development. A consent form was signed by students before answering the questionnaire.

Perceived Stress Scale (PSS)

The 10-item version was used in this study. Each item was scored using a 5-point rating scale from 0 (never) to 4 (very frequent). Higher scores corresponded to higher perceived stress. The perceived stress level was analysed by quartiles of perceived stress as done in previous studies. The first quartile represented the students not/less stressed, with a PSS score of 0 to 13; the second quartile had a PSS score of 14 to 26, and the third quartile had a PSS score of 27 to 40. From a past study, Cohen, Kamarck and Mermelstein (1983) reported that the convergent validity of PSS-10 instrument was moderate with a reliability rating of 0.78.

The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is a self-rated instrument that measures sleep quality over a month period. The index comprised of 19 items, combined to form 7-component scores. The components include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Scoring is based on 0-3 Likert scale which is 0 (no difficulty) to 3 (severe difficulty). The 7-component scores were then added to yield a global score which ranged from 0 to 21. The overall PSQI global score correlation coefficient for test–retest reliability was 0.87. The PSQI reported high validity,

internal consistency and a reliability coefficient with Cronbach's alpha of 0.83 for its seven components (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989).

Data analysis

Data was collected and analysed using *The Statistical Package for the Social Science (SPSS) version 24*. Descriptive statistics and inferential statistics were performed in this study. A Pearson's Product-Moment Correlation ('r') Test was performed to examine the relationship between stress and sleep quality amongst students. A Two-way ANOVA analysis was also done to investigate if demographic attributes (gender and year of study) affected sleep quality and stress level.

RESULTS

A total of 90 respondents were randomly chosen for this research. There were 29 male respondents (32.3%), and 61 female respondents (67.8%). The respondents comprised of the first, second and third year students. Each category had 30 respondents (33.33%) respectively. Meanwhile, the breakdown of samples in terms of CGPA is summarised in Table 1.

Table 2 presents the stress levels and sleep quality of respondents. From the analysis, most respondents had high (25.6%, n = 23) or moderate stress levels (71.1%, *n* = 64) whilst only a minority of them had a low level of stress (4.4%). As for global PSQI score (sleep quality), a majority of students (*n* = 67) had experienced poor sleep quality (74.4%).

A Pearson correlation test was conducted to determine if there was a relationship between stress with sleep quality amongst students. The result reported stress scores of M = 2.20, SD = 0.52 while sleep quality registered M = 0.74, SD = 0.439. Referring to Table 3, the result of the correlation analysis was r = 0.286, p = 0.006. The null hypothesis was rejected. Albeit weakly related, the result nevertheless suggested that higher stress level would result in poor sleep quality.

A two-way ANOVA was conducted to examine the influence of two independent variables (gender, year of study) on the sleep quality of students. Gender was measured in two dimensions (male, female) whilst year of study consisted of three levels (first year students, second year students, third year students). Only the year of study factor was found to be statistically significant at the .05 significance level. The main effect for gender yielded F (1, 84) = 2.911, p > 0.05, indicating that the effect for gender was not significant (male M = 0.66, SD = 0.484; female M = 0.79, SD = 0.413). The main effect for year of study yielded F (2, 84) = 2.911, p < 0.05, indicating a significant difference amongst first year students (M = 0.87, SD = 0.346), second year students (M = 0.60, SD = 0.498) and third year students (M = 0.77, SD = 0.430). The interaction effect (gender*year of study) was not significant, with F (2, 84) = 2.090, p = 0.130, p > 0.05. These results are shown in Table 4 and Table 5.

Table 1. Summary of Demographic Characteristics

Item	n	%
Gender		
Male	29	32.2
Female	61	67.8
Year of Study		
Year 1	30	33.3
Year 2	30	33.3
Year 3	30	33.3
Cumulative Grade Points Average		
Below 2.0	1	1.11
2.00-2.49	4	4.44
2.50-2.99	23	25.56
3.00-3.49	37	41.11
3.50-4.00	25	27.78

Table 2. Perceived Stress Scale and Global PSQI Score (Sleep Quality)

Item	n	%
Perceived Stress Scale	4	4.4
Low stress	64	71.1
Moderate stress	22	24.4
High Perceived stress		
Global PSQI Score (Sleep Quality)		
Good sleep quality	23	25.6
Poor sleep quality	67	74.4

Table 3. Correlation between Stress with Sleep Quality

		Stress	***Sleep quality***
Stress	Pearson Correlation	1	.286**
	Sig. (2-tailed)		.006
	N	90	90
Sleep quality	Pearson Correlation	.286**	1
	Sig. (2-tailed)	.006	
	N	90	90

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4. Mean and SD for Sleep Quality Scores.

Gender	**Year of Study**	**Mean**	**Std. Deviation**	**N**
Male	1st year	.92	.289	12
	2nd year	.33	.500	9
	3rd year	.63	.518	8
	Total	.66	.484	29
Female	1st year	.83	.383	18
	2nd year	.71	.463	21
	3rd year	.82	.395	22
	Total	.79	.413	61
Total	1st year	.87	.346	30
	2nd year	.60	.498	30
	3rd year	.77	.430	30
	Total	.74	.439	90

Table 5. Two-Way ANOVA analysis on the influence of gender and year study on sleep quality

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	2.272[a]	5	.454	2.570	.033	.133
Intercept	38.422	1	38.422	217.336	.000	.721
Gender	.515	1	.515	2.911	.092	.033
Year of Study	.659	2	.830	4.693	.012	.101
Gender*Year of Study	.739	2	.369	.090	.130	
Error	14.850	84	.177			
Total	67.000	90				
Corrected Total	17.122	89				

a. R Squared = .133 (Adjusted R Squared = .081)

A two-way ANOVA was also conducted on the influence of two independent variables (gender, year of study) on stress scores of students. Gender was measured in two dimensions (male, female) and year of study consisted of three levels (first year, second year, and third year students). Only the gender factor was statistically significant at the .05 significance level. The main effect for gender yielded $F(1, 84) = 6.436$, $p < 0.05$, indicating a significant difference amongst male students ($M = 2.00$, $SD = 0.378$), and female students ($M = 2.30$, $SD = 0.527$). The main effect for year of study yielded $F(2, 84) = 2.686$, $p > 0.05$, indicating that the effect for year of study was not significant; first year students ($M = 2.17$, $SD = 0.461$), second year students ($M = 2.07$, $SD = 0.450$) and third year students ($M = 2.37$, $SD = 0.556$). The interaction effect (gender*year of study) was not significant, with $F(2, 84) = 0.490$, $p = 0.614$, $p > 0.05$. These results are shown in Table 6 and Table 7.

Table 6. Mean and SD for Stress Scores

Gender	Year of Study	Mean	Std. Deviation	N
Male	1st year	1.92	.289	12
	2nd year	1.89	.333	9
	3rd year	2.25	.463	8
	Total	2.00	.378	29
Female	1st year	2.33	.485	18
	2nd year	2.14	.478	21
	3rd year	2.41	.590	22
	Total	2.30	.527	61
Total	1st year	2.17	.461	30
	2nd year	2.07	.450	30
	3rd year	2.37	.556	30
	Total	2.20	.502	90

Table 7. Two-Way ANOVA analysis on the influence of gender and year study on stress scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.205[a]	5	.641	2.805	.022	.143
Intercept	357.775	1	357.775	1565.662	.000	.949
Gender	1.471	1	1.471	6.436	.013	.071
Year of Study	1.228	2	.614	2.686	.074	.060
Gender*Year of Study	.224	2	.112	.490	.614	.012
Error	19.195	84	.229			
Total	458.000	90				
Corrected Total	22.400	89				

a. R Squared = .143 (Adjusted R Squared = .092)

DISCUSSION

The results of the Pearson's correlation test showed a weak relationship between stress and sleep quality. Participants reported increased levels of stress (total PSS score) in the poor sleep category (PSQI global score >5). Students attempted to deal with challenging course demands by reducing their sleep time, resulting in poor sleep quality. This was supported by a study conducted by Lund, Reider, Whiting, and Prichard (2010). The study

suggested that poor sleep quality amongst college students correlated with higher stress levels. Meanwhile, in another related study, Theadom and Cropley (2008) pointed out that chronic stress may result in sleep disturbances and daytime dysfunction.

Meanwhile, according to Astill, Verhoeven, Vijzelaar, and Van Someren (2013), stress level amongst students was rising, contributing to reduced sleep quality especially during the exam weeks. Students appeared to readily give up sleeping time for more studying time. The results of the present study also complement previous findings in that the close interrelationship between stress and sleep demonstrated directionality issues, in which students with poor sleep quality was either secondary to or predictive of stress levels (Ahrberg, Dresler, Niedermaier, Steiger, & Genzel, 2012).

Demographic attributes and sleep quality

The present study finds no significant main effect of gender on sleep quality. Omar *et al.* (2012) obtained similar results. However, as the main effect of year of study was statistically significant, this clearly shows that first year students reported worse sleep quality compared to advanced level students, in line with Correa *et al.* (2017). One of the possible reasons was first year students needed to go through a transitional period of change. Students who first entered university may find themselves having to adapt to living away from home and cope with life management and university work. Hence, they would likely cope better once settled in, usually in the subsequent years of university study. For the interaction effect (gender*year of study), no interaction was found between them.

Demographic attributes and stress

The present study reported a statistically significant difference in the main effect of gender on stress. Female students appeared to report higher stress than male students owing to the difference in male and female response to stress. According to Stahle (2015), male showed a “fight or flight” mentality when stressed, and they appeared to cope with stress better. One plausible reason why females tended to suffer more from stress could be attributed to their hormonal system which make them emotionally sensitive. Generally, increased level of stress entailed a decline in psychological health and diminished learning (Anuradha *et al.*, 2017). This result was consistent with the previous study where female students reported higher levels of stress than their male counterparts (Shah *et al.*, 2010). Meanwhile, the main effect of year of study on stress showed no significant difference. This appeared to contradict the previous study, e.g. Anuradha *et al.* (2017) which demonstrated that final year students succumb to stress more easily than the first year students. On the other hand, Ramteke and Ansari (2016) showed that first year students suffered more from stress compared to students from a higher level of studies. As for the interaction effect, gender*year of study, the finding did not find evidence of interaction between these two variables. This finding was supported by Ramteke and Ansari (2016) where it was shown that interaction between gender and education level was not significant.

CONCLUSIONS

The study found a significant relationship between stress and sleep quality among Cognitive Science undergraduate students. However, no interaction effect was found between gender and year of study on sleep quality as well as gender and year of study on stress. Due to the limited scope of the study, future research ought to be conducted with a more sizeable sample and amongst different academic programmes.

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Visualisation System of COVID-19 Data in Malaysia

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ABSTRACT

Pandemics are highly unlikely events, therefore, we need a system to understand the statistics about the pandamic. Machine learning algorithms can analyse the data and then we can plan for handling the pandamic. To date, many people are suffering because of the lack of reliable information system. The problem is that there is no integrated system to use the data and plan for pandemic management to minimise social panic. This study aims to provide a system, using COVID-19 data as a sample to visualise and analyse cases, deaths, discharged ICU cases updates in Malaysia as a whole state wise of COVID-19 daily statistics. The results provide visualisation and case comparison among states in Malaysia to easily and quickly understand the situation. This will help and assist the management in decision-making.

Keywords: COVID-19, Decision support system, Disaster management, Panic, Pandemic

INTRODUCTION

The Coronavirus outbreak which began in Wuhan, China, in December, has expanded to every corner of the globe. Millions of people around the world have been sickened and died. With the pandemic affecting worldwide, it is crucial to look at the numbers to counter the outbreak. World Health Organization states that Coronavirus (COVID-19) is contagious caused by coronavirus (World Health Organization, 2020). This viral disease is caused by a recently discovered coronavirus mutation; SARS-CoV-2; a disease that causes respiratory infections in humans. This virus was brought to our attention through cases reported from Wuhan, China in December 2019. The earliest case of COVID-19 in Malaysia was reported on 24 January 2020.

COVID-19 virus is spread by droplets in a short distance and settles on surfaces when an infected person coughs or sneezes without covering their mouth and nose (Ministry of Health, 2021). There are effective ways of avoiding catching the virus, such as washing your hands regularly with soap and water, using alcohol-based hand sanitiser, avoid touching your face and eyes, maintaining a social distance of six feet apart, wearing two-ply face masks and staying up-to-date with COVID-19 virus news.

Alternative infection prevention and control measures can be applied in the healthcare environment such as wearing personal protective equipment to help prevent the spread of infectious diseases. People must meet proper standards of healthcare, the equipment must be worn correctly in the appropriate context (Ministry of Health, 2021). A study by MacIntyre and Hasanain (2020), wearing a mask may protect people from becoming infected and prevent transmission of infection from infected people because a surgical mask can filter three micrometres droplets. Hence, wearing a mask is important because new research on face coverings shows that the risk of infection to the wearer is decreased by 65 percent (Chu *et al*., 2020). Besides, during this COVID-19 crisis, it is necessary to curb this pandemic.

The need to build up a system to analyse and visualise the COVID-19 crisis as a step to counter the pandemic is crucial for the nation. The government can take further action and deliberate on timely planning to control the pandemic by implementing a plan for targeted high-risk states, high-risk individuals and various health

backgrounds. By using the programming tool, python, via an open-source web application Jupyter Notebook, we aim to visualise and analyse the cases, deaths, discharged cases, and current ICU status within a particular time in Malaysia or the specifications of each state with the COVID-19 outbreak daily statistics. Besides, the system also focuses on the total number cases in each state and visualises it at a specific time. Finally, the system also seeks to compare cases between states in Malaysia. With the following specific tasks, the system will target to complete each aspect to get the best results from the system.

The next section relates to studies that provide literature reviews in the field. Materials and methods explain the methodology of how the system was designed and developed. The last section is about the results and conclusion.

Related Studies

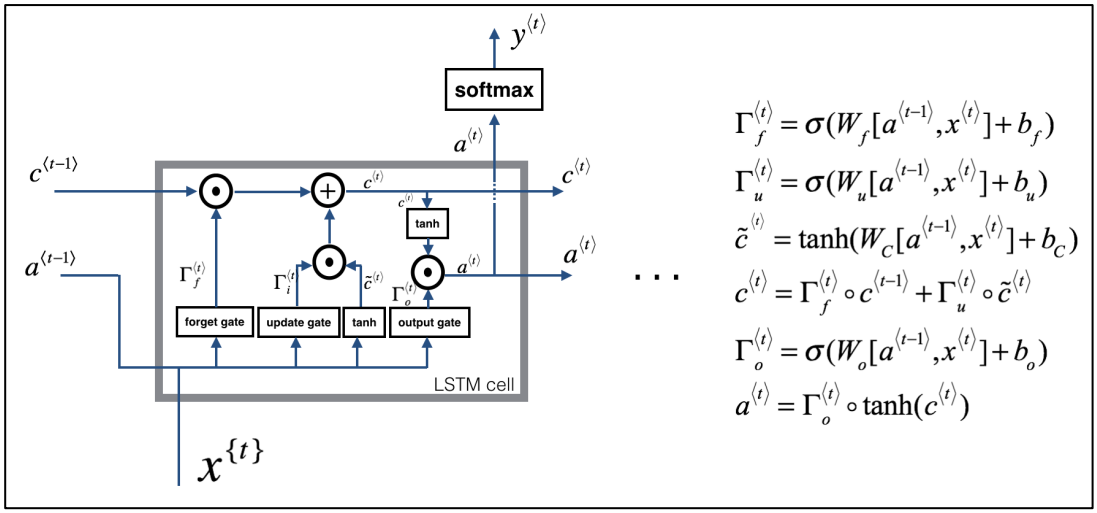
Time series prediction

Machine learning (ML) has recently emerged as one of the key computing technologies and is increasingly applied in day-to-day life and various industrial domains (Deparday, Gevaert, Molinario, Soden, & Balog-Way, 2019). ML is an artificial intelligence application that uses algorithms that work on characteristics of available data to make further predictions. In the era of emerging technologies such as unmanned aerial vehicles, internet of things, and satellite-based technology, the network is becoming more autonomous. Such systems require several local decisions to be made, such as bandwidth selection, data rate selection, power control, and user association to a base station. We can use ML algorithms to address these issues and lower human intervention in uncertain and stochastic environments.

Researchers are using different machine learning algorithms to detect or predict COVID-19 cases. One technique is time series, which uses information from past data, values, and patterns to predict future activity. Time series is a set or series of data points ordered in time whereby the independent variable would be the time, and the forecast for the future would be the goal for the time series. It is often modelled via stochastic process, Y(t), whereby in a forecasting setting, the method Y(t+h) would be used with what information is available during that particular time and setting (t) would be applied (Kerrigan *et al*., 2019). The difference between time series data and cross-sectional data is the fact that time-series data is collected from various points in time. In contrast, cross-sectional data would collect data at a single point in time. Some well-known examples of forecasting models used in time series would be ARIMA, TBATS, Prophet, LSTM, ANFIS, MNETAR, and GARCH. The application of time series can be found in various contexts such as daily weather temperature, allocation of resources, business planning, and stock price forecasting (Erica, 2021). Univariate is called when a time series data contains records of a single variable. When the dataset has more than one variable, it is multivariate data. Time series can be either continuous or discrete. The observations are calculated at every instance of time in an ongoing time series. However, a discrete-time series contains observations measured at distinct points of time (Adhikari & Agrawal, 2013).

LSTM network is a special kind of recurrent neural network (RNN) that could learn long-term dependencies proposed by Hochreiter and Schmidhuber (1997). LSTM is explicitly designed to avoid the long-term dependency problem. The architecture of this network is shown in Figure 1 (Franklin, 2018).

Bouhamed (2020) proposed deep learning nested sequence prediction models with LSTM to monitor the infection and recovery process of the Covid-19 cases continuously. This research used COVID data from 79 countries. This model is capable of controlling the Covid-19 pandemic by making the right decisions. Yudistira (2020) compared the LSTM model with the precedent model of RNN. This study involved 100 countries data cases from 22 Jan 2020 until 1 May 2020. LSTM was concluded as a promising tool to predict the COVID-19 pandemics by learning from big data and can potentially predict future outbreaks.



$$\Gamma_f^{\langle t\rangle} = \sigma(W_f[a^{\langle t-1\rangle}, x^{\langle t\rangle}] + b_f)$$
$$\Gamma_u^{\langle t\rangle} = \sigma(W_u[a^{\langle t-1\rangle}, x^{\langle t\rangle}] + b_u)$$
$$\tilde{c}^{\langle t\rangle} = \tanh(W_C[a^{\langle t-1\rangle}, x^{\langle t\rangle}] + b_C)$$
$$c^{\langle t\rangle} = \Gamma_f^{\langle t\rangle} \circ c^{\langle t-1\rangle} + \Gamma_u^{\langle t\rangle} \circ \tilde{c}^{\langle t\rangle}$$
$$\Gamma_o^{\langle t\rangle} = \sigma(W_o[a^{\langle t-1\rangle}, x^{\langle t\rangle}] + b_o)$$
$$a^{\langle t\rangle} = \Gamma_o^{\langle t\rangle} \circ \tanh(c^{\langle t\rangle})$$

Figure 1. LSTM-cell. This track and updates a "cell state" or memory variable c(t) at every time-step, which can be different from a(t)

Linear Regression (LR) is a linear approach to modelling the relationship between a scalar response and one or more explanatory variables (also known as dependent and independent variables). An LR line has a condition of the structure:

$$y = \mathrm{Ax} + \mathrm{B} \qquad (1)$$

Where *y* is the independent number while x is the dependent variable. The slope of the line is A, and B is the intercept, which is the value of y when x equals zero (Yadav, 2020). LR is to predict response with a linear function of predictors as follows:

$$y = \Delta 0 + \Delta 1 \times 1 + \Delta 2 \times 2 + \cdots \Delta n \times n + \epsilon \quad (2)$$

Where x 1 , x 2 ,..., x n are predictors, and y is the result of the prediction. At the same time, Δ 0 , Δ 1 , Δ 2 ,…, Δ n are parameters and ϵ for errors (Uyanık & Güler, 2013).

Yadav (2020) studied the spreading rate and forecast the cases of the Covid-19 by developing the regression analysis models using COVID-19 Indian data from 1 March 2020 to 11 April 2020 was used. The models' performances were evaluated with sum of squared errors, degree of freedom for error, R^2 and adjusted R^2. This model performed well such as actual case were 8.1k on 1st day, 17.8k on 7th day and its predicted cases were 8.5k and 17.6k . Ayyoubzadeh, Ayyoubzadeh, Zahedi, Ahmadi, and Kalhori (2020) studied predicting COVID-19 incidence through analysis of Google trends data in Iran using data mining and deep learning. They used daily COVID-19 cases from 15 February 2020 to 18 March 2020.

Face mask detection

The studies by Jiang and Fan (2020), and Loey, Manogaran, Taha, and Khalifa (2021) combine machine-learning algorithms to detect face masks. The authors used one algorithm for feature extraction and the other for classification purpose. The authors also used more than one dataset. To increase the versatility and accuracy of the system, the authors combined two datasets to train their algorithms.

Cakiroglu, Ozer and Gunsel (2019) implemented an existing model called Mask RCNN. They trained the model by small datasets and combined segmentation with an object bounding box detection. Similarly, Li, Wang, Li and Fei (2020) used YOLOv3 for face detection and changed the detection layer to detect smaller faces. They also replaced the logistic classifier with Softmax to maximise the difference of inter-class features and decreasing the dimension of features on detection layers to improve the speed. The system was trained on the WIDER FACE database and the CelebA database and tested on the FDDB database. Nagrath *et al*. (2021) used

deep learning, TensorFlow, Keras, and OpenCV to detect faces. The detected faces were cropped and passed to the MobilenetV2 classifier to classify the faces into two classes, mask and no mask.

In the study by Loey *et al*. (2021), the datasets were classified into "with masks" and "without masks". The study by Jiang and Fan (2020) on the other hand, classified their datasets into "face with masks", "face without masks", "faces without and without a mask in the same image", and "confusing images without a mask". This classification was made possible due to the author's dataset containing not only images of faces and people wearing masks, but also images with faces masked by hand or other objects. Both authors successfully implemented their face mask detection system as most of their algorithms have a high detection accuracy.

MATERIALS & METHODS

The programming language that we used for developing this expert system was Python. To perform more productivity and easy collaboration, we used the Jupyter Notebook as the main platform for using the programming language.

While on the other side, the method that we used in this project was the Waterfall method. The Waterfall method widely used in software development and IT as a linear project management approach (Andrei, Casu-Pop, Gheorghe, & Boiangiu, 2019). It involves five phases which are requirements analysis, design, implementation, verification, and maintenance as shown in Figure 2 below. In the first phase of requirements, we gathered the requirements for the system which emphasise elements that we want to implement. This includes the decision of specific tasks in machine learning. In another way, the requirement phase is one of the components in the planning stage of this whole project. The next phase is the design phase of breaking down the logical design and physical design. The logical design consists of finding possible solutions with theories and brainstorming while the physical design consists of ideas that are constructed before being made into concrete specifications. In this phase, we also included searching for source codes and datasets to find examples of the actual codes for this machine learning in a few different websites like kaggle.com and github.com. Overall, the design stage involved us providing support, improvement and solidity to the intentions that we collect in the requirement phase.

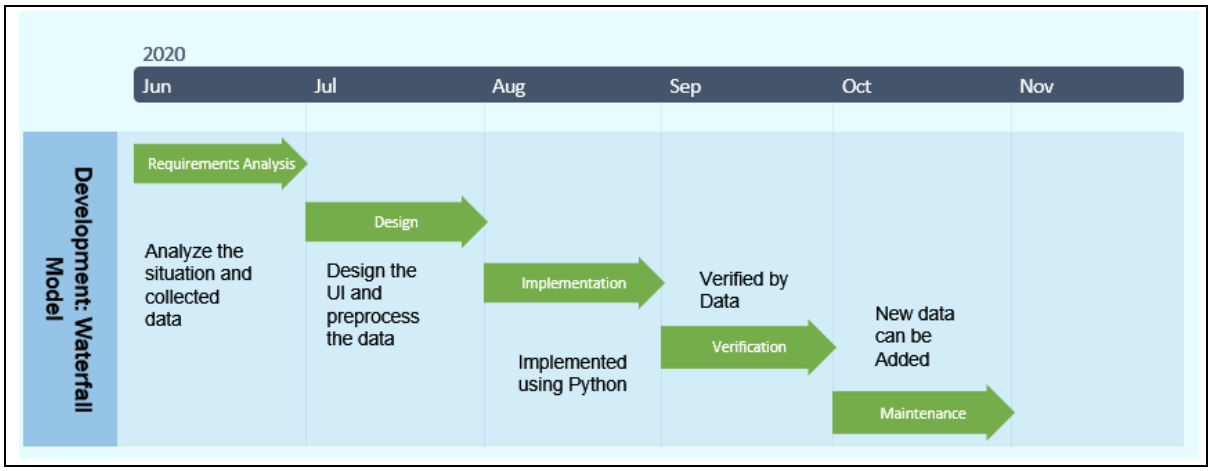


Figure 2. The Waterfall Model.

Next is the implementation phase. In this phase, the programmers had to specify and implement the requirements to produce an actual code for machine learning. The authors developed a system and implemented the data of every state and generally Malaysia as a whole. Eventually, the next stage is the verification phase. In this phase, we tested the whole machine learning and checking the specific task together to make sure everything

fulfils the requirements that were laid out in the first phase. As we finish the fourth phase of the Waterfall method, the project comes to an end. Finally, the last phase is the maintenance phase. In this phase, we have to improve machine learning with feedback from the fourth stage and create a new version based on feedback including bugs, misinformation, and errors during production.

Machine Learning Library

The library used in our project includes pandas, NumPy, time delta, urlopen, matplotlib, seaborn as well as plotly.express. Pandas datetime is needed to make it easier to plot the data. This project requires updated data from the source. Hence, there is a need to import urlopen to open the required online dataset by its URL. Instead of just using matplotlib as the basic visualisation in python, we decided to choose plotly.express to help our visualisation be more interactive.

Datasets

Two datasets were used in this project. As mentioned before, this project aims to show the current trend of COVID-19. Thus, an updated dataset is required. For both datasets, the URL is inserted into our machine learning. https://raw.githubusercontent.com/ynshung/covid-19-malaysia/master/covid-19-malaysia.csv is the dataset used for COVID-19 cases in Malaysia.

For the second dataset, the same method to insert the dataset was used. However, empty values and NaN can be found in the dataset that may affect the visualisation. To overcome this, we replace the '-' symbol with None, which can be found under the 'wp-putrajaya' column. Then, the function dropna() helps to drop any NaN and None values in the dataset.

Pre-processing of Data

Below is the code to show the latest update for total cases, death, discharge and ICU for a particular time. To make the data analysis easier, the data was reshaped using temp.melt() function. This function is useful in formatting the column to identifier variables (id_vars= 'date'), and measured variables (value_vars=['cases', 'discharged', 'death']). Note that, in the temp() function, the tail() value of the dataset was taken, which means the final current data is taken, hence fulfilling the goal to visualise the current trend of Covid-19 in Malaysia. In this visualisation, px.treemap was used to show hierarchical data using nested rectangles. Each of the rectangles was defined by labels that can be clicked to zoom in or out, and when hovered, it will show the path bar on the left corner of the treemap.

RESULTS

Latest Update for Covid-19 Active, Death, Discharged and ICU Cases

Using the datasets and by applying the algorithms, it shows that the current total cases were 8734, 8526 for total discharge and 122 for total death as shown in Figure 3 below. The total death can be barely seen in the screenshot, due to the small number compared to the total cases and discharged. As can be seen from the output below, the data for the updated case of death is shown when hovered. No label showed for ICU current data as no cases for the current time.

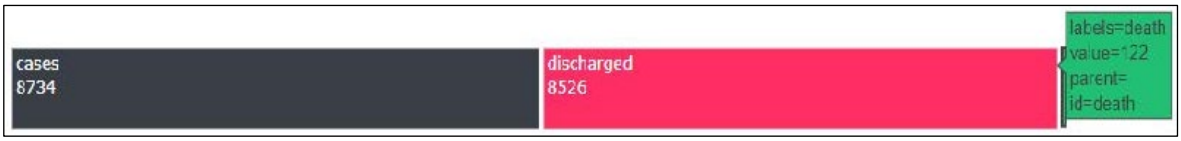


Figure 3. Covid-19 total cases, discharge and death.

Visualising Covid-19 Active, Death, Discharged and ICU Cases

Before visualising each data, plot_df_Msia was defined first to make it easier to call the function later. Inside this function, plotly.express was used to make an interactive bar chart with a colour sequence that shows the increasing amount of data from the beginning until the current time. To visualise the data, function plot_df_Msia was called

with the variable name inserted inside the function, followed by the colour palette that was defined earlier. As a result, the total number of cases is shown in Figure 4, deaths shown by Figure 5, discharged shown by Figure 6, and the total number of patients in ICU shown in Figure 7.

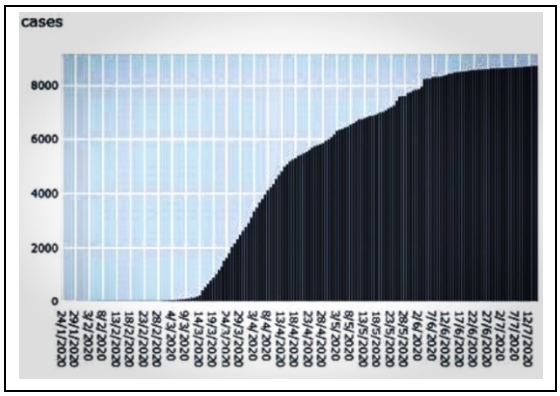


Figure 4. Malaysia's Covid-19 cases.

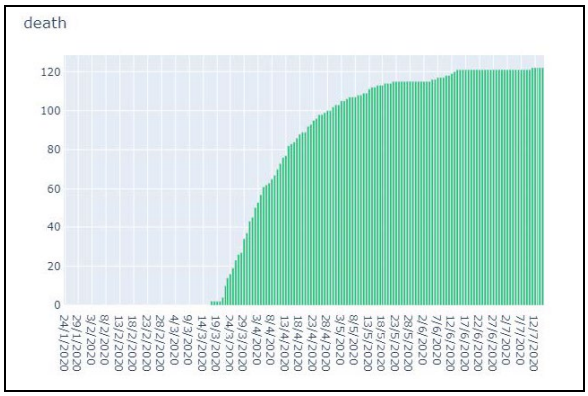


Figure 5. Malaysia's Covid-19death cases.

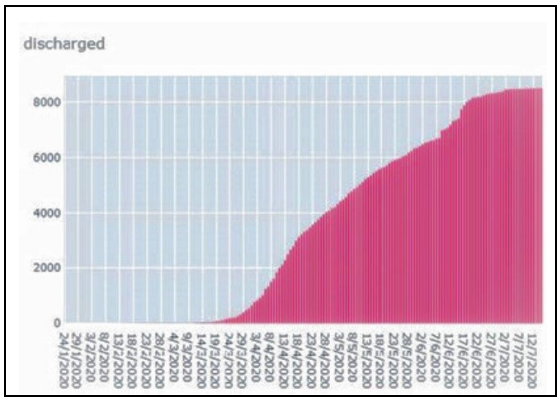


Figure 6. Malaysia's Covid-19 discharged cases.

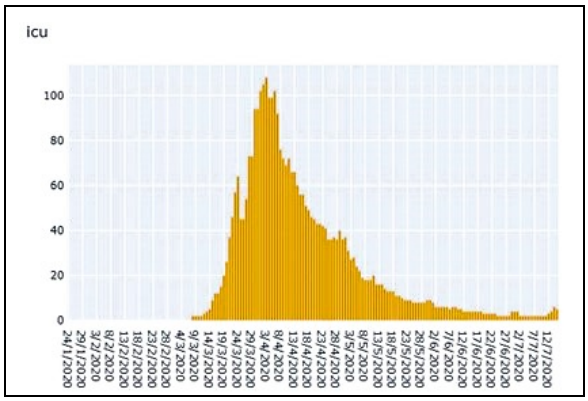


Figure 7. Malaysia's ICU Covid-19 cases

Visualising Trend in Covid-19 Discharged and Death Cases

Trend is a future direction and is very important for best planning. temp.melt() is used again to make the analysis easier. This time, the temp() function takes all data inside the dataset, and not only the tail as mentioned before. The measured variables (value_vars) only include cases, discharge and death. The analysis is then visualised using px.line, as shown in Figure 8.

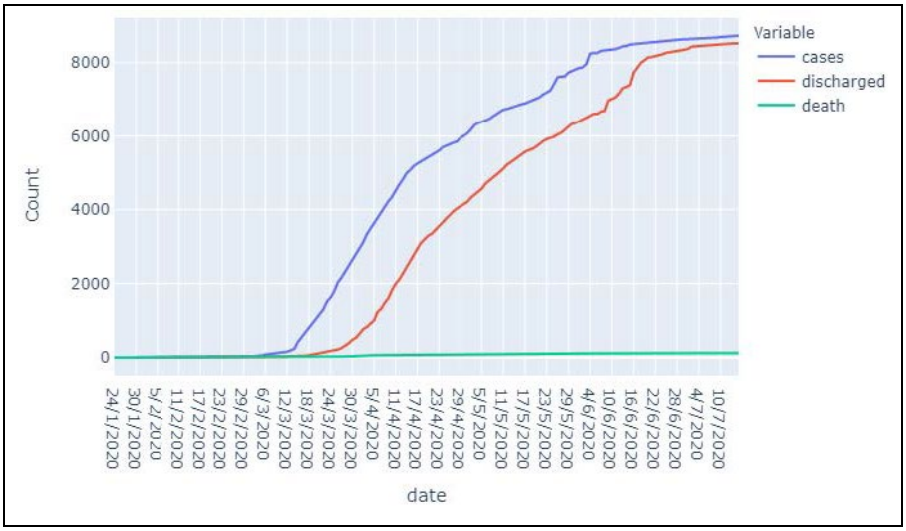


Figure 8. Comparison of Covid-19 death, and discharge cases.

Latest Update of Covid-19 Cases Based on State

The latest updated system can help in proper planning and management. Below is the code to show the latest update for each state in Malaysia for a particular time. The data was reshaped by using temp.melt() function to make the analysis data easier. This function is useful in formatting the column to identifier variables (id_vars= 'date'), and measured variables (value_ vars = ['perlis', 'kedah', 'pulau-pinang', 'perak', 'selangor', 'negeri sembilan', 'melaka', 'johor', "pahang', 'terengganu', 'kelantan', 'sabah', 'sarawak', 'wp-kuala-lumpur','wp-putrajaya', 'wp-labuan']). In the temp() function, the tail() value of the dataset was taken, which indicates that the final current data is taken from the dataset, to visualise the current trend of Covid-19 in Malaysia. In visualisation, px.treemap was used to show hierarchical data by using nested rectangles. Each rectangle is defined by labels that can be zoomed in or out, and when hovered, it will show the path bar on the left corner of the treemap. Based on Figure 9, it shows the total case for each state. The total case in Kuala Lumpur is 2447, 2094 in Selangor, 1027 in Negeri Sembilan, 701 in Johor, 503 in Sarawak, 380 in Sabah, 365 in Pahang, 258 in Melaka and Perak, 157 in Kelantan, 111 in Terengganu, 121 in Pulau Pinang, 99 in Kedah, 98 in Putrajaya, 18 in Perlis and 17 in Labuan. The highest total case is in Kuala Lumpur with 2447, the lowest total case is Labuan with 17 (Figure 9).

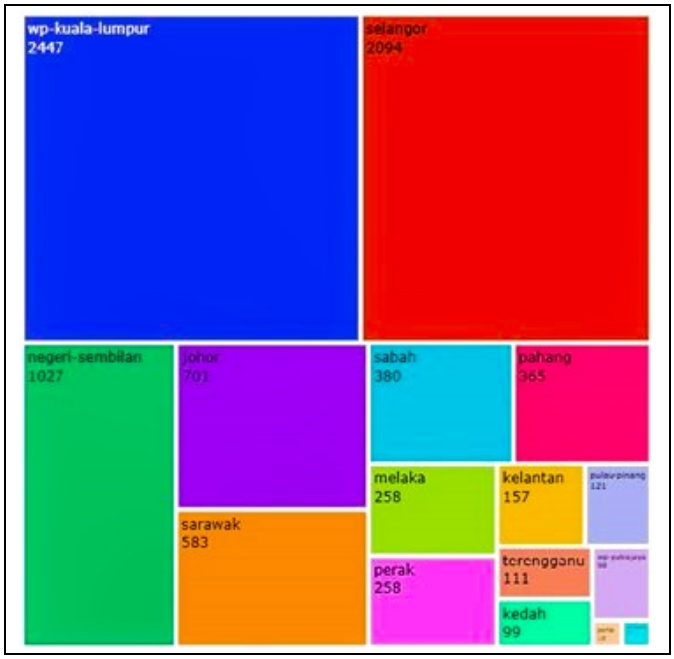


Figure 9. Comparison of Covid-19 cases among States.

Detailed Visualisation of Covid-19 Cases Based on State

We have calculated detailed visualisation of each state, but only one example of Perlis is shown here in Figure 10. The same method was applied to all other 12 states and 3 federal territories by changing the variable name for each state, such as plot_stacked(‘kedah’), plot_stacked(‘pulau-pinang’), plot_stacked(‘perak’), plot_stacked (‘selangor’), plot_stacked(‘negeri sembilan’), plot_stacked(‘melaka’), plot_stacked(‘johor’), plot_stacked (‘pahang'), plot_stacked('terengganu'), plot_stacked('kelantan'), plot_stacked('sabah'), plot_stacked ('sarawak'), plot_stacked(‘wp-kuala-lumpur'), plot_stacked('wp-putrajaya'), plot_stacked('wp-labuan'). Before visualising the

data, plot_stacked() function and plot_line() function was defined to make it easier to call the function later. In plot_stacked() function, px.bar() was used to represent each data in rectangular mark. In the plot_line() function, px.line() was used to represent the data in vertex of a polyline mark in 2D space.

Comparison of Covid-19 Cases Among States

Comparative analysis among states is very useful to point out high-risk states and manage the situation. We used plt.figure to compare cases between states in Malaysia. The purpose of using plt.figure is to create figure objects. The whole figure is regarded as the figure object. It is important to use plt.figure( ) specifically when we want to change the size of the figure and when we want to add several objects to the Axes in a single figure. For the figure size object plt.figure(15,7), it only has six figures possible because it cannot be done until fig.add_subplot(237). We can see in Figure 11, an upward trend, then changing the trend horizontally showing that the COVID-19 cases between states are being controlled.

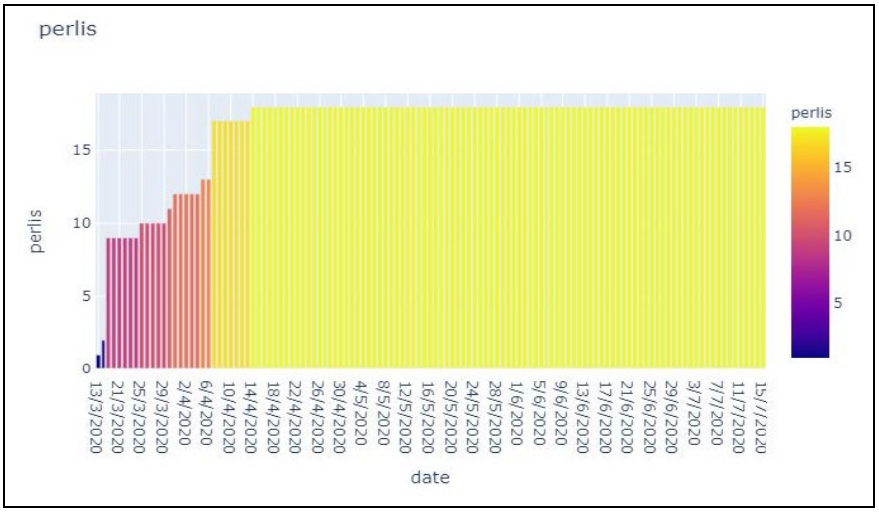


Figure 10. Covid-19 cases in Perlis

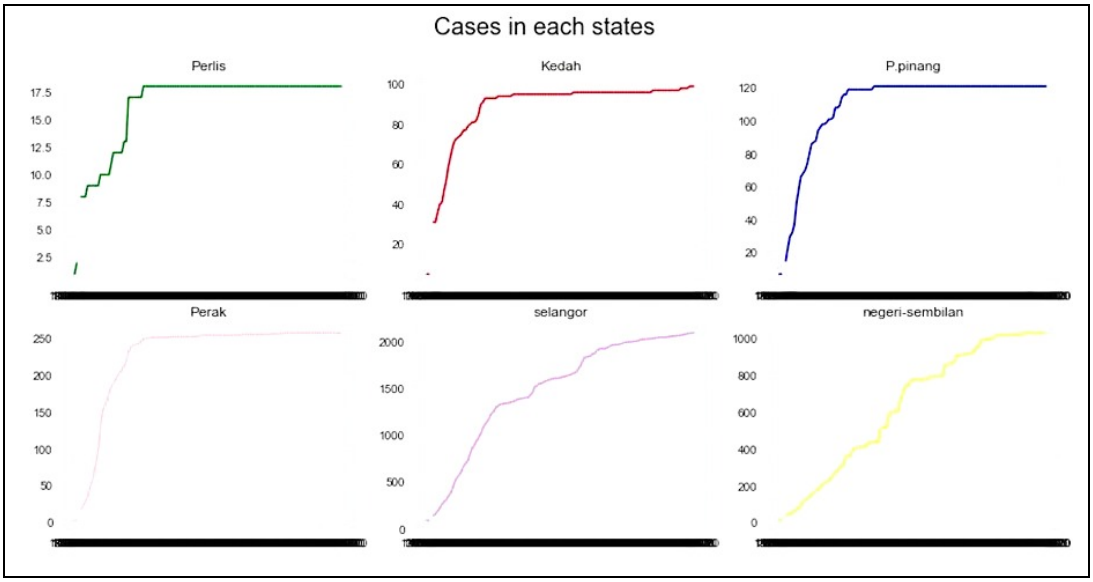


Figure 11. Covid-19 cases based on States

CONCLUSION

This study provided a system, using COVID-19 data as a sample, visualise, and analyse the cases, deaths, discharged ICU cases updates at a particular time in Malaysia as a whole or with the specification of each state with the COVID-19 outbreak daily statistics. The results provided visualisation and comparison of cases among states in Malaysia. This will assist the management in decision making. Therefore, the pandemic can be managed by proper planning and utilising advanced technologies such as machine learning.

Limitation and Recommendation

The main limitation of this system is to get real-time data from all the important sources. The real real-time data will predict the real situation. Therefore, it is recommended to integrate such a system with data sources to get real-time data.

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Perceptions of Students Learning French as a Foreign Language in Malaysia

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ABSTRACT

The study investigated the perceptions of students learning French as a foreign language in a Malaysian public university. The specific objectives were to examine: (1) the self-reported French language proficiency level; and (2) their perceptions of their listening, speaking, reading and writing skills in French. Questionnaire data were collected from 80 undergraduates enrolled in French Levels 1 and 2 courses. The analysis showed that language learners from Level 1 and Level 2 rated themselves as having fair proficiency level when they made their rating without comparing themselves to a French native speaker. However, when they compared themselves with a native French speaker, more of them rated their proficiency as poor. The results showed that the relative difficulty of mastering language skills in French, from the most difficult to the easiest, are writing, speaking, reading and listening. Similar results were found for Level 1 and Level 2 French but the undergraduates struggled with writing and speaking at Level 2 more than at Level 1 because of an increased vocabulary range, greater grammatical complexity and longer texts. The results suggest that the difficulties are not much in comprehension of the language but more towards expressing themselves whether in speaking or writing.

Keywords: French language proficiency, Learning French as a Foreign Language

INTRODUCTION

Foreign languages are learnt for various reasons ranging from personal enrichment to fulfilling job requirements involving the use of foreign languages, particularly in the era of rapid economic and technological development. Proficiency in foreign languages increases the competitiveness of graduates (e.g., better work opportunities and higher salary potential) in a workplace where global communication is increasingly becoming seamless. On a personal level, learning a foreign language enables language learners to expand their worldview and develop a deeper understanding of other cultures (Tar, 2011).

Foreign language learning can be defined as the "learning of non-native language outside of the environment where it is commonly spoken" (Moeller & Catalano, 2015). A foreign language is a language which is taught in a society where the language is not spoken as a native language (Gass & Schachter, 1989), and the language is learned in a classroom situation (Moeller & Catalano, 2015). For instance, French, Japanese, Arabic and Korean are taught as foreign languages in Malaysia. The foreign language is primarily for communication with people outside one's own community unlike a language which has social functions inside the community (Littlewood, 1984).

This paper focusses on French. French is considered as the second most studied world language after English, and it is an official language in 29 countries with about 76 million native French speakers and 274 million fluent French speakers worldwide (World Population Review, 2021). According to Chinedu and Anthonia (2015), French is one of the most spoken Romance languages that has been used as a language of instruction in most of the countries. French language is one of the languages used in meetings by the United Nations Organization and other international organisations (Adewuyi, Bernard & Adewuyi, 2015).

In Malaysia, there is a growing number of Malaysians learning the French language in schools and universities (The Star, 2019). Alliance Française which serves as an official French Language Centre in Malaysia provides French language classes to members of the public. Since 1998, over 28,000 have registered for Diplôme approfondi de langue française (Advanced diploma in French language) (Alliance Française de Kuala Lumpur, 2021). Other organisations such as Malaysia-France University Centre, French University Graduates Association of Malaysia, Malaysian Students' Association France and Malaysian-French Chamber of Commerce and Industry are the partners of Campus France Malaysia (Campus France Malaysia, 2016). Besides this, universities also teach French as a foreign language. For instance, Universiti Malaya offers a Bachelor's Degree in French Language, whereas Universiti Malaysia Sarawak and Universiti Sabah Malaysia offer French as an elective subject.

Despite the growing popularity of French courses, research has shown that the learning of French as a foreign language is difficult. Foreign language learners experience frustration, stress and confusion when learning and communicating in the foreign language (Pawapatcharaudom, 2007). There is a lack of studies on students' experiences of learning French. Most of the studies on foreign language learning were on English, and they focused on grammar rather than language skills (Akalin & Zengin, 2007; Büyükyavuz & İnal, 2008; Solak & Bayar, 2015).

Here some findings on learning of English as a foreign language are reviewed to provide an indication of the challenges involved in learning a foreign language. Pawapatcharaudom (2007) found that writing was the most difficult English skill for Thai learners of English. For adult foreign language learners in China, acquiring a native-like accent and speaking with confidence were the most difficult (Wu, Wu, & Le, 2014). Similarly, English as a Second Language students in the United States struggled with academic oral skills in oral presentations and interacting with others in class (Ferris & Tagg, 1996). Afshar and Asakereh (2016) focused on speaking skills in the learning of English as a foreign language by Iranian university students and they faced linguistic problems such as pronunciation. Yet another study, Nguyen (2011) pointed to pronunciation as a leading problem faced by the Vietnam, Indonesia and Thailand students in learning English in an Australian university. The participants in this study also revealed the English instructors from their own countries did not teach language skills but focused on grammar. It is not sufficient to focus on grammar because there are seven aspects of language to learn, which are phonology, morphology, lexis or grammar, semantics, pragmatics, syntax and discourse (Mitchell, Myles, & Marsden, 1998). A study indicating the relative difficulty of language skills is that of Yahya (2012) conducted on learning of English as a foreign language at Arab American University of Jenin. The order of difficulty from highest to lowest is as follows: listening, grammar, speaking, writing, pronunciation, and reading. In order to find out the reasons for ineffective language learning, it is important to examine learner difficulties in aspects of language learning other than grammar.

Next, the findings of the few studies on learning of French as a foreign language are reviewed. Kolawole (2015) studied learning of French as a foreign language in three colleges of education in Oyo, Nigeria. Only a third of the students were interested to study French at the degree level due to unemployment of graduates with a French degree and the prevailing Anglophone learning environment where students used Pidgin English in the French language village at Badagry. As a result, immersion in a French-speaking environment did not take place. A majority of them also felt that the infrastructure was not adequate such as language laboratory, internet facilities and textual materials. The study also revealed that the government did not enforce the teaching of French although it is the second official language in Nigeria. Tar (2011) found that learning of French as a foreign language at the secondary school level in Odo, Nigeria was hampered by the lack of other people to communicate with by using the target language. The female and male students had similar views on other problems besetting French language learning, namely, shortage of teachers, textbooks, teaching materials and a lack of interest and motivation as well as discrepancies between their native language and French. The low perceived usefulness of French and the lack of support for French is understandable. English dominates in almost all domains, particularly government functions because of the historical, multi-ethnic and cultural nature of Nigeria (Ayeomoni, 2012).

These studies on learning of French as a foreign language did not touch on the relative difficulty of the language skills. The findings that are on the relative difficulty of language skills are available only for English (Afshar & Asakereh, 2016; Akalin & Zengin, 2007; Büyükyavuz & İnal, 2008; Ferris & Tagg, 1996; Nguyen, 2011; Pawapatcharaudom, 2007; Solak & Bayar, 2015; Wu et al., 2014; Yahya, 2012). Therefore, research is this area is needed to understand learner difficulties as they try to learn French for various communicative purposes in an environment where French is not used outside the classroom.

The study investigated the perceptions of students learning French as a foreign language in a Malaysian public university. The specific objectives were to examine: (1) the self-reported French language proficiency level; and (2) their perceptions of their listening, speaking, reading and writing skills in French.

METHOD OF STUDY

The study on challenges of learning French as a foreign language was conducted on university students enrolled in French Language Level 1 or Level 2 courses in a Malaysian public university.

A total of 80 undergraduates ranging in age from 19 to 23 years old participated in the study by filling in the questionnaire: 60 participants from French Language Level 1 and another 20 participants from Level 2 course. The difference in the number of students at Levels 1 and 2 is unavoidable because fewer students enrol in the Level 2 course. The students were from various faculties in the university. There were more females (72.5%) than males (27.5%). There are more females than males in tertiary institutions in Malaysia (Hirschmann, 2021; Malaysiakini, 2016).

The selection criteria for participants were students who were enrolled in the French Language Level 1 and Level 2 courses. Native speakers of French were excluded from the study. The participants in the study were bilingual or multilingual speakers. They could communicate with others in at least two languages, for example, Malay and English, Malay and Mandarin, Malay and Tamil, Mandarin and English, Mandarin and Tamil, Tamil and English, Malay and other indigenous languages such as Iban, Rungus and Melanau.

Out of the 80 participants who responded to the questionnaire, seven participants were interviewed to obtain further information on their experiences in learning French as a foreign language. Four participants were from French Level 1 and three participants were from Level 2. The rationale of using a semi-structured interview for this study is it elicits detailed information on challenges in mastering the four language skills in learning French language from the perspective of participants.

In this study, data were collected using a questionnaire and a semi-structured interview. The questionnaire on challenges of learning a foreign language was adapted from Pawapatcharaudom (2007). Section A of the questionnaire included seven questions on the basic demographic information of participants regarding their age, gender, level of French language courses taken, year of study, faculty and programme of their studies, and self-rating of their own French language proficiency level. They were asked to tick one of the options: poor, fair, good or excellent. Dewaele and Dewaele (2021) found a significant correlation between actual and self-reported proficiency scores in French. Their language proficiency data involving the four skills were collected at beginning, in the middle and at the closure of a study abroad period in a Francophone country. Section B contained 37 items which were categorised into four parts: part A (10 items on listening skills), part B (13 items on speaking skills), part C (7 items on reading skills) and part D (7 items on writing skills). A five-point Likert scale was used to measure the perspectives of participants involved in this study, ranging from 1 (strongly disagree) to 5 (strongly agree).

The interview guide for the semi-structured face-to-face interview was adapted from Nguyen (2011) and Afshar and Asakereh (2016). In Nguyen's (2011) study, two versions of interview questions were included which are teachers'

version and students' version. For the student's version, there are 16 interview questions regarding the students' opinions on the skills they are good and bad at among the four language skills (listening, speaking, reading and writing), their reasons, and the ways to improve their English language. On the other hand, Afshar and Asakereh (2016) included 11 interview questions regarding the factors causing the speaking problems in English, the types of linguistic-related problems affecting students' speaking skills and whether students' speaking ability can be improved by enrolling them in listening and speaking courses in university. In the present study, six main interview questions were adapted from Nguyen (2011) and Afshar and Asakereh (2016). The questions focused on skills which were given more or less attention by the language instructors and other aspects of their language learning.

The questionnaires were distributed to participants enrolled in French Language Level 1 and Level 2 classes. The second researcher asked for permission to speak to the students in the last 15 minutes of the French class. She gave a detailed briefing on the aim of the study and the instructions on how to fill in the questionnaires. In addition, the researcher reassured students on the confidentiality their responses. Students who agreed to participate in the study signed the consent form and proceeded to fill in the questionnaires. The questionnaires were collected at the end of the class.

For the interview session, seven participants who volunteered for the interviews were contacted to fix an appointment. Four were from Level 1 (Participants A-D) and three were from Level 2 (Participants E-G). Before the interview, the second researcher informed the participants that the interview conversations would be audio-recorded. The participants signed the consent form to confirm their agreement in participating in the study.

For the data analysis, the questionnaire data were keyed into the Statistical Package for the Social Sciences for Windows version 20.0. Means and standard deviations were calculated in order to compare the perceptions between Level 1 and Level 2 language learners on the challenges they encountered in mastering listening, speaking, reading and writing skills when learning French as a foreign language. The recorded interviews were transcribed and coded to identify problems encountered when learning listening, speaking, reading and writing skills so that the information can be used to explain the questionnaire results.

RESULTS

The results from the questionnaires are reported, and where appropriate, excerpt from the interview are used to explain the participants' perceptions of their proficiency in French so that the explanations are from the participants' perspective rather than the researchers'.

Self-reported French language proficiency level

This section describes the results on participants' French language proficiency with or without comparing themselves to native speakers of French.

The results show that most of the participants in French level 1 and 2 courses rated their proficiency in French as fair when compared to non-native speakers of French. Table 1 shows that 61.7% of 60 participants in French Level 1 rated their proficiency as fair. Similarly, 60% of 20 participants in French Level 2 also rated their proficiency as fair. Fewer participants rated their proficiency as poor (Level 1, 21.7%; Level 2, 25%). Likewise, only a small percentage of the participants were confident of their proficiency in French (Level 1, 16.7 %; Level 2. 15.0 %). It seems that Level 1 French students were aware that they were only beginners in the language.

Table 2 shows that about half of the participants in French level 1 and 2 courses rated their proficiency in French as poor when compared with a native speaker (46.7% and 55% respectively). A fairly large proportion rated their proficiency in French as fair (Level 1, 38.3%; Level 2, 40%). In comparison, only a very small percentage of the participants were confident of their proficiency in French (Level 1: 6.7% good and 8.3% excellent; Level 2: 5% good).

From the perspective of the participants in the French Level 2 course, none of them reached excellent proficiency in French.

In short, the results indicate that language learners from both Level 1 and Level 2 rated themselves as having fair French language proficiency when they made the rating without comparing themselves to a native speaker. However, when they made the comparison to a native speaker, more of them rated their proficiency as poor. This means that the participants lacked confidence in their French language proficiency even though they had completed one semester of learning French at either Level 1 or Level 2. The next section shows the skills where they lack confidence.

Table 1. Number and percentage of Level 1 and Level 2 language learners' self-rated French language proficiency level (N=80).

Level	Poor	Fair	Good	Excellent	Total
Level 1	13 (21.7%)	37 (61.7%)	10 (16.7%)	0 (0.0%)	60 (100.0%)
Level 2	5 (25.0%)	12 (60.0%)	3 (15.0%)	0 (0.0%)	20 (100.0%)
Average	18 (22.5%)	49 (61.3%)	13 (16.3%)	0 (0.0%)	80 (100.0%)

Table 2. Number and percentage of Level 1 and Level 2 language learners' self-reported French language proficiency level when compared with native speakers (N=80).

Level	Poor	Fair	Good	Excellent	Total
Level 1	28 (46.7%)	23 (38.3%)	4 (6.7%)	5 (8.3%)	60 (100.0%)
Level 2	11 (55.0%)	8 (40.0%)	1 (5.0%)	0 (0.0%)	20 (100.0%)
Average	39 (48.8%)	31 (38.8%)	5 (6.3%)	5 (6.3%)	80 (100.0%)

Participants' perceptions of their listening, speaking, reading and writing skills in French

In this section, the participants' perceptions of their listening, speaking, reading and writing skills in French are reported. On the five-point Likert scale, five shows strong agreement, one shows strong agreement and three shows a neutral response. A comparison of the results in Tables 3 to 6 showed that both Level 1 and Level 2 participants found listening the easiest, followed by reading, and both are receptive skills. However, there was a difference for productive skills: Level 1 participants found writing easier than speaking, whereas Level 2 participants found speaking easier than writing. The details on the results for the four skills will be described next.

Table 3 shows the perceptions of Level 1 and Level 2 participants on their proficiency in listening French. The average means scores show that the participants found listening at French Level 1 (mean of 3.74) easier than listening at Level 2 (mean of 3.01). Participants in French Level 1 reported that they could clearly hear the pronunciation by instructors (mean of 4.10) and they also felt comfortable listening to a native French speaking instructor in the classroom (mean of 4.10). These two aspects of listening skills in French were easy for the Level 2 participants (mean of 3.55 and 3.45 respectively). In addition, the Level 2 participants reported that they could understand the main idea expressed by the native French speaking instructor (mean of 3.45). However, the mean scores showed that Level 1 participants reported better listening skills than Level 2 participants.

Table 3. Mean scores showing Level 1 and Level 2 participants' perceptions of their listening skill in French.

	Aspects of listening skill	Level 1	Level 2
1.	I can clearly hear the pronunciation by instructors.	4.10	3.55
2.	I feel comfortable listening to a native French speaking instructor in the classroom.	4.10	3.45
3.	I can understand instructors in French classes.	4.05	3.40
4.	I can understand the questions asked by the instructors in French in the classroom.	3.98	3.10
5.	I can understand the main idea expressed by the native French speaking instructor.	3.95	3.45
6.	I can understand the questions asked by the instructors in French during oral assessments.	3.93	2.60
7.	I can understand the accent of the instructors in the classroom and during oral assessments.	3.77	2.95
8.	I understand the tone of a native French speaker.	3.47	3.00
9.	I can understand a native speaker speaking French at normal speed.	3.07	2.40
10.	I never have any listening problem in French.	2.93	2.15
	Average mean scores	3.74	3.01

The aspect of listening skill posing the most problem to Levels 1 and 2 participants was understanding a native speaker speaking French at normal speed (mean of 3.07 and 2.40 respectively). For example, Participant C from Level 1 said:

> *Excerpt 1*
> When French people, they talk French, they will talk in normal speed that maybe I can't catch up or maybe I can't really listen and understand to them. (Participant C)

Beginner learners of foreign languages may be able to understand speech enunciated clearly and slowly but not when French is spoken at natural speed. Consequently, non-native speakers would easily feel nervous and suffer from lack of confidence when they have to communicate with native speakers.

In addition, the Level 2 participants faced some problems understanding the questions asked by the instructors in French during oral assessments (mean of 2.60) but the Level 1 participants could cope with it (mean of 3.93). The Level 2 participants also found the accent of the instructors in the class and during oral assessments challenging (mean of 2.95) but the Level 1 participants could also cope with it (mean of 3.77). As the level of French increases, less familiar vocabulary and more complex grammatical structures are used, making it more difficult for the participants to understand what they hear.

Table 4 shows Level 1 and Level 2 participants' perceptions of their speaking skill in French. The average mean scores of below three shows that the language learners find it challenging to speak French (Level 1, 2.66; Level 2, 2.15), and much more difficult than listening to French. Speaking in French Level 2 was definitely more difficult for the participants because there was only one item with a mean of above three.

Table 4. Mean scores showing Level 1 and Level 2 participants' perceptions of their speaking skill in French.

	Statements	Level 1	Level 2
1.	I can pronounce French words clearly after listening to the pronunciation given by instructors.	3.63	3.15
2.	I can pronounce the consonant /r/ and vowel /u/ in French clearly and correctly.	3.35	2.70
3.	I can have a simple conversation in French.	3.23	2.90
4.	I can answer instructors' questions in French in the classroom.	3.18	2.55
5.	I feel comfortable talking with a native speaker instructor in the classroom.	3.10	2.55
6.	I can pronounce the French accents clearly [e.g.: acute (´), grave (`), circumflex (ˆ), diaeresis (¨) and cedilla (¸)]	3.02	2.15
7.	I can answer the questions by giving sentences fully in French during oral assessments.	2.98	2.25
8.	I have clear pronunciation when I communicate in French.	2.82	2.30
9.	I have an adequate French vocabulary for effective speaking.	2.77	2.20
10.	I can ask questions in French in the classroom.	2.72	2.40
11.	I find it easy to express myself in French.	2.52	1.85
12.	I never have any speaking problem in French.	2.52	1.85
13.	I can explain my ideas clearly in French.	2.38	1.75
	Average mean scores	2.66	2.15

Among the different aspects of the speaking skill in French, the participants found it rather easy to repeat French words clearly after listening to the pronunciation given by instructors (Level 1, 3.63; Level 2, 3.15). In fact, the first researcher had encountered a student who could read aloud a passage in good pronunciation but did not understand much of what is in the passage.

Generally French pronunciation at Level 1 was within the capability of about half the participants as shown by the mean of 3.02. Examples of characteristic French sounds are /r/ and /u/ and examples of French accents are acute (´), grave (`), circumflex (ˆ), diaeresis (¨) and cedilla (¸).These were unfamiliar sounds to the participants. For instance, Participant A said that the back sounding of the "r" is very difficult for Malaysian learners because languages in Malaysia such as Malay, Mandarin and English do not have the back sounding of the consonant "r". The French sounds became increasingly difficult for Level 2 participants, probably because these sounds appeared in more complex words. Excerpt 2 shows Participant G's (Level 2) confusion over French accents:

> *Excerpt 2*
> Yeah, because French, obviously that is not our mother tongue language and plus we also have the Borneo language which is, I took Melanau. So, a bit confusing about the accents. Because it's two different things and we have to learn how to pronounce it correctly or else it will have a different meaning. (Participant G)

Languages spoken in Malaysia such as Iban, Melanau, Bidayuh and Kayan do not have the accents to be marked on consonant and vowels of particular words as in French language. According to Participant G, the French instructors encouraged their students to practise the unfamiliar French sounds more often in order to improve their language skills.

The Level 1 participants were able to engage in simple conversations in French with their instructor (mean of 3.23 and 3.18 respectively). They felt somewhat comfortable talking with their native speaker instructor in class (mean of 3.10). However, the Level 2 participants reported that they did not feel capable of handling these aspects of speaking in French, as shown by mean scores of less than three (mean of 2.55 to 2.70, Table 4).

The greatest difficulty for both Levels 1 and 2 participants was explaining their ideas clearly in French (Level 1, 2.38; Level 2, 1.75). Speaking French was difficult for participants in both groups. Level 1 participants found it difficult to ask questions in French in class (mean of 2.72) and even more difficult to answer questions using full sentences in French during oral assessments (mean of 2.98). The mean scores are lower for Level 2 participants showing the greater challenge they faced to ask questions (mean of 2.40) or answer questions using full sentences in French (mean of 2.25). This could be caused by a lack of adequate French vocabulary for effective speaking and the problem worsened as the participants moved from Level 1 to Level 2. Taken together, the results suggest that they had more difficulties producing spontaneous speech as the French level increased because the speaking tasks in the classroom had changed and were more challenging. For example, in Level 1 they were given sample sentences they could use in conversations, but in Level 2 they had to formulate their own sentences by using information provided in task sheets.

Next, Table 5 shows Level 1 and Level 2 participants' perceptions of their reading skill in French. The average mean scores show that the reading French was easier at Level 1 (average mean of 3.43) than at Level 2 (average mean of 2.95).

Table 5. Mean scores showing Level 1 and Level 2 participants' perceptions of their reading skill in French.

	Statements	Level 1	Level 2
1.	I can read the letters in the French alphabet.	4.02	3.40
2.	I can read the documents given by instructors in the classroom.	3.55	3.30
3.	I can understand the French words printed on the documents during the assessments.	3.52	3.10
4.	I can understand the meaning of words on the documents given by instructors.	3.37	3.00
5.	I can guess the meaning of new vocabulary in French.	3.37	3.00
6.	I can read the written French accents (e.g.: acute (´), grave (`), circumflex (ˆ), diaeresis (¨) and cedilla (¸)) on the documents.	3.32	2.50
7.	I never have any reading problem in French.	2.83	2.35
	Average mean scores	3.43	2.95

Interestingly, a similar pattern was evident in the aspects of reading mastered by the Levels 1 and 2 participants. Both groups reported that they could read the letters of the French alphabet, and this was the easiest for them. Most of the students could read and understand the documents given by instructors in class and during assessments (mean scores above 3). While Level 1 students could guess the meaning of new vocabulary in French (mean of 3.37), the Level 2 participants gave mixed responses on this (neutral mean of 3). Somehow the Level 1 students could read the written French accents (e.g.: acute (´), grave (`), circumflex (ˆ), diaeresis (¨) and cedilla (¸)) on the documents (mean of 3.32) but the Level 2 participants could not handle this (mean of 2.5). In sum, participants from both levels had problems reading the accents and comprehending meaning of words in French.

Finally, Table 6 shows results on Level 1 and Level 2 participants' perceptions of their writing skill in French. The average mean scores showed that writing in French was difficult for Level 1 participants (average mean of 2.74) and very difficult for Level 2 participants (average mean of 2.14).

Table 6. Mean scores showing Level 1 and Level 2 participants' perceptions of their writing skill in French.

	Statements	Level 1	Level 2
1.	I can write down the sentences in French given as examples by instructors during classes.	3.25	2.45
2.	I can write down French words with correct grammar (e.g.: masculine (*le* garçon) and feminine (*la* fille).	2.95	2.60
3.	I am able to write in the correct sentence structure in French.	2.77	2.10
4.	I can remember and write French words with suitable accents (e.g.: acute (´), grave (`), circumflex (ˆ), diaeresis (¨) and cedilla (¸)).	2.63	2.15
5.	I can use perfect grammatical rules when writing in French.	2.63	1.90
6.	I have an adequate French vocabulary for writing short essay for an exam.	2.40	1.80
7.	I never have any writing problem in French.	2.53	2.00
	Average mean scores	2.74	2.14

The only aspect of writing in French that the Level 1 participants could cope with copying down sentences in French (mean of 3.25). These sentences were given as examples by instructors during classes, and students were asked to copy them down so that they could learn the vocabulary. Copying down sentences does not count as a productive skill, which could explain why the Level 1 participants reported some confidence in handling this task. Strangely, the Level 2 participants reported tremendous difficulties with copying down sentences, as shown by the mean of 2.45 which is below the mid-point of 3. By Level 2, the instructors do not write down all the sentences for the students to copy. French is not a phonetic language and the words are not written the way they are pronounced. In French, many letters are silent, particularly when they appear at the end of words. Hence, it becomes difficult to write French as the students advance in the French course.

The participants found it challenging to use correct grammar when writing sentences, and writing French words with suitable accents. Participant B from Level 1 explained why he could not do well in the examination because of the many grammatical rules that were different from Malay, Mandarin and English languages:

> *Excerpt 3*
> I guess because writing involves a lot of stuffs like grammatical rules and all and even though he does teach us, but, again it's not as heavily focused on as speaking. So, I find that a huge problem especially when I go for my final exam. (Participant B)

The final examination was focussed on essay writing whereas the coursework assignments were on oral assessments. Participant F from Level 2 said, "I quite do badly in writing in French when it comes to words that have a lot of accents in one sentence." Non-native speakers need to a long time to memorise the grammatical rules, and practise writing sentences with correct sentence structures as well as placing suitable accents on words when learning French as a foreign language.

The most difficult aspect of writing for French language learners is inadequate vocabulary for writing short essays in the examinations. Table 6 shows that Level 1 participants had some difficulties (mean of 2.40) while the Level 2 participants had severe difficulties (mean of 1.80). Interestingly, most of the participants interviewed highlighted the difficulty of differentiating masculine and feminine words because of cultural differences within French and Malaysia contexts. Each object has gender in French. Participant D from Level 1 said that French grammar was difficult and confusing because there are feminine and masculine words, and her view was echoed by Participant G from Level 2, as shown in Excerpt 4:

> *Excerpt 4*
> It's a bit complicated because they will have a feminine and masculine. So, it's very difficult to understand how to use the masculine and the feminine in grammar part. (Participant G)

As the languages commonly spoken in Malaysia (English, Malay, Mandarin and other indigenous languages) do not mark gender, grammatical gender-marking was difficult for the participants. Krenca, Hipfner-Boucher, and Chen's (2020) study showed that in a French immersion setting, the group of children whose first language marks gender has significantly different proportion of correctly marked feminine nouns compared another two groups whose first language did not have this feature of morphology.

DISCUSSION

In this section, the results are discussed in relation to related findings on learning of foreign languages in other contexts due to the lack of studies on learning of French as a foreign language. Firstly, the finding on the different ratings of French proficiency when compared to non-native and native speakers of French is not surprising. In the present study, most of the participants rated their French language proficiency as fair in relation to non-native speakers of French and between poor to fair in relation to native speakers of French. The results show that the participants were aware that French native speakers have greater competence than non-native speakers of French. What can be considered surprising is that there was little difference between the Level 1 and Level 2 participants in their self-rating of proficiency in French. In Thailand, Pawapatcharaudom (2007) also found out that the 70.00% of the language learners rated themselves having fair proficiency level when they were required to rate their own overall English proficiency compared with the proficiency of other students in their class. However, 63.33% of the language learners rated themselves as having poor English proficiency compared with the proficiency of English native speakers. In Pawapatcharaudom (2007) and in the present study, the language learners were aware that they were only beginners in the foreign language when compared to native speakers of the language. In the present study, the only exposure to French was in the French class, and this restricts opportunities for them to experience the language in authentic use. More than five decades ago, Carroll (1967) had already found that students who have spent time abroad in French-speaking environments or started learning the language during elementary school attain greater competence than other language majors without these opportunities. A recent study (Dewaele & Dewaele, 2021) confirmed that progress in learning French was correlated with the presence of a strong local French social network. Their study involved British and Irish students who had spent some time abroad in Francophone countries, and these students were both language and non-language majors.

As for their perceptions of their language skills, the results showed that receptive skills (listening and reading) were perceived as easier than productive skills (speaking and writing). However, there were differences between Level 1 and Level 2 participants. Both groups of participants perceived listening as the easiest skill to learn. Level 1 participants perceived speaking as the most difficult skill whereas Level 2 participants perceived writing as the most difficult skill to learn. This is due to the skill focus of the two levels of French courses. Level 2 participants struggled with writing and speaking because of an incremental emphasis on productive skills. They struggled with longer sentences, less familiar vocabulary, and more complex grammatical structures. Students in another Malaysian

university felt that listening and speaking should be an important focus in their French class (Halim, Abd Rahim, & Mansor, 2017), showing that the attributed more value to oral skills than written skills in French. For the participants in the present study, listening was relatively easy but speaking was very hard for beginner learners. Use of productive skills like speaking and writing require a certain base of vocabulary. In Sahenk Erkan's (2017) study on Turkish university students, more than half of the learners indicated that they had structured nearly correct phrases in French, indicating that they could develop their vocabulary knowledge in French. In the study, an Internet site (www.lexique.fle.fr) was used to provide materials and native speaker models for the students learning French. Dewaele and Dewaele (2021) reported that British and Irish students reported a significant linear increase in speaking and listening proficiency from the beginning to the end of the study abroad period in a Francophone country, but proficiency in reading and writing increased significantly only after the mid-way point. Dewaele and Dewaele's (2021) results confirm the results of the present study on the greater difficulty of learning written skills in French than oral skills.

CONCLUSION

The study was on perceptions of students learning French as a foreign language in a Malaysian public university. The findings showed the participants' awareness of their limited proficiency in French as seen in their self-rating of fair proficiency when compared with non-native speakers of French but fair to poor when compared with native speakers of French. Among the language skills, the receptive skills were found to be easier to learn, particularly listening. However, the Level 1 participants found speaking to be the most difficult skill whereas writing was the most difficult skill to Level 2 participants. This was reflective of the course context in the university where the study was conducted. Nevertheless, the results offer preliminary identification of learning difficulties in French. The results on the relative difficulty of the four language skills provide useful information to French language instructors and material designers to design the foreign language learning materials by preparing more speaking and writing activities. Future studies on challenges in learning of French as a foreign language can be conducted on a larger scale to verify the findings of this study.

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Predicting the Entrepreneurship Intention of Undergraduate University Students in Malaysia: A Comparison Study

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ABSTRACT

Entrepreneurship allows students to learn beyond their chosen field of study and provides an interdisciplinary work and development environment. This study aims to examine the influence of attitude towards behavior, subjective norm, and perceived behavioral control on entrepreneurship intention among Malaysian undergraduates. In addition, this study intends to compare the influence of attitude towards behavior, subjective norm, and perceived behavioral control on entrepreneurship intention between diploma and bachelor's degree students. Based on a quantitative approach, primary survey data were collected from 400 undergraduate students at a public university using convenience sampling to limit bias. The findings in this study indicate that attitude towards behavior, subjective norm, and perceived behavioral control are significantly positively related to entrepreneurship intention for diploma and bachelor's degree students. Notwithstanding this, the multiple regression results reveal that the strongest predictor of entrepreneurship intention for diploma students is the subjective norm while perceived behavioral control is the main predictor that affects entrepreneurship intention for bachelor's degree students. These findings contribute to the entrepreneurial intention literature by applying the theory of planned behavior in Malaysia with valuable practical implications for the management of universities and the government.

Keywords: Attitude towards behaviour, entrepreneurship intention, perceived behavioural control, subjective norm, undergraduate students

INTRODUCTION

Entrepreneurship can be defined as a dynamic process of vision, change, and creation that requires an application of energy and passion towards the creation and implementation of new ideas and creative solutions (Kuratko & Audretsch, 2009). Entrepreneurship has become a significant research topic and previous studies have proven that entrepreneurship helps to reduce the unemployment rate and improve country growth and productivity. Unemployment among graduates is regarded as a serious problem in Malaysia. With an ongoing COVID-19 pandemic, the unemployment rate has risen, and according to recent statistics produced by Malaysia's Department of Statistics (2020), the unemployment rate has risen from 3.9 percent in March to 4.7 percent in August 2020. In 2019, a total of 26.7 percent of graduates were unemployed, owing primarily to a lack of skilled occupations (Ministry of Finance Malaysia, 2020). With the rising number of graduates every year, the labor market has become incredibly competitive. Therefore, to solve unemployment issues in Malaysia, the government has taken several initiatives to create entrepreneurs among graduate students. The Malaysian Ministry of Higher Education also has urged that each of the subjects offered by any program needs to comprise the element of managerial and entrepreneurial skills. For example, in Universiti Teknologi MARA (UiTM), specific subjects such as Principles of Entrepreneurship (ENT530) is offered in the third semester for bachelor's degree students. With this subject, it can create successful entrepreneurs because the syllabus provides some important knowledge and inspirations for students to develop an individual's entrepreneurial intention (Abdul Kadir, Salim, & Kamarudin, 2012). Moreover, the study of Ismail *et al*. (2009) indicated that there is a high possibility that youngsters who take up entrepreneurial subjects have strong inspiration to become entrepreneurs.

In this regard, this study aims to measure and compare the influence of attitude towards behavior, perceived behavioral control, and subjective norm on entrepreneurship intention among diploma and bachelor's degree students. The current study has provided two significant insights into the state of the literature. Firstly, based on the theory of planned behavior, this study has provided insights on the overview of defined factors that can potentially determine entrepreneurship intention in which this study seeks to compare the proposed relationship between diploma and bachelor's degree students. The findings might reveal new knowledge for the current research. Although previous studies demonstrated relationships among the proposed variables, there is little evidence to support the examination of these variables from the context of demographics analyses. Thus, the purpose of this study is to compare between diploma and bachelor's degree students because empirical findings suggest that posit education level might impose a significant difference in entrepreneurship intention level (e.g., Beeka & Rimmington, 2011; Quan, 2012; Zellweger, Sieger, & Halter, 2011). For instance, van der Sluis, van Praag, & Vijverberg (2004) shows a significant relationship between year of schooling with entrepreneurship intention. According to Iacobucci and Micozzi (2012) and Packham, Jone, Miller, Pickernel, and Thomas (2010), advanced education level provides more technical abilities and learning opportunities to the students which could help them to increase their entrepreneurial awareness. Therefore, it could be concluded that poor educational background will lead to imprudent entrepreneurship intentions. Finally, the application of this study in the context of the Malaysian setting has provided future research with a reliable tool for assessing or further developing the extent of the identified factors.

Literature Review

Entrepreneurship Intention

Ajzen (1991) proposed the Theory of Planned Behavior (TPB) which recognized several determinants that influence people's intention and behavior. The theory was built based on the advancement of the earlier Theory of Reasoned Action (Fishbein & Ajzen, 2005). The TPB predicted three determinants that affect individual intention. Firstly, it is the attitude towards the behavior. Attitude is described as the extent to which a person has a favorable or unfavorable evaluation or appraisal of the behavior. Next, the second determinant is subjective norms. Subjective norms are described as the degree to which a person felt a social pressure to perform or not perform the behavior. Finally, the third element is perceived behavioral control where it refers to the anticipated ease or difficulty while performing the behavior and is expected to mirror previous experiences as well as perceived barriers and obstacles. According to Zain, Akram, and Ghani (2010), entrepreneurial intention involves the internal nerve, desire, and courage to stand alone by own feet. Intentions to be entrepreneurship can arise in an individual's inner self and mind if they have any transition and by that, the individuals can be potential entrepreneurs (Ismail *et al*., 2009). According to Walter and Dohse (2012), the entrepreneurial intention is access to know-how which means how to develop a new business or enter a new business, access to know who. The following are the main determinants that could affect entrepreneurial intention:

Attitude towards Behavior

Attitude towards the behavior is classified by the set of accessible behavioral beliefs which is according to the expectancy-value model (Fishbein & Ajzen, 2005). Liñán, Rodríguez-Cohard, and Rueda-Cantuche (2011) found that high entrepreneurial intention is led by a positive attitude. Based on a systematic literature review, Lortie and Castogiovanni (2015) found 16 studies that indicated a positive relationship between attitude and intention. In a similar vein, Mahfud, Triyono, Sudira, and Mulyani's (2020) study towards 215 polytechnic students in Indonesia revealed that entrepreneurial attitude affects psychological capital and business willingness. Thus, the students with a tendency or disposition to respond with some degree of favorableness towards entrepreneurship will engage more on entrepreneurship. Therefore, this study proposed the following hypothesis:

> H1: There is a significant positive relationship between attitude towards behavior and entrepreneurial intention for diploma and bachelor's degree students.

Perceived Behavioral Control

Perceived behavioral control associate's people's intention and action with resources and opportunities in which people will engage in a particular action if they have available resources such as money, time, and others (Ajzen,

1991). Ajzen (1991), Mwiya, Wang, Shikaputo, Kaulungombe, and Kayekesi (2017), and Paço, Ferreira, Raposo, Rodrigues, and Dinis (2011) have confirmed that perceived behavioral control predicts entrepreneurial intention. Lortie and Castogiovanni (2015), Urban and Pendame (2015), and Wong, Lee, and Leung (2006) strongly believed that perceived behavioral control could acts as the strongest predictor as compared to the subjective norm and attitude towards the behavior. For instance, research confirms that strong financial support could affect the success of business initiation (Gimmon & Levie, 2010). Therefore, this study proposed the following hypothesis:

> H2: There is a significant positive relationship between perceived behavioral control and entrepreneurial intention for diploma and bachelor's degree students.

Subjective Norm

Subjective norm can be defined as the social norm that individuals can perform or not perform towards desired behavior (Ajzen, 1991). It is recognized as the influence of a third party such as family or friends in influencing people to act and behave. Previous research has noted that subjective norms have an important role in underlying entrepreneurial intentions (e.g., Ariff, Bidin, Sharif, & Ahmad, 2010; Bhuyan & Pathak, 2019; Xue, David, & Liang, 2011). For instance, the study of Saraih, Ali, Sufian, and Ruslan (2020) towards 488 undergraduate students in one of the public universities in the Northern Region of Malaysia, has found that subjective norm is positively significant towards entrepreneurial intention (r=0.63, p=0.00). Therefore, this study proposed the following hypothesis:

> H3: There is a significant positive relationship between subjective norm and entrepreneurial intention for diploma and bachelor's degree students.

Research Framework

Figure 1 shows the conceptual framework established to study the relationship between dependent and independent variables.

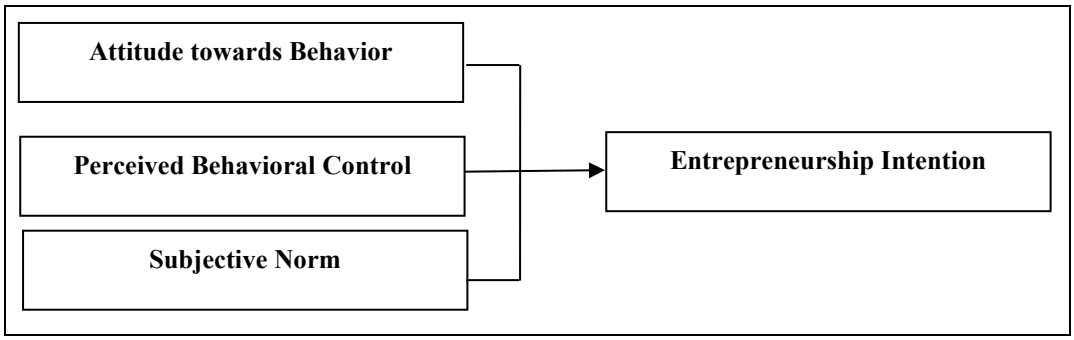

Figure 1. Conceptual Framework

METHODOLOGY

This study employs a quantitative survey and a simple random sampling for 400 public university students in Malaysia. From this sample, 180 respondents are diploma students and 177 respondents are bachelor's degree students. Thus, this constitutes 88.5% of the response rate. Table 1 summarizes the demographic profiles of this study.

Table 1. Profile of Respondents

No.	Profile	Diploma		Degree	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
1	Gender:				
	Male	76	42.2	51	28.8
	Female	104	57.8	126	71.2
	Total	180	100	177	100
2	Age:				
	21 years old and below	166	92.2	30	16.9
	22 years old and above	14	7.8	147	83.1
	Total	180	100	177	100
3	Does Family Own Business:				
	Yes	60	33.3	75	42.4
	No	120	66.7	102	57.6
	Total	180	100	177	100

In this study, the questions were adapted from the Entrepreneurial Intention Questionnaire (29 items) developed by Liñán and Chen (2009) and measured using a five-point Likert scale, starting from 1-strongly disagree to 5-strongly agree. The following are items for each variable:

Attitude:

- Being an entrepreneur would entail great satisfaction for me.
- A career as an entrepreneur is very attractive for me.
- If I had the opportunity and resources, I'd like to start a company.
- Among various options, I would rather be an entrepreneur.

Subjective Norm

- If I decided to create a company my close family would approve of that decision.
- If I decided to create a company my friends would approve of that decision

Perceived Behavioral Control

- I know the necessary practical details to start a firm.
- I can control the creation process of a new firm.
- I know how to develop an entrepreneurial project.
- If I tried to start a firm, I would have a high probability of succeeding.

Entrepreneurship Intention

- I will make every effort to start and run my firm.
- I am determined to create a firm in the future.
- My professional goal is to become an entrepreneur.
- I am ready to do anything to be an entrepreneur.

This study relies on the value of skewness and kurtosis to test the normality of the data, where these two items are referred to as the shape of the data distribution. According to Kline (2005), the value of skewness should fall within the range of -3 to +3 for the skewness while for the kurtosis the value should fall within the range of -10 to +10 to indicate normal distribution or otherwise it departs from normality. Then, the reliability of the instruments is measured using Cronbach's Alpha values, with less than 0.60 indicating poor reliability, 0.60 to

0.70 indicating moderate reliability, 0.70 to 0.80 indicating good reliability, 0.80 to 0.90 indicating extremely good reliability, and 0.90 indicating excellent (Sekaran & Bougie, 2016). Further, this study uses Pearson correlation to analyse the relationship between the dependent variable and independent variables to test the hypothesis. The relationship is significant if the p-value is less than 0.05 (one-tailed). Finally, this study also uses multiple regression to find out the main predictors of entrepreneurship intention.

FINDINGS

Based on the results of the normality test (Table 2), this study fulfilled the assumption of normality. Referring to Table 3, Cronbach's Alpha for attitude towards behavior (diploma=0.81, bachelor's degree=0.86), perceived behavioral control (diploma=0.85, bachelor's degree=0.85), subjective norm (diploma=0.80, bachelor's degree=0.81), and entrepreneurial intention (diploma=0.84, bachelor's degree=0.90) exceed 0.80. Hence, these variables are regarded as extremely good and reliable.

Table 2. Normality Results

Variables	Diploma		Bachelor's degree	
	Skewness	**Kurtosis**	**Skewness**	**Kurtosis**
Independent variables:				
Attitude toward Behaviour	-0.67	1.32	-0.53	0.18
Perceived Behavioural Control	-0.48	-0.15	0.07	-0.13
Subjective Norm	-0.85	0.64	-0.04	0.08
Dependent variable:				
Entrepreneurial Intention	-0.86	0.65	-0.40	-0.22

Table 3. Reliability Results

Variables	Diploma		Bachelor's degree	
	Cronbach's Alpha	**No. of Items**	**Cronbach's Alpha**	**No. of Items**
Independent variables:				
Attitude towards Behavior	0.81	4	0.86	7
Perceived Behavioral Control	0.85	4	0.85	6
Subjective Norm	0.80	2	0.81	7
Dependent Variable:				
Entrepreneurial Intention	0.84	4	0.90	6

According to the correlation analysis in Table 4, there is a significant relationship between attitude towards behavior and entrepreneurship intention of diploma students (r =684, p = 0.000) and bachelor's degree students (r = 0.722, p = 0.000). Therefore, the first hypothesis, H1 is accepted. Second, there is a significant relationship between perceived behavioral control and entrepreneurship intention for diploma students (r = 0.699, p = 0.000) and bachelor's degree students (r = 0.726, p = 0.000). The second hypothesis, H2 is also accepted as a result. The final findings discovered that there is a significant relationship between subjective norm and entrepreneurship intention for both groups of students (Table 4). Therefore, the third hypothesis, H3 is accepted.

To achieve the objective of this study, this study uses multiple regression analysis to test the three hypotheses. From Table 5, the adjusted R Square (R^2) for the diploma group is 0.652 which indicates that almost 65.2% of the variance in entrepreneurial intention is significantly explained by the three independent variables of attitude, subjective norms, and perceived behavioral control. For diploma students, the overall results are 1) attitude toward behavior (β = 0.263, p = 0.000), 2) perceived behavioral control (β = 0.282, p = 0.000) and 3) subjective norm (β = 0.375, p = 0.000). Therefore, it can be concluded that the strongest independent variable is the subjective norm.

Then, the adjusted R Square(R^2) value for bachelor's degree students is 0.711 where 71.1% of all the three independent variables have a significant influence on entrepreneurial intention. For bachelor's degree students, the overall results are : 1) attitude toward behavior (β = 0.319, p = 0.000), 2) perceived behavioral control (β = 0.358, p = 0.000) and 3) subjective norm (β = 0.301, p = 0.000). Therefore, from this result, the strongest independent variable is perceived behavioral control.

Table 4. Pearson Correlation Results

		Entrepreneurship Intention	
		Diploma	**Bachelor's degree**
Attitude towards Behavior	Pearson Correlation	0.684**	0.722**
	Sig. (1-tailed)	0.000	0.000
	N	180	177
Perceived Behavioral Control	Pearson Correlation	0.699**	0.726**
	Sig. (1-tailed)	0.000	0.000
	N	180	177
Subjective Norm	Pearson Correlation	0.748**	0.750**
	Sig. (1-tailed)	0.000	0.000
	N	180	177

Table 5. Regression Results

Variables	**Beta**	**Sig.**
Diploma students:		
Attitude toward Behavior	0.263	0.000
Perceived Behavioral Control	0.282	0.000
Subjective Norm	0.375	0.000
R^2	0.658	
Adjusted R^2	0.652	
F Change	112.882	
Sig.	0.000[b]	
Bachelor's degree students:		
Attitude toward Behavior	0.319	0.000
Perceived Behavioral Control	0.358	0.000
Subjective Norm	0.301	0.000
R^2	0.716	
Adjusted R^2	0.711	
F Change	145.317	
Sig.	0.000[b]	

DISCUSSION AND CONCLUSION

According to the findings, attitude towards behavior, perceived behavioral control, and the subjective norm have a significant positive relationship with entrepreneurship intention for diploma and bachelor's degree students. These results are consistent with the previous studies by Lortie and Castogiovanni (2015) and Liñán *et al*. (2011). This study reveals that the subjective norm (β = 0.375, p = 0.000) is the strongest predictor of student entrepreneurship intention for diploma students. This means that the students' entrepreneurship can be inculcated through strong support from their close ones such as family, peers, lecturers, and anyone considered important. The result of this study also indicates that the perceived behavioral control (β = 0.358, p = 0.000) variable is the main predictor of student entrepreneurship intention among the bachelor's degree students. To support this finding, Engle *et al*. (2010), Lortie and Castogiovanni (2015), Urban and Pendame (2015), and Wong *et al*. (2006) all strongly believed that perceived behavioral control was the stronger predictor than the subjective norm, with attitude toward behavior serving as a supporting factor. For instance, research confirms that strong financial performance affects enterprise performance (Gimmon & Levie, 2010). Thus, if students can perform certain behaviors and have control over them, the likelihood that he or she will become an entrepreneur increases. Therefore, this study concludes that there is a significant difference in performance between diploma and bachelor's degree students. In other words, diploma students require more social support than bachelor's degree students because their exposure to entrepreneurship education is limited. On the other hand, the perceived behavioral control such as rule and regulation, capital assistance, limited supportive business environment, and others are more important in assisting bachelor's degree students to venture into entrepreneurship. For instance, most bachelor's degree students at UiTM must register for the Principles of Entrepreneurship Course (ENT 530), which requires them to establish their own business. As a result, the exposure has occurred earlier, before they graduate.

As for managerial implications, the researchers believe that the university should provide strong support, particularly in terms of entrepreneurship education, financial assistance, moral support and development, business training and program, and others. In addition, because the university is the closest place for the student, the university must play an active role in fostering a more entrepreneurial mindset among students. Consequently, providing that assistance can improve the entrepreneur's attitude and reduce perceived barriers for the younger entrepreneur. Moreover, family and friends, as well as community surroundings play an important role in instilling entrepreneurship, as subjective norms have been discovered to have a significant influence. Therefore, the university should implement a role model or mentor to motivate students to participate in business activities.

There are certain limitations on the current study that can be used to offer recommendations for future research directions. This includes that the study was conducted as a cross-sectional study, which might have an impact on the timeline's validity. Therefore, it would be necessary for future studies to conduct longitudinal studies. Another limitation is that the research model is limited since this study only focuses on three determinants. Future research could build on the current study's findings to include mediating and moderating variables, and other important factors as variables.

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Satisfaction on Housing Quality in Mukim Bandar Johor Bahru and Mukim Plentong

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ABSTRACT

Housing study is one of the vital subjects these days as a home is a part of every person. The significance of it is undeniable because it has become one of the necessities of human life. Studies have shown that housing adequacy is connected with the Quality of Life because everything starts at home. The preceding housing problems will reflect on the policy problems of local authorities and management. Some of the previous aftermaths on housing might affect the balance and sustainability of residents. A lot of issues about housing have been drawn to the media especially in Malaysia. Water supply crisis, flood issue, a technical issue like elevator problem, waste management, security, lack of facilities such as public transport are some of the examples. It is also affecting the satisfaction towards housing quality indirectly. This study investigates the satisfaction on housing quality in Mukim Bandar Johor Bahru and Mukim Plentong, Johor Bahru, Johor which cover a total of 696,500 people. A sample of 196 respondents is surveyed to identify the locals' satisfaction with their housing quality in three aspects which are the physical of house, infrastructure, and the environment by using Cochran's formula. Descriptive analysis is used to analyse the quantitative data obtained. The result depicts the majority of respondents (74.0%) are satisfied with their housing condition overall. Despite identifying housing quality, this study also helps to identify the problems that the locals encountered which came out from the three highest rankings on common problems. They are drainage ditch, road damage or narrow, and roof damage.

Keywords: Environment, housing quality, infrastructure, physical of house, satisfaction level.

INTRODUCTION

Background of Study

Housing as an adequate shelter is very important in a person's life. According to Henilane (2016), special attention has been drawn to the concept of 'housing' in the economic literature. The term 'housing' is defined by the scholars as a commodity, as a tangible asset with a potential return, as a fixed asset regardless of whether it is owned or rented, and as a capital similar to a machine, if it is operated by a worker, but as a commodity, if it is not.

In conjunction with achieving the vision of Majlis Bandaraya Johor Bahru, which is '*to become a culturally and sustainable international city*', various development projects are being planned, especially housing. Many housing projects are done to provide suitable settlements and also to cater to the local population. Housing has become more than just a place to stay, it also could be an asset especially for those who can afford more than one unit of the house.

Adeleye, Azeez & Yusuff (2014) claims that an individual's perception of the environment is fundamental as it becomes the point of departure for any analysis of people and environment relations. Affordability, quality, demographic factors, public facilities, safety, and security are some of the aspects the potential buyer would consider when they want to buy a house. It is undeniable that those aspects will determine whether the property has a better demand in the market. Over the years, planners and designers have used several criteria to evaluate housing quality. According to Anderson and Weldemann (as cited in Adeleye *et al*., 2014) these include economic, physical, and social criteria.

This study will be looking at three aspects. One of the major components of the quality of housing is the physical of the house. External structure, internal structure, and internal environment are things that can be indicators to measure the quality of a house. According to Statistics New Zealand (2015), the external structure includes structural integrity, weather-lightness, security, external materials, and insulation, while internal structure describes the water supply, sewage disposal, power supply, and other internal components. Lastly, the internal environment is related to adequate ventilation, adequate lighting, floor surfaces free from tripping hazards, indoor air quality, and moisture levels. Another aspect that we will be looking at in this study is the facilities provided. Public services such as schools, hospitals, post offices, public transport, and police station are vital to people's well-being. This is because the facilities are nearer to them especially if there is an emergency. Housing quality can also be evaluated by looking at the environment. This relates to the availability of sufficient space in the residence. The main measuring instrument to describe space problems is the overcrowding rate (Streimikiene, 2015). An appropriate space of a home is essential because it is the place where people have their privacy and pleasant time.

Literature Review

Quality of Life

Various thinkers in the fields of social policy, psychology, economics, health services, and medicine proposed varying definitions of a good Quality of Life (QoL) as their way to answer some of life's ultimate questions, meanings or aims. According to the World Health Organization (2014), QoL is defined as an individual's insight of one's life situation in the context of the culture and value systems in which they live and concerning their goals, expectations, standards, and concerns. It is a wide-ranging notion affected in a complex way by the person's physical health, psychological condition, personal beliefs, social relationships, in addition to and the person's relationship to his/her environment. Diener, Suh, Lucas, and Smith (as cited in Theofilou, 2013) describe QoL as how a person measures the 'goodness' of multiple aspects of one's life which include emotional reactions to a life event, disposition, sense of life fulfilment, and satisfaction and, satisfaction with work and personal and personal relationships. Therefore, QoL is extremely important to serve the health and well-being of a person.

A research conducted by Flanagan (1978) in defining the Quality of Life of Americans found that 15 factors were important or very important to their QoL and that their necessities and wants were well or very well met. The 15 factors highlighted in the research were as follows: material comforts; health and personal safety; relationships with your parents, brothers, sisters, and other relatives; having and raising children; close relationship with husband/wife/a person of the opposite sex; close friends; helping and encouraging others; participation in activities relating to the local and national government and public affairs; learning; understanding yourself; work; expressing yourself; socializing; reading, listening to music, or observing sports events or entertainment; and participation in active recreation. In this research, Flanagan (1978) also stipulated that the 'ideal' way to measure an individual's QoL is by evaluating the experiences of each individual. Only a significant or remarkable impact on the individual's QoL would be reported to make it practical to implement such an evaluation. People could suffer from all the defects that subjective ratings have because memories are flawed and selective where a current experience may distort the report.

In Malaysia, the quality of life is a measurement of growth and harmony. There are several indicators to portray the wellbeing of the community, such as income and distribution, environment, transport and communication, health, education, housing, environment, family life, social participation, and public safety (Abu Samah, Hassan, Jaafar, Mohd Jaafar & Raja Ariffin, 2013). Meanwhile Abdullah, Ahmad Sarkawi, and Md. Dali (2017) reveals that Malaysian Wellbeing Indices have been evaluated and published through a few reports like The Malaysian Quality of Life Reports (MQLI, 1999-2011), The Malaysian Wellbeing Index (MWI, 2013), The MURNInet (1998), and the MURNInets (2011), and, last but not least, The Malaysian Family Wellbeing Index (MFWI, 2011).

Housing Quality

Quality means the standard of something as measured against other things of a similar kind, the degree of excellence of something where we put certain standards to measure it. As housing is one of the essential needs of an individual, considering its quality is a necessary element to ensure people's health especially children's development. Based on the study by Baker, Mason, and Mallett (as cited in Aniza, Norfazilah & Norhayati, 2018), accessibility to adequate housing has been proven crucial specifically for vulnerable populations like the indigenous communities, to elevate their physical and mental well-being.

In looking for the most significant aspects to represent the quality of houses that is preferable to everyone, past researchers would be considering three main factors, including the physical factors, the social factors, and economic factors (Anderson & Weldemann as cited in Adeleye *et al*., 2014; Abdul Rahman, Salleh & Omar, 2012). Each factor provides a broader range to express its characteristics as to meet the satisfaction of the homeowner. Generally, most findings depict that the perception or satisfaction of housing is influenced by the housing quality. Abdul Rahman *et al*. (2012) stipulate that physical factors have four categories namely dwelling unit, facilities and services, accessibility, and surrounding environment, while the social factors can be distinguished in terms of socio-demographic, social community, and place attachment. On the other hand, they also claim that the economic factors are related to the residents' socio-economic background.

Various relevant indicators could be selected to regulate the quality of a house. Streimikiene (2015) views that the indicators for housing quality dimension are the percentage of crowding rate, percentage of housing deprivation rate by the number of items, percentage share of the total population considering their dwelling as too dark, and percentage share of the population satisfied with housing quality. One of the components of housing quality is ventilation, which means that air circulation plays a massive role in assuring that everyone in the house breathes soothingly the fresh air without any problem. It enhances the mood in the house that the household members feel comfortable. The same goes for the lighting in the house as poor indoor lighting could adversely affect one's well-being. It is not just about lighting mood, but poor eyesight could be a problem if the house is always in a dark condition. As much as plants would, we humans also need natural light daily.

The crowding rate in a home is also a consideration of housing quality. This relates to the housing space deficit where an increase in family size would contribute to the overcrowding problem in the house. Every household needs a different house structure according to its life cycle, whereby each stage requires different needs and purposes. In Hashim and Yahaya (2001), there are four stages to meet the housing needs of the life cycle, the wit; couples without children level; basic family level: toddler; basic family level: teenagers; and adult and old level.

Hence, having the most suitable dwelling according to the family size brings out positive impacts especially for childhood development. The crowding rate is not just about the housing deficit for family size. It includes the personal or private space that is essential for each individual to rest, having ‘me-time’ without any disturbance because everyone owns the right to privacy. In addition, the physical space between neighbours could be related to the aspect of the physical environment, which is one of the objectives of this study.

Physical aspects for housing are the biggest concern that a person would be thinking about because this forecasts the probability of risk that might happen, for example, how long the electrical system would perform its consistency to deliver enough electric supply. People nowadays tend to consume more electricity, so this aspect is needed to be put into consideration. Physical aspects also include the external environment such as the location, the layout of the housing area, the provision and location of public facilities and infrastructure, sustainability aspects, social aspects, and as well as cost and value for money (Ali, 2018). Indeed, all these aspects discussed the need for balance to guarantee the well-being of an individual or family as a small but significant institution that starts from home.

Perception and Satisfaction on Housing

Perception is a belief or opinion, often held by many people and based on how things are viewed and perceived. Mathews and Parker (as cited in Al-KhanbashiRaja & Mohit, 2014) state that satisfaction is a process of evaluation

between what was received and what was expected. It is an evaluation to describe the degree of contentment of a person. Perception and satisfaction play important role in this study to reach the person's goal where both will be related to the dwelling.

Research has been conducted to determine the perception of housing in the Ogun State, southwest of Nigeria. For instance, Adeboye, Alagbe, and Ibem (2015) reveal that the respondents generally felt their housing conditions were not sufficient in meeting their current needs and expectation where, consequently, they were not contented or happy. Dwelling occupancy type and public social amenities (services) are both the first factor that accounted for 18.084% which is the highest of the variance, followed by the second factor, indoor environment quality, with 11.076% of the variance. As for the findings of the study, a strong relationship between housing adequacy and residential satisfaction is proven to the basic assumption. The research includes three dimensions of evaluating residential satisfaction, which are:

a) physical, social and economic environment oh housing estates
b) size, type location, appearance, and privacy of residence
c) security

As for housing satisfaction in Malaysia, Mohit and Mahfoud (2015) did a study on residential satisfaction in double-storey terrace housing in Kuala Lumpur. They examined five main components and 59 variables. The findings show that the residents are moderately dissatisfied with the neighbourhood and public facilities. On the other hand, they are a little over slightly satisfied with the physical features, housing support services, and the social environment. Overall, the correlation shows that satisfaction is highly related to housing support, social environment, and physical components rather than with the public and neighbourhood facilities components. Another study conducted by Ali and Mohit (2016) to determine the satisfaction and quality of urban life in Setiawangsa, Kuala Lumpur, shows that the respondents are very satisfied with their housing particularly in the aspects of home, neighbourhood, and quality of urban life. Even though cities are synonymous with hectic and stressful conditions, the study reveals that with an adequate place or environment to live in, people still could gain better welfare to achieve the true quality of life.

METHODS

Location of Study

This study was conducted in the range of two mukims which are Mukim Bandar Johor Bahru and Mukim Plentong. The two places are located spatially in the Johor Bahru District, Johor where the administrative center of the state is settled. Based on the data from Pusat Infrastruktur Data Geospatial Negara (2011), a sum of seven mukims are in Johor Bahru District which are Mukim Jelutong, Mukim Plentong, Mukim Sungai Tiram, Mukim Tanjung Kupang, Mukim Tebrau, Mukim Bandar Johor Bahru and Mukim Pulai as shown in Table 1. Both mukims are located adjacent to each other where the area of Mukim Bandar Johor Bahru is smaller than Mukim Plentong with the area of 41.1km² and 256km², respectively, according to the Department of Statistics Malaysia (2010). In comparison to the other five mukims, these two mukims are known as highly urbanised

Table 1. The total population according to mukim.

Mukim	Population
Bandar Johor Bahru	119,900
Plentong	576,600
Jelutong	27,200
Pulai	449,500
Sungai Tiram	17,500
Tanjung Kupang	12,400
Tebrau	397,200
Total	**1,600,300**

and where there is a higher density of population, and housing development is growing rapidly since the 1990s. Figure 1 is the location of the study.

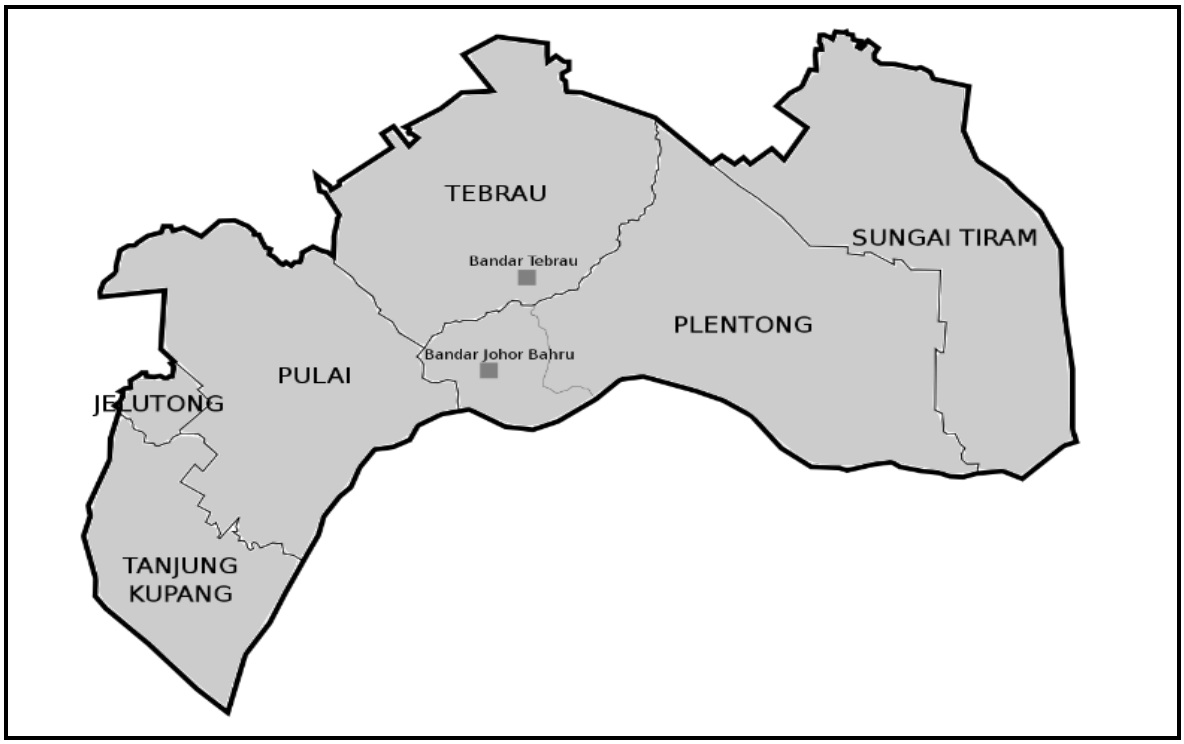

Figure 1. The location of Mukim Bandar Johor Bahru and Mukim Plentong. (*Source: Pusat Infrastruktur Data Geospatial Negara, 2011*)

Data Collection

The research instrument used in this study is self-administered questionnaires. Likert Scale was used to evaluate the satisfaction on the quality of the houses among the targeted respondents particularly from the aspects of physical, infrastructure, and environment. Purposive sampling was applied where the distinct criteria were the legitimate homeowner or tenant, the head of household, or representative, who is knowledgeable about the house condition and has been staying at the house.

Based on the information gathered from the Jabatan Perangkaan Malaysia Negeri Johor (N. Anis, personal communication, October 3, 2019), the total population of the two mukims chosen is 696,500. Hence, this study used Cochran's formula to get the number of the sample because it is suitable for a large population. The sample size was 196. The respondents were chosen randomly from both mukims.

Cochran's formula is as follows,

$$n_o = \frac{Z^2 pq}{e^2}$$

Where:

e is the margin of error
p is the estimated proportion of the population
q is 1-p
Z- value is found in Z table

As there is not much information on the subject, to begin with, this study assumes that half of the population are the homeowners where p=0.5. 95% of confidence is implemented for precision gives us the Z-value of 1.96, with 7% precision. Therefore, the full calculation is:

$$n_o = \frac{Z^2 pq}{e^2}$$

$$n_o = \frac{(1.96)^2(0.5)(1-0.5)}{0.07^2}$$

$$n_o = 196$$

Data Analysis

Descriptive analysis was implemented to analyse the quantitative data collected from the survey. Statistical Package for Social Sciences (SPSS) was used as the software to record and interpret the data obtained. Through SPSS, the data collected can be simply coded to run.

RESULTS

The Likert Scale was used for determining the perception of housing satisfaction. Five types of evaluation terms were used which are (1=Very not satisfied, 2=Not satisfied, 3=Not sure, 4=Satisfied, 5=Very satisfied). There were three main aspects of housing satisfaction variables that this study was focused. They were the physical of house, environment, and infrastructure. As shown in Table 2, most of the respondents were ‘Satisfied’ and ‘Very Satisfied’ for each variable with a total of more than 50%. For the physical of house aspect, the parking area had the lowest total percentage of 'Satisfied' (41.8%) and 'Very Satisfied' (26.0%) among all the variables. Meanwhile, the infrastructure aspect had the lowest total percentage of both ‘Satisfied’ and ‘Very Satisfied’ too, particularly on public transport facilities (55.1%), adequacy of safety (49.4%), and adequacy of recreational facilities (55.1%). On contrary, home cleanliness (87.2%) and housing location (81.1%) were the variables that had the highest total percentage of both ‘Satisfied’ and ‘Very Satisfied’ in the aspect of the environment.

As Table 3 below, the highest mean was the physical of house aspect with 4.0. This depicted that people were mostly satisfied with the physical of the house overall. On contrary, the lowest mean was 3.7 for the environmental aspect. Both infrastructure and environment were in 'Not Sure' because the mean was below 4.0.

Table 4 showed the comparison means for two mukims. Mukim Johor Bahru had a higher mean for the physical of the house (4.0) and environment aspects (3.9). While the infrastructure aspect in Mukim Johor Bahru was slightly lower with 3.8 compared to 3.9 in Mukim Plentong. Both the physical of house (3.9) and environment (3.6) aspects in Mukim Plentong were lower than Mukim Johor Bahru.

Table 5 depicted the overall satisfaction with housing quality. 145 respondents from 196 chose 'Yes' with the biggest percentage of 74.0%, 10.2% were from respondents who chose 'Moderate' and the smallest percentage was 2.6% who answered 'No'. This section was an open-ended question which was why some respondents skipped answering this part, with the irrelevant number of 26 respondents.

Table 6 indicated the common housing problems encountered by the homeowner. They ranked the issues from 1 to 12 in a close-ended question. Rank 1 was indicating the most common housing problem while Rank 12 was the least likely common housing problem. The drainage ditch was the highest rank as many respondents put it as Rank 1. The outcomes were shown as in Table 6.

Table 2. Perception on housing satisfaction in percentage.

	Housing satisfaction variables	Evaluation terms (%)				
		Very Not satisfied	**Not Satisfied**	**Not Sure**	**Satisfied**	**Very Satisfied**
Physical of house						
1.	Wall structure	1.0	8.7	12.8	52.0	25.5
2.	Floor structure	0.0	7.7	11.2	53.6	27.6
3.	Roof structure	1.5	2.6	20.4	46.9	21.9
4.	Piling structure	0.5	4.6	14.3	55.6	25.0
5.	Source of water supply	1.0	4.6	11.7	52.6	30.1
6.	Source of electricity supply	1.0	2.0	9.7	53.6	33.7
7.	Condition of toilet	0.5	10.2	13.3	52.0	24.0
8.	Condition of bedroom	0.0	4.1	12.2	56.6	27.0
9.	Condition of kitchen	1.0	10.0	13.8	49.5	26.0
10.	Condition of dining room	3.6	4.6	15.8	49.5	26.5
11.	Condition of living room	1.5	3.1	9.7	53.1	32.7
12.	Number of bathrooms	3.1	11.7	9.2	47.4	28.6
13.	Number of bedrooms	1.5	4.6	16.8	49.5	27.6
14.	Number of sockets	1.5	8.7	13.8	43.9	32.1
15.	Door/gate structure	1.5	7.1	15.3	51.5	24.5
16.	Window structure	2.6	6.1	11.7	55.6	24.0
17.	Home area	2.6	5.6	36.2	51.0	30.1
18.	Home design	1.0	5.1	16.3	51.0	26.5
19.	Parking area	4.6	9.7	17.9	41.8	26.0
Infrastructure						
1.	Public transport facilities	6.6	12.8	25.5	40.8	14.3
2.	Adequacy of waste management	4.6	4.1	17.9	50.0	23.5
3.	Adequacy of good schools	1.0	3.6	13.8	48.0	33.7
4.	Adequacy of shopping facilities	1.5	2.0	13.3	40.3	42.9
5.	Adequacy of roads	2.0	3.6	11.2	49.5	33.7
6.	Adequacy of streetlights	1.0	2.6	13.3	48.0	35.2
7.	Adequacy of the place of worship	4.1	1.5	7.7	47.4	39.3
8.	Adequacy of safety	9.2	15.3	26.0	32.1	17.3
9.	Adequacy of recreational facilities	6.1	13.8	25.0	32.1	23.0

Table 2. Cont…

Housing satisfaction variables		Evaluation terms (%)				
		Very Not satisfied	**Not Satisfied**	**Not Sure**	**Satisfied**	**Very Satisfied**
Environment						
1.	Privacy level	3.1	12.2	19.4	42.9	22.4
2.	Presence of foul odour	7.1	15.8	29.4	41.8	14.8
3.	Noise level	7.1	15.3	15.8	45.9	15.8
4.	Crime rate	4.6	15.3	25.5	40.8	13.8
5.	Housing location	3.1	4.6	11.2	51.0	30.1
6.	Safety	5.6	11.2	15.8	51.0	16.3
7.	Congestion rate	4.1	15.3	15.8	49.0	15.8
8.	Environmental problem	4.9	12.8	20.4	43.9	18.4
9.	Local community	2.6	5.1	15.3	53.1	24.0
10.	Air ventilation	3.1	7.1	11.2	52.0	26.5
11.	Home cleanliness	1.5	2.0	9.2	55.1	32.1
12.	Temperature comfort	2.0	6.6	12.2	52.6	26.5

Table 3. Descriptive statistics for housing satisfaction variables.

	N	**Minimum**	**Maximum**	**Mean**
Physical of house	19	3.8	4.2	4.0
Infrastructure	9	3.3	4.2	3.9
Environment	12	3.4	4.1	3.7

Table 4. Descriptive statistics for housing variables according to two mukims.

	N	**Minimum**	**Maximum**	**Mean**
Mukim Johor Bahru				
Physical of house	19	3.7	4.2	4.0
Infrastructure	9	3.3	4.3	3.8
Environment	12	3.6	4.2	3.9
Mukim Plentong				
Physical of house	19	3.7	4.1	3.9
Infrastructure	9	3.3	4.3	3.9
Environment	12	3.2	4.1	3.6

Table 5. Overall satisfaction on housing quality.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	145	74.0	85.3	85.3
	Moderate	20	10.2	11.8	97.1
	No	5	2.6	2.9	100.0
	Total	170	86.7	100.0	
Missing	Irrelevant	26	13.3		
Total	196	100.0			

DISCUSSION

Overall, across the variables to evaluate the satisfaction in housing quality, this research found that the majority of the respondents are satisfied with their housing quality which includes the physical of the house, environment, and infrastructure. Hence, this indirectly answered the first objective of the research which is to identify the perception of the quality of housing from the three perspectives mentioned before. They are not dealing with any big issues that threaten their life, safety, or health. Among the three main aspects, respondents are more satisfied with the physical of the house. The other two aspects frequently depend on responsible agencies such as Jabatan Kerja Raya and Majlis Bandaraya. Any problem encountered cannot be solved directly, unlike the physical of house. Thus, there is no big issue on the physical of the houses that would contribute to dissatisfaction.

Table 6. Common housing problems encountered.

Problems Encountered	Rank
Drainage ditch	1
Road damage/narrow	2
Roof damage	3
Electrical wiring	4
Lighting	5
Piping	6
Vandalism	7
Disruption of water supply	8
Disruption of electrical supply	9
Air ventilation	10
Crime	11
Neighbourhood problem	12

Based on the survey conducted, some respondents faced a little unpleasant satisfaction on the parking area for physical structure. They complained that the number of parking spaces is insufficient and sometimes their car is blocked by another car. As for the infrastructure aspect, public transport facilities, adequacy of both safety and recreational facilities have less satisfaction among the respondents. On another note, all sub-variables in the environment are chosen as satisfied mostly by the respondents. A foul odour and noise level have the highest percentage of ‘Very Not Satisfied’, which means that some of the respondents suffered from these issues. It is believed that this is due to the housing location. Some of the respondents live in an industrial location at Pasir Gudang (in Mukim Pletong) which affects the level of satisfaction of the variables. However, the majority of respondents chose 'Satisfied' for overall satisfaction on housing quality with a percentage of 74.0%.

Various housing issues have been determined by the respondents in this research. They ranked the issues from the most common to the least problems, where the issue would be in the first rank if the percentage of respondents has the highest number. Therefore, this covered the second objective of the research which to identify the challenges in housing. The most frequent issues that people ranked the highest are the drainage ditch, road damage or narrowed road, and roof damage. Electrical wiring is in the fourth-ranked despite most respondents are satisfied with the physical of house because the house is built since the 1990s. The houses have been ages and have inappropriate wiring plan. Meanwhile, road damages or narrow roads are ranked second and it is believed due to the homeowners had a few cars that they park outside of their house. This causes the narrow road. In some cases, the road itself is built narrow especially those houses in the 1990s and before. Other issues are also significant as the common issues because these challenges actually will physically or emotionally disrupt the daily life of respondents. Hence, there is a need to overcome these issues.

CONCLUSION

Determining the way that could enhance the quality of life in terms of homeownership plays an important role to secure any social impact especially when it comes to inner peace or mental illness. A home is a place to feel secure and safe where homeownership, therefore, acts as an important role in mitigating life stress, especially in old age (Szabo, Allen, Alpass & Stephens, 2017). At least people should discover their bare minimum to tolerate the housing quality. The healthiness of people's minds should be the priority regarding any situation.

The variables used in this study, which is to determine the perception of housing quality, should be more varied for further research. By this, more details can be gathered to improvise the findings of this type of research. Broad information will help in identifying what is the best solution to overcome any consequences particularly because different dimension tells different layers of the issue. As for this research, only three main perspectives are covered which are the physical of the house, environment, and infrastructure, ascribing the simpler to determine housing satisfaction. Not just that, more sub-variables also need to be put in appropriate consideration to get the best result.

The responsible agency such as Majlis Bandaraya Johor Bahru and Jabatan Kerja should take note of the common problems that the respondents encountered especially the drainage ditch, road damages or narrow roads, and roof damages. These problems could lead to a more serious problem. Refining the quality standard or enhancing law is very preferable to overcome the issues.

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Perbezaan Pandangan Masyarakat Melayu dan Cina Terhadap Dasar 1MALAYSIA: Satu Kes Kajian di Satok, Kuching

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ABSTRAK

Setelah mendapat keputusan tidak memuaskan pada Pilihan Raya Umum Ke-12 yang diadakan pada 8 Mac 2008, maka Barisan Nasional (BN), harus mencari alternatif untuk menarik semula perhatian rakyat Malaysia supaya kembali memilih dan menyokong BN seperti sebelum itu. Satu strategi yang digunakan Perdana Menteri Dato' Sri Mohammad Najib Tun Abdul Razak selepas mengambil alih pucuk kepimpinan negara pada tahun 2009 adalah dengan melancarkan Dasar 1Malaysia yang berbekal slogan 'Rakyat Didahulukan, Pencapaian Diutamakan'. Dasar 1Malaysia yang dilihat mempunyai sifat perpaduan, integrasi dan kesaksamaan pasti akan menggundang pelbagai reaksi daripada pelbagai kumpulan etknik yang terdapat di negara ini. Tujuan kajian ini adalah untuk menganalisa perbezaan dan persamaan pandangan dan interpretasi masyarakat Melayu dan Cina di Sarawak, terutama sekali di sekitar kawasan komersial Satok - iaitu tempat kajian dilakukan - terhadap Dasar 1Malaysia dari aspek pengetahuan am mengenai konsepnya, dan penerimaan dan persetujuan mereka terhadap idea tersebut. Objektif kajian ini adalah untuk menunjukkan bahawa wujudnya perbezaan persepsi dan interpretasi antara masyarakat Melayu dan masyarakat Cina berkaitan kefahaman terhadap Dasar 1Malaysia dan caranya dilaksanakan.

Kata kunci: Interpretasi, kaum, pandangan, perbezaan idea, persamaan pendapat

PENGENALAN DAN LATAR BELAKANG

Tahun 2008 begitu signifikan bagi politik tanah air kerana pada tahun tersebut kita dapat menyaksikan kepimpinan Barisan Nasional (BN) telah goyah. Tiada sesiapa yang berani menerpa bahawa, dalam pilihan raya negara yang ke-12 (PRU-12) pada 8 Mac tahun itu, BN yang telah mentadbir negara sejak tahun 1957 akan hilang kepercayaan dua pertiga di Dewan Parlimen dan tewas di lima negeri iaitu di Kedah, Kelantan, Perak, Pulau Pinang dan Selangor. Prestasi BN di Kelantan juga semakin bertambah buruk. Perkara ini adalah satu keputusan yang mengejutkan dan BN seolah-olah hilang arah dan hilang keyakinan dan juga nampak kurang pasti dengan kewibawaan yang sedia ada. Walaupun, mereka tidak mengatakan demikian, namun keputusan pilihan raya yang ke-12, adalah satu episod yang sangat memalukan pucuk pimpinan dan penyokong UMNO (United Malays National Organisation) dan BN. Walaupun, parti pembangkang belum dapat menawan Dewan Parlimen, namun satu sorakan yang ditunjukkan oleh mereka seolah-olah mereka telah memenangi pilihan raya tersebut.

Kedudukan BN tidak lagi semantap dahulu kerana majoriti rakyat menaruh harapan tinggi supaya pihak BN mampu memimpin rakyat ke arah kehidupan yang lebih berkualiti. Sebenarnya banyak faktor yang menggoyahkan kedudukan BN. Antara faktor yang dianggap telah mempengaruhi keputusan pilihan raya ke-12 adalah seperti calon baharu, ketidakpuasan hati dalam kalangan sesama pemimpin parti, kadar kes jenayah semakin meningkat, rasuah berleluasa, penyalahgunaan kuasa dan pemilikan harta berlebihan dalam kalangan pemimpin, dan isu HINDRAF (Hindu Rights Action Force). Faktor-faktor ekonomi adalah seperi kenaikan harga minyak, harga barangan, bayaran tol, dan kenaikan kos sara hidup juga telah dianggap mempunyai peranan penting yang mengakibatkan kemerosotan sokongan pengundi kepada BN.

Lantaran itu, bagi meraih kembali kepercayaan rakyat, beberapa usaha pembaharuan perlulah dilakukan segera dan pada skala menyeluruh. Hal ini adalah penting kepada pihak kerajaan memandangkan perpaduan semakin lemah dalam kalangan rakyat akibat terlalu banyak konflik. Selepas mengambil alih kuasa daripada Tun Ahmad Badawi, Dato' Sri Mohammad Najib Tun Razak bertindak dengan melancarkan Dasar 1Malaysia pada skala menyeluruh dan besar-besaran untuk memulihkan keadaan BN yang telah kehilangan kepercayaan daripada penyokong-penyokongnya. Mengikut Bridgman dan Davis (1999), pertukaran tampuk kepimpinan negara biasanya akan membawa agenda baru kerajaan. Dengan ini demikian, seseorang pemimpin yang baru harus menggariskan dasar dan ideanya sebagai petunjuk bahawa nilai dan niat beliau berkaiatan isu-isu yang melanda masyarakat diberi perhatian dengan terperinci. Pelancaran dasar seperti Dasar 1Malaysia menunjukkan nilai dan niat seseorang ketua dan beliau akan mendominasi domain isu-isu tertentu (Baumer & Van Horn, 2014).

Menyedari hakikat bahawa pihak kerajaan akan menghadapi kesukaran untuk memulih semula keadaan sekiranya mereka mengabaikan kepentingan seluruh rakyat tanpa mengira batasan kaum, agama mahupun latar belakang, maka Dasar 1Malaysia yang berbekalkan slogan, 'Rakyat Didahulukan, Pencapaian Diutamakan' ini dilaksanakan. Dasar ini secara keseluruhannya memfokuskan kepada perpaduan kesemua warganegara Malaysia yang terdiri daripada pelbagai kaum seperti Melayu, Cina, India, Iban, Kadazan dan lain-lain supaya bergerak sebagai satu kumpulan ke arah memajukan negara Malaysia dalam menuju dan merealisasikan Wawasan 2020.

Sebagai sebuah kerajaan yang bertanggungjawab, BN telah menggubal Dasar 1Malaysia bagi tujuan untuk memastikan keadilan serta kesaksamaan dapat dinikmati oleh segenap lapisan masyarakat dan kaum. Dasar 1Malaysia merupakan salah satu dasar awam di Malaysia yang memberikan implikasi terus kepada kehidupan rakyat. Dasar awam adalah mengenai tindakan-tindakan kerajaan yang dilakukan untuk sesuatu tujuan (Anderson, 2015; Hussain, 2002). Kerajaan akan memilih untuk membuat atau memilih tidak membuat sesuatu untuk menyelesaikan masalah yang dihadapi oleh rakyat**.** Gerston (2004) pula melihat dasar awam sebagai satu komitmen terhadap sesuatu. Berdasarkan pandangan ini beliau melihat dasar awam sebagai satunya respons terhadap matlamat baru, nilai baru, dan hubungan yang muncul akibat krisis atau konfrontasi. Bagi Denhardt, Denhardt dan Blanc (2014), dasar awam ialah tindakan politik untuk menghadapi realiti politi, manakala Kernaghan dan Siegel (1999) berpendapat bahawa dasar awam ialah satu tindakan khas kerajaan. Turner dan Hulme (1997), melabelkan cadangan khas, keputusan keraajaan dan program yang dilaksanakan kerajaan sebagai satu dasar. Perlaksanaan Dasar 1Malaysia melibatkan pelbagai program, projek, tindakan kerajaan seperti Bantuan Rakyat 1Malaysia (BR1M), Klinik 1Malaysia, Kedai Rakyat 1Malaysia, dan Komputer Rakyat *(Netbook)* 1Malaysia. Perlakasanaan kesemua ini memerlukan pengagihan sumber negara dan juga menggambarkan nilai seseorang pimpin. Oleh itu, Dasar 1Malaysia boleh dianggap sebagai dasar utama kerajaan pada masa itu.

Easton (1957), seorang ilmuwan sains politik yang tersohor menterjemahkan dasar awam sebagai satu nilai peruntukan pihak berkuasa bagi keseluruhan masyarakat. Ini bermakna sesuatu dasar yang diketengahkan oleh pihak berkuasa, iaitu kerajaan, adalah untuk keseluruhan masyarakat. Maka sesuatu dasar itu harus mempertimbangkan kesan yang bakal diterima oleh masyarakat sebelum diketengahkan. Manakala, Lasswell dan Kaplan (1970), mendefinisikan dasar awam sebagai sesuatu program yang telah ditetapkan matlamat, nilai dan pelaksanaanya. Ini menunjukkan pembuat dasar iaitu kerajaan, telah mengambil kira atau membuat pertimbangan sebelum melaksanakan sesuatu dasar. Jelas bahawa kerajaan mempunyai peranan yang signifikan dalam memperkenalkan mana-mana dasar yang secara langsung akan memberikan impak kepada kehidupan rakyat. Seperti Dasar 1Malaysia, kerajaan mempunyai peranan agar dasar yang diketengahkan dapat diterima oleh rakyat. Pembentukan dasar awam bertujuan untuk menyelesaikan masalah masyarakat.

Ironinya, sebagai sebuah kerajaan, BN telah mengambil pendekatan pragmatik memperkenalkan Dasar 1Malaysia bagi memupuk perpaduan, keadilan dan kesaksamaan bagi menjamin kestabilan negara. Politik dan dasar sukar untuk dipisahkan kerana aktor-aktor politik yang dipilih oleh rakyat yang akan menjadi penggubal dasar. Sebagai sebuah kerajaan, BN sedar seandainya mereka tidak menjalankan dasar yang lebih adil untuk rakyat Malaysia

yang berbilang bangsa, maka, sudah tentu pada Pilihan Raya Umum yang seterusnya, akan menyebabkan pihak BN menghadapi tentangan yang lebih hebat. Isu perpaduan ditekankan kerana perpaduan rakyat merupakan elemen penting dalam integrasi nasional dan pembangunan negara. Maka pengenalan Dasar 1Malaysia sebagai teras dasar di Malaysia amat bertepatan untuk memupuk semangat perpaduan serta memastikan keadilan dan kesaksamaan dapat dirasa oleh semua rakyat.

Pilihan Raya Umum Ke-12

Keputusan PRU-12 ini merupakan keputusan paling buruk bagi BN dalam sejarah pilihan raya yang diadakan di negara kita. Namun begitu keputusan tersebut merupakan pencapaian terbaik bagi parti-parti pembangkang terutama bagi parti-parti pembangkang di Semanjung. Daripada 222 kerusi yang dipertandingkan, BN hanya mampu memenangi 139 kerusi sahaja. Sementara di peringkat DUN, pihak pembangkang berjaya menewaskan BN di lima buah negeri iaitu Kedah, Kelantan, Perak, Pulau Pinang dan Selangor. Manakala daripada 505 kerusi DUN yang dipertandingkan, hanya 307 buah kerusi yang mampu dimenangi oleh pihak BN (SPR, 2008; Wikipedia, 2008). Keputusan ini jelas membuktikan BN telah kekurangan sokongan daripada rakyat.

Akibat pola perubahan besar PRU-12 ini, maka ramai penganalisa politik melabelkan fenomena tersebut sebagai 'Tsunami Politik'. Senario ini juga telah dianggap sebagai "*wake up call*" bagi BN khususnya UMNO. Malah, PRU-12 tersebut telah mencatatkan bilangan undi rosak terbesar dalam sejarah Pilihan Raya Umum Malaysia. Keadaan ini juga menunjukkan bahawa para pengundi tidak berpuas hati dengan prestasi BN. Maka tindakan kerajaan memperkenalkan Dasar 1Malaysia adalah bertepatan.

Persepsi rakyat telah banyak berubah. Rakyat telah menolak kepimpinan BN seperti yang berlaku di Kedah, Pulau Pinang, Perak dan Selangor. Yang mengejutkan, ramai dalam kalangan orang Melayu telah meninggalkan BN dan menyokong PKR (Parti KeAdilan Rakyat) dan PAS (Parti Islam Se-Malaysia). Pengundi Cina pula meninggalkan MCA (Malaysian Chinese Association) dan Gerakan (Parti Gerakan Rakyat Malaysia) dan memberikan sokongan mereka kepada DAP (Democratic Action Party) dan juga PKR.

Rakyat Malaysia daripada pelbagai peringkat mempunyai harapan terhadap pucuk pimpinan Dato Sri Mohammad Najib Tun Abdul Razak untuk membawa perubahan positif untuk memacu negara ke tahap yang lebih tinggi. Tugas yang dipikul oleh Dato' Sri Mohammad Najib Tun Razak amat berat dalam mengembalikan keyakinan, kepercayaan dan sokongan rakyat Malaysia terhadap BN yang telah merekodkan keputusan terburuk dalam sejarah pilihan raya Malaysia selain daripada memulihkan keadaan kemelut ekonomi negara.

Yang pastinya ialah Dato' Sri Mohammad Najib Tun Razak telah menggantikan Tun Abdullah Ahmad Badawi pada waktu yang sangat mencabar dan kesan daripada Pilihan Raya Umum 2008 memerlukan perhatian kepimpinan yang matang daripada beliau. Masalah-masalah dan cabaran-cabaran yang melanda Malaysia akan menguji kesabaran dan kebolehan beliau untuk mengemudikan negara ini kepada tahap yang lebih cemerlang dan terbilang. Pada masa yang sama, masalah perpaduan kaum yang telah berlarutan begitu lama perlu diselesaikan jika BN ingin terus memegang tampuk kepimpinan negara. Persoalannya, mampukah BN mencapai perpaduan kaum dan meningkatkan taraf kehidupan rakyat melalui Dasar 1Malaysia?

Adakah Dasar 1Malaysia merupakan satu slogan yang bertujuan untuk memikat hati rakyat, mengubah persepsi mereka terhadap UMNO dan BN? Adakah Dasar 1Malaysia ini satu perjanjian BN dan rakyat bahawa BN akan mendahulukan rakyat. Dasar mengikut Lowi (1972), dapat menentukan politik tetapi tidak sebaliknya, bermakna tindakan kerajaan akan memastikan hala-tuju politiknya.

Sudah tentu, Dasar 1Malaysia bukanlah langkah pertama yang dilaksanakan oleh pihak kerajaan untuk mengatasi masalah pemisahan antara kepelbagaian bangsa di Malaysia. Sejarah ada menceritakan usaha Dato' Onn Jaafar dan Perdana Menteri kita terdahulu dalam usaha menyatupadukan rakyat tanpa mengira bangsa, namun ternyata

rakyat masih keliru dan rata-ratanya tidak bersetuju dengan usaha ini. Jika ditelitikan daripada setiap kali negara bertukar Perdana Menteri, pastinya Perdana Menteri tersebut memperkenalkan slogan baru dengan harapan serta tujuan untuk membawa perubahan pada waktu pentadbiran mereka seperti 'Islam Hadhari' di bawah pemerintahan Tun Abdullah Ahmad Badawai, 'Malaysia Boleh' di bawah Tun Dr Mahathir Mohammad dan tidak kurang juga dengan 1Malaysia di bawah pentadbiran Dato' Sri Mohammad Najib Tun Abdul Razak.

Dasar 1Malaysia

Dasar atau gagasan 1Malaysia Dato' Seri Najib Tun Abdul Razak merujuk kepada satu masyarakat Malaysia yang dapat berdiri, berfikir dan bertindak sebagai satu banga negara. Apabila menerang maksud Dasar 1Malaysia ini, Dato' Seri Najib Tun Abdul Razak menyatakan:

> Kita berdiri, kita berfikir dan bertindak sebagai bangsa Malaysia. Dan mengambil tindakan-tindakan berdasarkan kehendak semua kumpulan etnik dalam negara kita (Bahagian Penerbitan Dasar Negara, 2009).

Walau bagaimanapun, Dasar 1Malaysia ini masih tetap melaksanakan dasar sedia ada dan tidak akan:

> … mengetepikan dasar afirmatif, dasar untuk menolong kaum Bumiputera asalkan dasar itu dilaksanakan dengan cara yang adil dan saksama dan memberi pertimbangan kepada golongan Bumiputera yang layak mendapat sesuatu pertimbangan daripada kerajaan (Bahagian Penerbitan Dasar Negara, 2009).

> Yang penting, menurut Dato Seri' Najib, Malaysia sebagai sebuah negara berbilang bangsa tidak akan "bertindak dalam tembok etnik yang kita amalkan sejak sekian lama" Dari awal lagi, Malaysia telah dibelenggu masalah perpaduan kaum, integrasi nasional, dan pengaplikasian prinsip kesamarataan dan ekuiti (Bahagian Penerbitan Dasar Negara, 2009).

Kerajaan menaruh harapan dan mempunyai keyakinan yang tinggi bahawa Dasar 1Malaysia akan dapat menolong Malaysia untuk merealisasikan impiannya untuk menjadi sebuah negara maju pada tahun 2020. Terdapat tiga teras utama dalam gagasan 1Malaysia iaitu prinsip penerimaan, prinsip kenegaraan dan prinsip keadilan sosial dan lapan nilai yang menjadi terasnya. Nilai-nilai tersebut merangkumi perkara-perkara seperti budaya cemerlang, ketabahan, rendah hati, penerimaan, kesetiaan, meritokrasi, pendidikan dan integriti.

Dalam erti kata lain, konsep ini adalah untuk semua rakyat Malaysia tanpa mengira kaum, agama, dan budaya, serta tidak mengenal umur, jantina, taraf kehidupan dan sebagainya. Perkara ini diakui Yacob (2011) di dalam kajiannya di mana beliau mengatakan bahawa Dasar 1Malaysia ini adalah selaras dengan Perlembagaan Persekutuan. Cabaran kepada kerajaan ialah cara-cara untuk menyebarkan Dasar 1Malaysia kepada seluruh rakyat Malaysia agar konsep ini dikenali (Khairi, 2011). Berdasarkan dapatan kaji selidik Universiti Malaya, rakyat negara ini menerima secara umum Dasar 1Malaysia namun setiap kelompok kaum masih mempunyai tanggapan sempit terhadap dasar atau gagasan tersebut.

Dengan lain perkataan, rakyat Malaysia masih bimbang akan impak Dasar 1Malaysia itu terhadap kehidupan dan hubungan sesama mereka. Oleh hal yang demikian, dasar ini merupakan cabaran terhadap pemimpin negara daripada akar umbi untuk menterjermahkan retorik itu supaya menjadi kenyataan (Sinar Harian, 2012).

Persepsi Aspirasi Dasar 1Malaysia

Ketika Dasar 1Malaysia mula dilancarkan oleh Perdana Menteri, pelbagai reaksi timbul dalam kalangan masyarakat kita. Masyarakat umum mulai membuat pentafsiran sendiri terhadap gagasan tersebut. Terdapat reaksi yang positif daripada berbagai-bagai kalangan masyarakat terhadap gagasan ini. Perasaan bimbang dan curiga terhadap hak dan tanggungjawab dalam kalangan pihak tertentu apabila terlaksananya gagasan ini tidak terlepas daripada benak fikiran masyarakat. Ada yang mempersoalkan banyak perkara mengenai Dasar 1Malaysia, ada juga yang menerimanya bulat-bulat sahaja.

Oleh hal yang demikian, usaha untuk merealisasikan sesuatu dasar yang dilaksanakan bukanlah mudah dan amat rumit. Masih ramai rakyat Malaysia yang langsung tidak memahami sepenuhnya idea aspirasi falsafah di sebalik dasar yang telah digubal oleh Dato' Sri Mohammad Najib Tun Abdul Razak. Kebanyakan pihak menganggap bahawa dasar ini hanyalah retorik semata-mata dengan niat politik sahaja dan bukannya bertujuan demi kepentingan rakyat Malaysia secara keseluruhannya.

Kajian selidik Universiti Malaya menunjukkan rakyat menerima secara umum Dasar 1Malaysia, secara umum setiap kelompok kaum di negara ini masih mempunyai tanggapan sempit terhadap gagasan tersebut (Sinar Harian, 2012).

Setiap etnik mempunyai pandangan mereka sendiri tentang Dasar 1Malaysia dan walaupun sudah 55 tahun Malaysia mencapai kemerdekaan, namun jurang pemisah antara kaum masih wujud dengan ketara. Misalnya, kaum Cina ingin akan hak kesamarataan tanpa mengira bangsa, agama mahupun status. Namun, bagi orang Melayu masih merasakan mereka mempunyai hak untuk mempertahankan hak-hak keistimewaan iaitu *"status quo"* yang dinikmati selama ini.

Menyedari hakikat bahawa terdapat pelbagai persepsi masyarakat tentang Dasar 1Malaysia, maka pentingnya untuk mendekati masyarakat di luar bagi meninjau pendapat mereka tentang Dasar 1Malaysia kerana walaupun semua bangsa bergelar 'rakyat Malaysia', namun realitinya setiap bangsa dan agama masih memperjuangkan nasib atau hak-hak yang diwakili oleh kumpulan masing-masing. Bukan itu sahaja mereka kuat mempertahankan identiti mereka tanpa memikirkan golongan lain, malah mereka akan bersaing untuk merebut hak serta peluang yang datang. Situasi ini merumitkan objektif Dasar 1Malaysia lagi kerana dasar tersebut mengkehendaki konsep pembinaan negara bangsa iaitu "Bangsa Malaysia" dicapai.

Dasar 1Malaysia memang satu usaha murni daripada pihak kerajaan, namun adakah dasar itu lebih dilihat sebagai satu usaha agenda politik kerajaan? Adakah slogan 'Rakyat Didahulukan, Pencapaian Diutamakan' hanyalah sekadar slogan lain seperti yang sedia maklum setiap kali ada Perdana Menteri baru maka sudah pasti terdapat slogan atau ungkapan yang akan diuar-uarkan oleh para Perdana Menteri. Antara slogan lain yang pernah dipopularkan oleh para Perdana Menteri kita adalah seperti 'Islam Hadhari', 'Malaysia Boleh', 'Cemerlang, Gemilang dan Terbilang', dan 'Wawasan 2020'. Memang benar bahawa kesemua slogan yang dipopularkan menjadi sebutan rakyat, namun rakyat masih kabur dengan slogan tersebut.

Jika hendak mentadbir terus negara ini, BN perlu menepati apa-apa yang telah dijanjikan. Namun kebanyakan rakyat sebenarnya mengkehendaki kepastian tentang sejauh mana pihak kerajaan sanggup membela untung nasib rakyat di Malaysia. Ekoran perbezaan persepsi masyarakat yang berbeza-beza terhadap dasar ini, maka sejauh manakah Dasar 1Malaysia ini mampu bertahan?

TEMPAT DAN METODOLOGI KAJIAN

Kajian tentang persamaan dan perbezaan interpretasi Dasar 1Malaysia ini dijalankan di kawasan pusat komersial Satok, Kuching. Kawasan komersial Satok terletak di kawasan DUN Satok iaitu satunya Kawasan Pilihan Raya DUN yang terletak di Bandar raya Kuching dan satu-satunya kawasan yang majoriti penduduk dan pengundinya ialah orang Melayu. Kawasan komersial Satok, seperti kawasan komersial yang lain di negara ini sudah pasti didominasi oleh orang Cina, dan dikelilingi oleh berapa buah kampung Melayu seperti Kampung Melayu Satok. Lantaran itu, kaji selidik ini amat bertepatan untuk mengetahui pandangan masyarakat di kawasan Satok iaitu di Pusat Komersial Satok, Kuching, Sarawak.

Kaedah penyelidikan yang digunakan untuk mendapatkan maklumat ialah survei sosial dan instrumen penyelidikan yang digunakan ialah borang soal selidik. Temu bual bersemuka digunakan untuk memastikan maklumat yang tepat diperoleh. Kajian ini melibatkan 150 responden yang telah dipilih menggunakan persampelan secara rawak iaitu dalam kalangan peniaga di kawasan pusat komersial Satok. Data yang diperoleh telah diproses menggunakan SPSS.

Persepsi Terhadap 1Malaysia

Melalui maklumat yang diperoleh daripada maklum balas, didapati sama ada kaum Melayu mahupun kaum Cina, kesemuanya telah mengetahui Dasar 1Malaysia. Pihak Kerajaan BN telah berjaya memperkenalkan 1Malaysia kepada warganegara Malaysia hingga membolehkan mereka mengetahui kewujudan Dasar 1Malaysia yang dilaksanakan oleh kerajaan. Masyarakat bukan sahaja mengetahui Dasar 1Malaysia malah mereka juga mengetahui bahawa Dasar 1Malaysiaatau Gagasan 1Malaysia telah diilhamkan oleh Perdana Menteri Dato' Sri Mohammad Najib Tun Razak.

Pada awal perlaksanaan Dasar 1Malaysia, didapati bahawa bangsa Cina lebih banyak memberikan sokongan positif berbanding dengan bangsa Melayu. Empat puluh sembilan perpuluhan tiga peratus orang Cina mempunyai tanggapan bahawa Dasar 1Malaysia ialah satu dasar yang terbaik, manakala 26.7% mempunyai tanggapan bahawa dasar tersebut adalah baik berbanding dengan 10.7% dan 5.3% tanggapan bagi orang Melayu (Jadual 1). Setelah dilaksanakan, kebanyakan golongan Cina yang menyokong perlaksanaan 1Malaysia pada peringkat awal didapati telah kurang memberikan sokongan terhadap dasar ini (Jadual 2). Hanya 4% dan 14.7% sahaja orang Cina mengatakan bahawa mereka sangat setuju dan setuju terhadap Dasar1Malaysia, manakala angka bagi orang Melayu ialah 16% dan 54.7%. Pada pendapat bangsa Cina (78.7%), bahawa Dasar 1Malaysia hanyalah agenda politik pihak BN yang berunsur retorik semata-mata, berbanding dengan orang Melayu (9.7%) (Jadual 7), walaupun kefahaman mereka (42.7%) tentang dasar tersebut adalah lebih tinggi daripada bangsa Melayu (17.4%) (Jadual 3).

Jadual 1. Tanggapan awal terhadap Dasar 1Malaysia (peratusan dalam parentesis).

Etniksiti	Sangat Baik	Baik	Biasa	Kurang Baik	Sangat Kurang Baik	Jumlah
Melayu	4 (5.3)	8 (10.7)	21 (28)	21 (28)	21 (28)	75 (100)
Cina	20 (26.7)	37 (49.3)	8 (10.7)	5 (6.7)	5 (6.7)	75 (100)
Jumlah	24 (16)	45 (30)	29 (19.3)	26 (17.3)	26 (17.3)	150 (100)

Jadual 2. Persetujuan dengan Dasar 1Malaysia (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	12 (16)	41 (54.7)	19 (25.3)	3 (4)	0 (0)	75 (100)
Cina	3 (4)	11 (14.7)	36 (48)	14 (18.7)	11 (14.7)	75 (100)
Jumlah	15 (10)	52 (34.7)	55 (36.7)	17 (11.3)	11 (7.3)	150 (100)

Jadual 3. Dasar 1Malaysia difahami oleh masyarakat (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	5 (6.7)	8 (10.7)	13 (17.3)	37 (49.3)	12 (16)	75 (100)
Cina	12 (16)	20 (26.7)	21 (28)	19 (25.3)	3 (4)	75 (100)
Jumlah	17 (11.3)	28 (18.7)	34 (22.7)	56 (37.3)	15 (10)	150 (100)

Memang tidak dapat dinafikan bahawa Dasar 1Malaysia adalah merangkumi skop yang amat luas. Lantaran itu tidak hairanlah konsep ini mengundang kekeliruan, seterusnya mencetus interpretasi yang berbeza-beza dalam kalangan rakyat. Malah, hasil kajian turut berjaya membuktikan bahawa mesej-mesej Dasar 1Malaysia masih kabur dan tidak jelas di mata masyarakat Cina (21.1%) berbanding dengan responden Melayu (54.7%) (Jadual 4). Walau bagaimanapun, di sebalik kekeliruan dan pelbagai interpretasi, dapatan kajian menunjukkan bahawa orang Cina (24%) lebih bersetuju dengan Dasar 1Malaysia jika dibandingkan dengan orang Melayu (10.6%) (Jadual 5).

Sememangnya Dasar 1Malaysia mempunyai lapan nilai iaitu kesetiaan, meritokrasi, pendidikan, ketabahan, rendah hati, integriti, penerimaan dan budaya kecemerlangan. Kesemua nilai tersebut telah diketahui dan diterima pakai serta diaplikasi oleh kaum Melayu dan kaum Cina di pusat komersial Satok dalam kehidupan harian mereka.

Walau bagaimanapun, kedua-dua bangsa Melayu dan Cina mengalami keraguan, kerisauan dan kegusaran terhadap perlaksanaan konsep 1Malaysia. Bagi bangsa Melayu, mereka khuatir akan Dasar 1Malaysia kerana dasar itu boleh menjejaskan pencapaian ekonomi mereka manakala bangsa Cina pula ingin akan layanan hak sama rata daripada pihak kerajaan. Mereka berpendapat bahawa mereka bukan golongan pendatang. Oleh itu, mereka turut mahu menikmati hak seperti orang Melayu dan Bumiputera lain. Sementara itu, kebanyakan orang Melayu tidak mahu dilayan sama rata dengan kaum-kaum lain. Manakala kaum Cina terus mendesak dan menuntut agar pihak kerajaan melayan semua kaum dengan sama rata. Namun demikian kebanyakan orang Melayu berpendapat bahawa Dasar 1Malaysia ada menekankan prinsip kesemarataan. Oleh itu, sebanyak 44% dan 16% daripada mereka telah menafikan wujudnya prinsip kesemarataan dalam 'Dasar 1Malaysia' dengan menyatakan pendapat tidak bersetuju dan sangat tidak setuju terhadap penyataan tersebut (Jadual 22). Manakala, angka untuk orang Cina adalah masing-masing 28% dan 4%. Orang Melayu (58.7%) juga menyatakan pendapat bersetuju dan sangat bersetuju bahawa Dasar 1Malaysia ada menekankan prinsip keadilan tetapi hanya 32% orang Cina mempunyai idea yang sama (Jadual 23). Orang Melayu (72%) juga mempunyai persepsi bahawa amalan-amalan Dasar 1Malaysia adalah selaras dengan konsep kebersamaan dalam satu keluarga besar, tetapi hanya 29.3% orang Cina bersetuju dan sangat setuju dengan pernyataan ini (Jadual 26).

Jadual 4. Penyampaian Dasar 1Malaysia jelas di mata masyarakat (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	17 (22.7)	24 (32)	25 (33.3)	6 (8)	3 (4)	75 (100)
Cina	6 (8)	10 (13.3)	13 (17.3)	15 (20)	31 (41.3)	75 (100)
Jumlah	23 (15.3)	34 (22.7)	38 (25.3)	21 (14)	34 (22.7)	150 (100)

Jadual 5. Penerimaan Dasar 1Malaysia oleh masyarakat umum (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	4 (5.3)	4 (5.3)	23 (30.7)	30 (40)	14 (18.7)	75 (100)
Cina	3 (4)	15 (20)	28 (37.3)	21 (28)	8 (10.7)	75 (100)
Jumlah	7 (4.7)	19 (12.7)	51 (34)	51 (34)	22 (14)	150 (100)

Setelah ‘Dasar 1Malaysia’ dilancarkan oleh Dato’ Sri Mohammad Najib Tun Abdul Razak dan dilaksanakan secara menyeluruh dan total, didapati bahawa sebahagian besar kaum Cina masih lagi tidak dapat melihat perubahan ketara tentang kebaikan dasar ini kepada masyarakat dan pembangunan negara. Hanya 24% dalam kalangan mereka berpendapat bahawa Dasar 1Malaysia dilaksanakan secara menyeluruh dan menyentuh pelbagai aspek kehidupan masyarakat Malaysia khususnya dalam bidang ekonomi, politik dan sosial (Jadual 8). Walhal, bagi masyarakat Melayu sebanyak 59.4% daripada mereka sangat bersetuju dan setuju bahawa dasar ini membawa banyak perubahan kepada Malaysia. Hal ini dibuktikan bahawa transformasi yang dilakukan oleh pihak kerajaan hanya mampu dirasai oleh golongan Melayu sahaja dan bukan terhadap golongan Cina. Dalam hal ini, pengkaji telah mendapati bahawa bangsa Melayu (64%) mendapati amalan-amalan Dasar 1Malaysia selaras dengan slogannya iaitu, ‘Rakyat Didahulukan, Pencapaian Diutamakan’ (Jadual 25). Bagi bangsa Cina, hanya 29.3% sahaja daripada mereka berpendapat bahawa amalan-malan ‘Dasar 1Malaysia’ adalah bertepatan dengan slogannya. Di bawah Dasar 1Malaysia, majoriti responden Cina (72%) mengatakan bahawa soal hak bumiputera, bahasa, dan budaya harus dipertikaikan (Jadual 11). Sementara kaum Melayu, ada yang bersetuju (32%) manakala ada pula yang tidak bersetuju (22.7%) dan sangat tidak bersetuju (26.7%) bahawa Slogan Dasar 1Malaysia tersebut hanyalah slogan komersial mengikut kaum Cina kerana hasil kajian telah membuktikan sebahagian besar masyarakat Cina (72%) memberikan respon bahawa Dasar 1Malaysia tidak memperjuangkan nasib dan hak-hak semua kaum. Manakala masing-masing 38.7% dan 22.7% orang Melayu tidak setuju dan sangat tidak setuju dengan kenyataan tersebut (Jadual 13). Dalam erti kata lain, faedah Dasar 1Malaysia rata-rata dinikmati oleh bangsa Melayu (dan Bumiputera) sahaja.

Jadual 6. Tiada perubahan ketara terhadap negara semenjak Konsep 1Malaysia (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	8 (10.7)	7 (9.3)	15 (20)	23 (30.7)	22 (29.3)	75 (100)
Cina	37 (49.3)	14 (18.7)	11 (14.7)	8 (10.7)	5 (6.7)	75 (100)
Jumlah	45 (30)	21 (14)	26 (17.3)	31 (20.7)	27 (18)	150 (100)

Jadual 7. Dasar 1Malaysia hanyalah retorik semata-mata (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	4 (5.3)	3 (4)	38 (50.7)	28 (37.3)	2 (2.7)	75 (100)
Cina	39 (52)	20 (26.7)	6 (8)	6 (8)	4 (5.3)	75 (100)
Jumlah	43 (28.7)	23 (15.3)	44 (29.3)	34 (22.7%)	6 (4)	150 (100)

Keputusan kaji selidik menunjukkan bahawa walaupun kedua-dua kaum tersebut mempunyai pandangan yang sama terhadap Dasar 1Malaysia, namun perbezaan pandangan antara kaum di Malaysia ini masih berkaitan teguh dengan isu perkauman. Banyak tafsiran yang diperkatakan mengenai Dasar 1Malaysia. Majoriti responden Melayu (65.3%) juga berpendapat bahawa bahawa Dasar 1Malaysia merupakan langkah alternatif BN untuk menarik semula perhatian rakyat selepas PRU-12, tetapi hanya 24% sahaja orang Cina bersependapat dengan perkara di sini (Jadual 9), dan bukan bertujuan untuk menyatupadukan rakyat. Majoriti responden, orang Melayu 81.3% dan orang Cina 72%, berpendapat bahawa Dasar 1Malaysia adalah untuk menarik perhatian kaum Cina (Jadual 10).

Jadual 8. Dilaksanakan secara menyeluruh dan menyentuh aspek kehidupan dalam bidang ekonomi, politik dan social (peratusan dalam parenthesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	14 (18.7)	38 (50.7)	17 (22.7)	5 (6.7)	1 (1.3)	75 (100)
Cina	8 (10.7)	10 (13.3)	32 (42.7)	22 (29.3)	3 (4)	75 (100)
Jumlah	22 (14.7)	48 (32)	49 (32.7)	27 (18)	4 (2.7)	150 (100)

Jadual 9. Dasar 1Malaysia merupakan langkah alternatif BN untuk menarik semula perhatian rakyat selepas PRU-12 (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	30 (40)	19 (25.3)	12 (16)	9 (12)	5 (6.7)	75 (100)
Cina	26 (34.7)	23 (30.7)	15 (20)	7 (9.3)	4 (5.3)	75 (100)
Jumlah	56 (37.3)	42 (28)	27 (18)	16 (10.7)	9 (6)	150 (100)

Jadual 10. Dasar 1Malaysia adalah untuk memancing undi golongan Cina (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	37 (49.3)	24 (32)	5 (6.7)	7 (9.3)	2 (2.7)	75 (100)
Cina	27 (36)	27 (36)	15 (20)	3 (4)	3 (4)	75 (100)
Jumlah	64 (42.7)	51 (34)	20 (13.3)	10 6.7)	5 (3.3)	150 (100)

Jadual 11. Di bawah Dasar 1Malaysia, soal hak Bumiputera dan Bahasa harus dipertikaikan (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	12 (16%)	12 (16%)	14 (18.7%)	17 (22.7%)	20 (26.7%)	75 (100)
Cina	34 (45.3%)	20 (26.7%)	21 (28%)	0 (0%)	0 (0%)	75 (100)
Jumlah	46 (30.7%)	32 (21.3%)	35 (23.3%)	17 (11.3%)	20 (13.3%)	150 (100)

Malah, bagi orang Melayu, mereka tidak terlepas daripada perasaan khuatir serta bimbang bahawa Dasar 1Malaysia akan menggugat hak dan keistimewaan yang telah dinikmati mereka. Walaupun didapati terdapat pihak yang mempertikaikan dan mentafsir Dasar 1Malaysia berlainan, namun yang jelas dasar ini masih lagi berpaksikan Perlembagaan Persekutuan iaitu hak-hak keistimewaan orang Melayu dan Bumiputera terpelihara manakala hak-hak kaum lain akan terbela dan dihormati. Berikutan ramai yang masih kurang memahami pengertian sebenar Dasar 1Malaysia apabila hanya 46% orang Melayu dan 20% orang Cina berpendapat bahawa Dasar 1Malaysia berteraskan Perlembagaan Persekutuan (Jadual 12).

Seterusnya rata-rata bangsa Melayu dan bangsa Cina berpendapat bahawa Dasar 1Malaysia ialah bertepatan dengan suasana dan cita rasa rakyat Malaysia. Selain itu, kedua-dua kaum tersebut bersepakat bahawa Dasar1Malaysia menyukarkan proses transformasi bangsa Malaysia lagi. Bagi mereka Dasar 1Malaysia bukanlah jalan penyelesaian terbaik bagi mendekatkan jurang pemisah yang masih wujud dengan ketara antara kaum di negara tetapi merupakan langkah alternatif pihak BN untuk menarik semula perhatian rakyat Malaysia supaya kembali menyokong BN setelah kurang menyerlah pada PRU-12 pada tahun 2008 (Jadual 9).

Dapatan kajian menunjukkan perbezaan ketara antara kedua-dua kaum. Kedua-dua kaum tersebut didapati tidak sependapat bahawa di bawah Dasar 1Malaysia perpaduan rakyat Malaysia yang berbilang kaum dapat diperkukuh. Kaum Melayu di kawasan komersil Satok berpendapat bahawa perpaduan antara kaum mampu dipererat dengan adanya Dasar 1Malaysia dilancarkan pada skala besar-besaran. Namun tidak begitu bagi kaum Cina. Bukan itu sahaja mereka tidak yakin, malah mereka juga begitu pasti bahawa Dasar 1Malaysia tidak memperjuangkan nasib dan hak-hak semua kaum di Malaysia tanpa mengira latar belakang mereka. Menurut dapatan daripada kaji selidik, didapati tiada seorang pun bangsa Melayu dan bangsa Cina yang sangat tidak bersetuju bahawa Dasar 1Malaysia mencerminkan rakyat Malaysia saling bekerjasama (Jadual 14). Walau bagaimanapun, pernyataan tersebut hanya disokong kuat oleh bangsa Melayu (62.4%) dan sebaliknya bagi bangsa Cina (24%). Malahan orang Melayu (46.7%) sangat menyokong pernyataan Dasar 1Malaysia bersifat "*multiculturalism*" (Jadual 15) dan liberalism (24%) (Jadual 16), tetapi jawapan yang bertentangan telah diberikan oleh kaum Cina, iaitu masing-masing 21.4% dan 17.4%.

Jadual 12. Dasar 1Malaysia berteraskan Perlembagaan Persekutuan (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	10 (13.3)	32 (42.7)	12 (16)	17 (22.7)	4 (5.3)	75 (100)
Cina	4 (5.3)	11 (14.7)	38 (50.7)	22 (29.3)	0 (0)	75 (100)
Jumlah	14 (9.3)	43 (28.7)	50 (33.3)	39 (26)	4 (2.7)	150 (100)

Jadual 13. Dasar 1Malaysia tidak memperjuangkan nasib dan hak-hak semua kaum (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	5 (6.7)	6 (8)	18 (24)	29 (38.7)	17 (22.7)	75 (100)
Cina	27 (36)	27 (36)	8 (10.7)	8 (10.7)	5 (6.7)	75 (100)
Jumlah	32 (21.3)	33 (22)	26 (17.3)	37 (17.3)	22 (14.7)	150 (100)

Jadual 14. Dasar 1Malaysia mencerminkan rakyat Malaysia yang saling bekerjasama (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	22 (29.3)	25 (33.3)	21 (28)	7 (9.3)	0 (0)	75 (100)
Cina	8 (10.7)	10 (13.3)	35 (46.7)	22 (29.3)	0 (0)	75 (100)
Jumlah	30 (20)	35 (23.3)	56 (37.3)	29 (19.3)	0 (0)	150 (100)

Jadual 15. Dasar 1Malaysia bersifat multicultralisme (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	12 (16)	23 (30.7)	23 (30.7)	14 (18.7)	3 (4)	75 (100)
Cina	8 (10.7)	8 (10.7)	10 (13.3)	30 (40)	19 (25.3)	75 (100)
Jumlah	20 (13.3)	31 (20.7)	33 (22)	44 (29.3)	22 (14.7)	150 (100)

Jadual 16. Dasar 1Malaysia bersifat liberalism (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	5 (6.7%)	13 (17.3%)	38 (50.7%)	14 (18.7%)	5 (6.7%)	75 (100)
Cina	8 (10.7%)	5 (6.7%)	14 (18.7%)	25 (33.3%)	23 (30.7%)	75 (100)
Jumlah	13 (8.7%)	18 (12%)	52 (34.7%)	39 (26%)	28 (18.7%)	150 (100)

Walaupun kebanyakan kaum Cina masih tidak berpuas hati terhadap perlaksanaan Dasar 1Malaysia, namun hakikatnya mereka tidak dapat menafikan dan harus menghargai segala bantuan dan kemudahan yang telah disumbangkan oleh pihak kerajaan. Antaranya adalah seperti pemberian Komputer Rakyat *(Netbook)* 1Malaysia yang dilihat majoriti Melayu (68%) mampu merapatkan jurang digital antara kawasan bandar dan luar bandar, tetapi orang Cina mempunyai pandangan yang berbeza apabila hanya 16% sahaja mereka setuju dengan kenyataan ini (Jadual 17). Begitu juga dengan Skim Simpanan Persaraan 1Malaysia. Di sini juga majoriti besar orang Melayu (73.3%) bersetuju dan sangat setuju dengan kenyataan bahawa Skim Simpanan Persaraan 1Malaysia ialah inisiatif kerajaan untuk memastikan golongan tiada pendapatan tidak mempunyai simpanan selepas bersara. Manakala, hanya 33.3% orang

Cina setuju dan sangat setuju dengan ayat tersebut (Jadual 18). Majoriti orang Melayu (66.6%) juga berpendapat bahawa Golongan Pekerja Sendiri lebih terjamin dengan adanya Skim simpanan Persaraan 1Malaysia, berbanding 26.7% untuk orang Cina (Jadual 19). Golongan pekerja sendiri termasuklah mereka yang tidak mempunyai pendapatan tetap dapat menikmati skim ini iaitu mempunyai simpanan wang apabila mencapai umur persaraan. Pemberian Baucar Buku 1Malaysia pula mampu memupuk sifat minat membaca di samping meringankan beban perbelanjaan buku dalam kalangan pelajar Institut Pengajian Tinggi. Taraf hidup, mengikut Van der Berg (2001), adalah berkait rapat dengan pencapaian akademik. Perlaksanaan Kedai Rakyat 1Malaysia pula dapat membantu Perusahaan Kecil dan Sederhana. Seterusnya Klinik 1Malaysia menyediakan khidmat rawatan kesihatan asas pada kadar RM1. Sementara BR1M berupa wang RM500 juga dapat meringankan beban rakyat. Kesemua ini merupakan satu set keputusan pemilihan matlamat yang berhubung kait antara satu dengan yang lain dan bertujuan untuk mencapai dasar tersebut (Jenkins, 1993).

BR1M ialah satu dasar pengagihan semula berbentuk pemberian wang bernilai RM500.00. Dasar pengagihan semula ini disebut begitu kerana dasar ini melibatkan perkara seperti peralihan pembayaran, kebajikan dan kesihatan (Gerston, 2004). Melalui dasar ini, kerajaan akan dengan sengaja memindahkan kekayaan, pendapatan, harta atau hak dari satu kelas atau kumpulan kepada kelas dan kumpulan yang lain, iaitu daripada kumpulan yang berada kepada kumpulan yang kurang berada (Anderson, 2015). Ini bermkasud, dalam dasar pengagihan semula, ada kumpulan atau golongan penduduk yang akan menang dan ada yang akan rugi pula (Ripley & Franklin, 1987). Insentif seperti BR1M bertujuan supaya golongan yang kurang mampu akan lebih bertanggungjawab terhadap kesejahteraan diri mereka (Dye, 1992). Begitu juga Baucar Buku 1Malaysia juga merupakan satu subsidi dan tujuan subsidi disalurkan adalah untuk memulihkan ketidakseimbangan dan ketaksamaan dalam kalangan masyarakat (Howlett & Ramesh, 1995; Hughes, 1998).

Jadual 17. Program pemberian Netbook merapatkan jurang digital antara kawasan bandar dan luar bandar (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	28 (37)	23 (31)	14 (18.7)	6 (8)	4 (5.3)	75 (100)
Cina	11 (14)	15 (2)	30 (40)	18 (24)	1 (1.3)	75 (100)
Jumlah	39 (2)	38 (25.3)	44 (29.3)	24 (16)	5 (3.3)	150 (100)

Jadual 18. Skim Simpanan Persaraan 1Malaysia adalah inisiatif kerajaan untuk memastikan golongan tiada pendapatan mempunyai simpanan selepas bersara (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	16 (21.4)	39 (52)	15 (20)	4 (5.3)	1 (1.3)	75 (100)
Cina	13 (17.3)	12 (16)	28 (37.3)	19 (25.3)	3 (4)	75 (100)
Jumlah	29 (19.3)	51 (34)	43 (28.7)	23 (15.3)	4 (2.7)	150 (100)

Jadual 19. Golongan pekerja sendiri lebih terjamin dengan adanya Skim Simpanan Persaraan 1Malaysia (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	13 (17.3)	37 (49.3)	19 (25.3)	3 (4)	3 (4)	75 (100)
Cina	11 (14.7)	9 (12)	41 (54.7)	14 (18.7)	0 (0)	75 (100)
Jumlah	24 (16)	46 (30.7)	60 (40)	17 (11.3)	3 (2)	150 (100)

Jadual 20. Dengan adanya Konsep 1Malaysia, pentadbiran negara menjadi lebih lancar (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	8 (10.7)	32 (42.7)	24 (32)	10 (13.3)	1 (1.3)	75 (100)
Cina	7 (9.3)	17 (22.7)	25 (33.3)	23 (30.7)	3 (4)	75 (100)
Jumlah	15 (10)	49 (32.7)	49 (32.7)	33 (22)	4 (2.7)	150 (100)

Jadual 21. Melalui Dasar 1Malaysia tidak ada golongan yang dipinggirkan (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	14 (18.7)	33 (44)	18 (24)	7 (9.3)	3 (4)	75 (100)
Cina	10 (13.3)	10 (13.3)	35 (46.7)	19 (25.3)	1 (1.3)	75 (100)
Jumlah	24 (16)	43 (28.7)	53 (35.3)	26 (17.3)	4 (2.7)	150 (100)

Jadual 22. Dasar 1Malaysia tidak menekankan prinsip kesemarataan (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	3 (4)	16 (21.3)	11 (14.7)	33 (44)	12 (16)	75 (100)
Cina	4 (5.3)	15 (20)	32 (42.7)	21 (28)	3 (4)	75 (100)
Jumlah	7 (4.7)	31 (20.7)	43 (28.7)	54 (36)	15 (10)	150 (100)

Jadual 23. Dasar 1Malaysia menekankan prinsip keadilan (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	6 (8)	38 (50.7)	24 (32)	4 (5.3)	3 (4)	75 (100)
Cina	7 (9.3)	17 (22.7)	32 (42.7)	15 (20)	4 (5.3)	75 (100)
Jumlah	13 (8.7)	55 (36.7)	56 (37.3)	19 (12.7)	7 (4.7)	150 (100)

Jadual 24. Di bawah Dasar 1Malaysia, perpaduan rakyat yang berbilang kaum dapat dikukuhkan (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	19 (25.3)	33 (44)	17 (22.7)	5 (6.7)	1 (1.3)	75 (100)
Cina	5 (6.7)	4 (5.3)	23 (30.7)	25 (33.3)	18 (24)	75 (100)
Jumlah	24 (16)	37 (24.7)	40 (26.7)	30 (20)	19 (12.7)	150 (100)

Jadual 25. Pengamalan Dasar 1Malaysia selaras dengan slogannya 'Rakyat Didahulukan, Pencapaian Diutamakan' (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	20 (26.7)	28 (37.3)	18 (24)	7 (9.3)	2 (2.7)	75 (100)
Cina	7 (9.3)	15 (20)	30 (40)	19 (25.3)	4 (5.3)	75 (100)
Jumlah	27 (18)	43 (28.7)	48 (32)	26 (17.3)	6 (4)	150 (100)

Jadual 26. Dasar 1Malaysia selaras dengan konsep kebersamaan dalam satu keluarga besar (peratusan dalam parentesis)

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	18 (24)	36 (48)	18 (24)	1 (1.3)	2 (2.7)	75 (100)
Cina	9 (12)	13 (17.3)	47 (62.7)	5 (6.7)	1 (1.3)	75 (100)
Jumlah	27 (18)	49 (32.7)	65 (43.3)	6 (4)	3 (2)	150 (100)

Jadual 27. Dasar 1Malaysia memberi kesan yang baik untuk masyarakat (peratusan dalam parentesis).

Etniksiti	Sangat Setuju	Setuju	Kurang Setuju	Tidak Setuju	Sangat Tidak Setuju	Jumlah
Melayu	23 (30.7)	27 (36)	22 (29.3)	2 (2.7)	1 (1.3)	75 (100)
Cina	9 (12)	10 (13.3)	49 (65.3)	7 (9.3)	0 (0)	75 (100)
Jumlah	32 (21.3)	37 (24.7)	71 (47.3)	9 (6)	1 (0.7)	150 (100)

Menurut pendapat kaum Melayu, Dasar 1Malaysia banyak memberikan kesan positif kepada masyarakat. Orang Melayu berasa negara kita sangat memerlukan Dasar 1Malaysia demi kebaikan semua pihak daripada pelbagai aspek pembangunan negara. Walaupun kebanyakan orang Cina yang tidak berpuas hati tentang perkara berkaitan dasar ini dan berpendapat (68%) bahawa dasar tersebut tidak memberikan banyak implikasi terhadap pembangunan negara. Bagi orang Melayu pula Dasar 1Malaysia ada membawa perubahan yang ketara terhadap negara kita apabila 30.7% dan 29.3% mereka tidak setuju dan sangat tidak setuju dengan ayat tersebut (Jadual 6). Orang Melayu (53.4%) berpendirian bahawa Dasar 1Malaysia akan dapat menjadikan pentadbiran negara lebih lancar, berbanding dengan 32% bagi orang Cina (Jadual 20). Bagi orang Melayu (69.3%), dengan adanya Dasar 1Malaysia, perpaduan rakyat yang berbilang kaum di Malaysia dapat dikukuhkan, tetapi hanya segelintir 12% sahaja orang Cina percaya bahawa

perkara ini dapat dicapai (Jadual 24). Bagi pernyataan bahawa tidak ada golongan yang akan dipinggirkan, rata-rata bangsa Melayu dan bangsa Cina tidak tentu mempunyai harapan yang melambung bahawa ini dapat dilaksanakan apabila hanya 47% dan 26.3% bangsa masing-masing setuju dan sangat setuju dengan ayat tersebut (Jadual 21). Untuk pernyataan adakah Dasar 1Malaysia memberikan kesan yang baik untuk masyarakat, 66.7% mengatakan setuju dan sangat setuju dengan pernyataan ini, manakala hanya 25.3% sahaja orang Cina mempunyai pendapat yang sama.

Dapatan kajian juga menunjukkan bahawa orang Melayu percaya bahawa Dasar 1Malaysia akan dapat menolong BN untuk menebus balik kemerosotan dalam memperoleh sokongan dan kekalahan di lima negeri pada PRU-12. Sebaliknya, bagi orang Cina mereka tetap berpendirian bahawa walaupun banyak bantuan dan kemudahan yang ditawarkan oleh pihak kerajaan, Dasar 1Malaysia belum cukup lagi untuk menebus kekalahan BN yang lalu.

RUMUSAN DAPATAN KAJIAN DAN KESIMPULAN

Keseluruhannya, kaji selidik ini telah berjaya merungkai serta menjawab objektif yang telah ditetapkan. Perdebatan terbuka berkenaan dengan Dasar 1Malaysia ini amat penting bagi memastikan dasar ini dapat mencapai matlamat yang telah ditetapkan. Dasar 1Malaysia merupakan satu dasar yang amat baik diketengahkan oleh kerajaan. Namun begitu, kelompongan dalam pelaksanaan dasar mungkin mengakibatkan dasar ini tidak seperti yang dirancang oleh pihak kerajaan. Kaum Cina melihat pelaksanaan dasar ini dapat memberikan keadilan serta kesaksamaan kepada semua kaum di Malaysia pada mulanya, namun setelah beberapa lama dilaksanakan dasar ini hanya dilihat mereka sebagai retorik politik untuk BN sebagai kerajaan memperkukuh kuasa mereka.

Perlaksanaan dasar dibuat oleh penjawat awam yang terdiri hampir keseluruhannya daripada Orang Melayu. Penjawat awam penting dalam proses politik kerana mereka mentafsirkan dan menginterpretasikan peraturan, undang-undang dan keputusan kerajaan (Gerston, 2004). Pentafsiran mereka boleh dipengaruhi oleh nilai, norma, kepercayaan, etnik dan ideologi mereka, dan ini boleh menyebabkan tindakan atau kelakuan mereka boleh menjadi berat sebelah.

Sebagai contoh, ketidakseimbangan perwakilan kaum dalam perkhidmatan awam jelas mencerminkan kegagalan Dasar 1Malaysia yang diuar-uarkan oleh pihak kerajaan. Penguasaan birokrasi oleh orang Melayu mencerminkan tujuan memberikan pekerjaan kepada orang Melayu dan mengekalkan kuasa pentadbiran di tangan orang Melayu (Lim, 2007). Sehingga hari ini penguasaan orang Melayu dalam birokrasi masih kukuh walaupun pengenalan Dasar 1Malaysia telah dilaksanakan kerajaan BN. Ini merupakan salah satu kelompongan yang dilihat oleh kaum Cina sebagai retorik pelaksanaan Dasar 1Malaysia. Ketidakseimbangan perwakilan kaum dalam perkhidmatan awam harus ditangani oleh kerajaan dengan pelaksanaan Dasar 1Malaysia.

Secara keseluruhannya, Dasar 1Malaysia telah menarik perhatian responden berbangsa Melayu dan Cina. Bantuan masyarakat seperti pertolongan 1Malaysia yang telah dihulurkan oleh pihak kerajaan memang ada membawa manfaat kepada rakyat Malaysia. Namun, responden Cina lebih melihat bahawa langkah pihak kerajaan tersebut hanyalah untuk menarik perhatian rakyat. Malah, ada yang melabelkan bahawa segala bantuan tersebut hanyalah pembaziran. Rata-rata orang Melayu berpuas hati terhadap Dasar 1Malaysia kerana bagi kebanyakan mereka (69.3%), dasar ini adalah benar-benar bertepatan dengan slogannya iaitu ‘Rakyat Didahulukan, Pencapaian Diutamakan’, tetapi hanya 12% sahaja orang Cina berpendapat begitu (Jadual 24).

Bagi kaum Cina, mereka mengkehendaki layanan yang sama rata. Mereka juga mahu kerajaan membela kepentingan serta nasib mereka sama seperti kaum lain. Mereka masih percaya bahawa Dasar 1Malaysia hanya akan mengutamakan dan menguntungkan orang Melayu. Dari sudut pandangan kaum Melayu pula, rata-rata mereka berasa khuatir sekiranya hak-hak keistimewaan yang dinikmati mereka selama ini terhapus. Namun begitu orang Melayu dan sebilangan orang Cina yakin bahawa Dasar 1Malaysia mampu memacukan arus pembangunan negara.

Akhirnya, menurut kedua-dua bangsa itu Dasar 1Malaysia merupakan satu konsep yang tidak sukar untuk difahami. Kebanyakan responden berpendapat bahawa Dasar 1Malaysia merupakan satu dasar yang jelas, praktikal dan pragmatik.

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