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Original Research Paper

Development of Mobile Application for Handling Household Emergency

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Abstract: Many people have a poor level of emergency preparedness, especially in their home environment. A previous study has stated that only a small percentage of people were well prepared in case of an emergency happening in their home while others are either do not know what to do or do not even think about it. This ignorance can lead to a harmful accident. For example, if an emergency such as a kitchen fire happens and is poorly handled by the people in the house it can lead to bigger accidents such as fire outbreaks. Thus, this study aims to identify the requirement, design, and develop a mobile application that can help users learn about household emergencies and increase their preparedness level for emergencies. Compared to other mobile applications for an emergency, Safe House App provides multimedia elements such as videos, and quiz activity which can attract users to use the application more to learn about the household emergency. The methodology implemented for this study is the Agile Model. Functionality Evaluation is conducted on 10 respondents aged 18 and above and most of the respondents are satisfied with the overall performance of Safe House App and agree that Safe House App can help the user increase their emergency preparedness level and attract them to learn about the household emergency.

Keywords: Agile Model, Mobile Application, Safe House App.

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1. Introduction

A household emergency is an accident that can happen inside your household or to be exact, damage that can happen to your house. The term household emergency is interchangeably used with home emergency though both terms are rarely used except for when a household emergency plan is mentioned. Some examples of household emergencies that are to be highlight in this research are power black-out, blocked toilet or pipe, damaged roof, broken air-conditioning system, broken window, and gas leak.

As of today, many uses smartphone as one of their most used gadgets in their daily lives. It is necessary for the smartphone that they are using to function as the owner expected it to, as well as the mobile application that they downloaded into their smartphone. According to Sharma et al [1], people use many different types of mobile applications in their daily lives, such as social networking, travel, utility, entertainment, health and fitness, news, and banking. Many different types of mobile applications developed to cater to customer needs. Both free and paid versions of mobile applications were developed and available in the market as of today for download. As we all know, the most used platform to download mobile applications are Play Store and Apple Store. The learning process through mobile applications is more effective than when not using mobile applications (Klimova, 2021). Mobile applications can give an impact to its users such as increasing the user achievement in learning and increasing user motivation as well as improving their communication skills [2]. Many different types of mobile applications are used for different purposes and one of them can be for learning.

Household emergency is a disaster that can happen to a household and will need to be taken care of immediately. Such disasters can be from a high scale such as natural disaster to a small scale such as broken windows or damaged roofs. Some types of household emergencies in the context of this project will be the small scale which are power black-out, blocked toilet or pipe, damaged roof, broken air-conditioning system, broken window, and gas leak. It may be small, but some of these emergencies can lead to a dangerous outcome, such as gas leaks can lead to fire outbreaks, and black-out can even lead to electrocution. Mobile application development for handling household emergencies, Safe House mobile application will be explaining the types of household emergencies and ways to handle them, which can help educate its users about household emergencies. Users will be able to use the Safe House application to learn about household emergencies and overcome the emergency event if it ever happens in the future.

According to Chen et al. [3], only 9.9% of households were well prepared for emergencies: 53.6% did not know what to do and 31.6% did not want to think about it. This shows that people have a poor level of emergency preparedness because only a small percentage of people are well prepared if the emergency happens within their own household. Being prepared in case of emergency is important to avoid harmful accidents to people living within the homes. One of the examples of most fatal accidents that can happen from neglect of household emergency can be electrocutions to death or even a fire breakout. Most of the time, females being at home are exposed longer to the hazards. They thus may have contributed to the increased incidences of female deaths from electrocution in 2015 [4].

2. Literature Review

2.1. Mobile Applications

Mobile application is a software application designed to run on mobile devices such as smartphones and tablet computers. It is a result of recent technological innovations. Mobile applications have appeared because of the convergence of media, information technology, internet, and advanced technologies [5].

According to Phongtraychack & Dolgaya [5], handset manufacturers designed and developed mobile phones of the first-generation. The competition was fierce and trade secrets were guarded. They did not want to expose the secrets of their handsets, so they developed the phone software in-house. During this period, the first mobile applications or games started to appear. Nokia was famous for putting the video game Snake on some of its earliest phones (1970-ies). Because of such things, people started to change their attitude to communication. When prices for mobile phones have dropped and batteries have improved, more people began carrying handy devices.

In 2017, Sharma et al. [1] observed that many users use mobile applications to attain information regarding social networking. Least users used mobile applications for travel and utility. Some perceive mobile applications for entertainment and music. The rest of the respondents use mobile

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applications to access health and fitness, news, and banking information. They also stated that these factors: design, quality of context, graphics, and user interface played an important role in influencing users towards using mobile apps. Design of mobile apps is the most important section of the mobile application development process. It must be based on the target user's interest. Mobile application developers need to maintain the consistency in applications by considering several features such as colours, typography and content that influences engagement of a user with the mobile apps.

2.2. Mobile Application for Learning

The research conducted by Hao et al. [6]is to investigate the effectiveness of mobile application that is designed to help students that are struggling to learn English. The data for this research is gathered among participants who were performing poorly in English classroom through interviews, observation, surveys, and exams. The study results show that enhance in the students for learning the subjects, moreover it also helps increase their confidence in studying the subject. It is then agreed that the mobile application is an effective tool for study though some aspect such as interface design still need to be improved.

Another study by Cho & Castañeda [7] is to determine whether students' motivation and engagement in learning change after participating in using mobile apps to learn a subject at school. The data from this research is gathered from eighty-two U.S students and showed that their intrinsic goal orientation, beliefs about controlling their learning, and self-efficacy for learning improved after participating in using the mobile application.

From this research result we conclude that mobile application for learning did have positive impacts on its user. Some of these positive impacts towards users are:

- Help increase their confidence in the study
- Improvement in intrinsic goal orientation
- Increase in beliefs about controlling their learning
- Improve in self-efficacy for their performance in learning

2.3. Mobile Application for Emergency

The research conducted by Scheper et al. [8] investigates the ease of use and usefulness of the mobile app for postoperative wound care after arthroplasty in 2019. They conducted this research because the early discharge of the patient may lead to decreased monitoring on the wound, which will cause the injury to worsen. As a result, almost all survey participants perceive that such app is useful indeed to help them monitor the postoperative wound and decrease the risk for the postoperative injury to worsen.

The purpose of this research conducted by Han et al. [9] is to describe the development, feasibility, acceptability, and effectiveness of a safety incident prevention program using the Safe Kids Hospital (SKH) application (app) among hospitalized Korean children aged three to six years old. The reason for conducting this research is because patient safety incidents are the most critical factor in determining the quality of cares services. As a result, the level of safety awareness increased after the safety incident.

From this research result, we can conclude that an emergency type mobile application is useful to its user to help them in a particular emergency and increase the level of safety awareness of the topic focused by the mobile application.

2.4. Household Emergency

Household is those who dwell under the same roof and compose a family also: a social unit composed of those living together in the same dwelling while emergency is an unforeseen combination of circumstances or the resulting state that calls for immediate action. Household emergency is when a disaster happens and in need of immediate action by the people living in the house [10]. Disaster that can happen to a household varies from as big as a natural disaster to as small as a broken roof. In this project context, researchers are focusing on small incidents like the broken roof, black out blocked, broken window, and gas leak.

A black-out refers to the total loss of power to an area and is the most severe form of power outage that can occur in a power system. It can be thought of as a situation when loads of thousands of megawatts are disconnected from the generators supplying power in a specific wide area [11] [12]. Black-out is one of the many types of household emergencies. According to Ralevski & Stojkoska

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[13] the gas leakage detection system that they developed is used to measure the temperature, CO, and smoke concentration in parts per million. The system is developed to notify people that the gas leakage incident happened before it's too late. The need for a detection system specifically for detecting it shows how dire gas leakage is and it is one of the types of household emergency.

2.5. Implication of Household Emergency

Some of the household emergencies such as power black-out, gas leak and broken air- conditioner can lead to certain damage that might be harmful and fatal to a household. The research conducted by Klimova [11] investigates the data of mortality in Bangladesh thirteen years apart which are related to electrical injuries. The result of surveys conducted in 2003 and 2016 is compared to investigate the changes in the distribution of electrocution deaths. The result shows that the death by electrocutions rates doubled in 2016 compared to 2003. This increase is because electricity has become more accessible, but the people in Bangladesh are not well informed about the precaution they must take to avoid hazards.

Research conducted by Cruz &Lam [12] identifies and analyses risk factors leading to utility gas and LPG incidents at the consumer level using network theory. The results show that 42% of the incidents regarding utility gas and LPG resulted in leakage and 13% resulted in fire. Furthermore, the causes are deformation in equipment, cracked connection line, and unintentionally turning gas on [13].

Indeed, some household emergencies may lead to harmful incidents if not handled properly by people living in the household, such as death by electrocutions and fire breakout [14].

3. Methodology

3.1. Development Methodology Design

There are three software development life cycle models compared before choosing the agile model. The three models are spiral model, evolutionary prototyping, and agile model. The spiral model is a combination of waterfall model and iterative model. Spiral model has four phases which are planning, risk analysis, engineering, and evaluation. Spiral model is suitable to be used when the project scale is large, when risks and costs evaluation is important and when a project has a level of risk of medium to high. Evolutionary prototyping model is a process model where a prototype is built, tested, and reworked until the most satisfied version is achieved. It has six phases which are requirements, quick design, build prototype, user evaluation, refining prototype, and implement and maintain. Evolutionary prototyping model is suitable to be used when the requirements of a project are unclear but the downside to this model is it will take a long time to finish developing the project since the prototyping process is slow. The project is not going to be a large scale but rather small, so the spiral model is not suitable to be implemented for this project. Plus, the evolutionary prototyping process is slow, so it is also not suitable because the development of the Safe House app needs to be completed in less than six months. If evolutionary prototyping is implemented the development might take more than six months to be completed. The development of Safe House App is applying the agile software development life cycle model. Agile model is a type of incremental model where software is developed in incremental and repetitive cycle. This SDLC model has several phases: planning phase, analysis phase, design phase, development phase, deployment and testing phase, and documentation phase. In this chapter, the reason for selecting agile model will be justified then activity done in each phase will be described in detail [15].

Agile model main goal is to easily adjust to changes that happen during the development of the system. Often, changes that happen using other type of SDLC model will cost more or will cost their time and have a tedious process that is not very practical for developing this system.

The Agile model is suitable for this system development because it is designed to be flexible. If any changes are done during the development, it can be implemented rather easily compared to other SDLC models. Moreover, the system frequently delivers working software at each iteration to make it easier to change anything that needs to be changed at one iteration before starting on the new iteration.

Once again, the agile model that is applied for this project contains six phases: planning, analysis, development, deployment, testing, and documentation.

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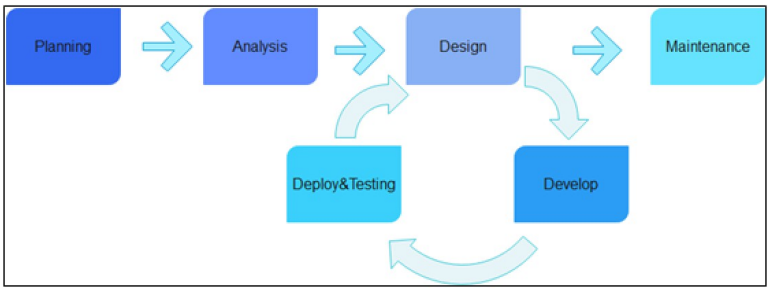

Figure 1. Agile Model Phases

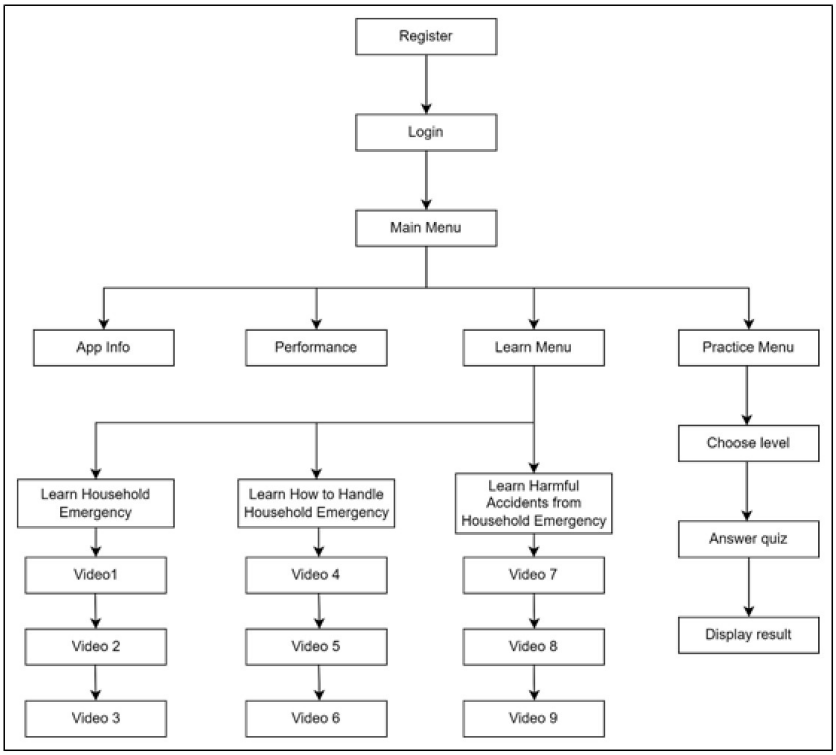

Figure 2. Safe House Mobile Application Flowchart

3.2. Sampling

Sampling is the process of selecting a group of people by the author to make them a research respondence. The reason for implementing this process is to get feedback from the target user for the project. In this research case, the respondence will be selected among Universiti Pendidikan Sultan Idris students from the Software Engineering course.

4. Finding and Discussion

4.1. Interfaces Design

Figure 3 shows the interface design of the Register Page, Main Menu Page, About App Page, and Learn Menu Interface. In the main menu page, it is consist of 4 buttons which are the info button, performance, learn and practice button. The info button at the top left corner navigates the user to the about app page. The performance button navigates the user to the performance page. The Learn button navigates the user to the learn menu page and the practice button to the user to the practice menu page.

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Figure 3. Interface Design
(a) Register Page
(b) Main Menu Page
(c) About App Page
(d) Learn Menu Interface

4.2. Product Testing Report and Findings Analysis

The purpose of distributing the questionnaire is to test the functionality of the mobile application that had been developed. The questionnaire form created is distributed to the 10 respondents through Google Form. The scale used for this questionnaire is the Likert scale that has 5 answers which are 1 Strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree, and 5 Strongly Agree. Respondents were chosen among the AC10's UPSI students.

4.2.1. Feedback from Respondents (Section A)

A total of 10 respondents were involved in this research. 50% of the respondents are male and another 50% are female. Where, 30% of respondents are between 19 to 23 years old, 70% are between 24 to 28 years old, and the remaining are 29 years old and above.

4.2.2. Feedback from Respondents (Section B)

Respondents give their feedback after downloading and using the Safe House Application. Evaluation in this section is based on the functionality provided in the application such as the navigability, accessibility of different pages, and the buttons functions.

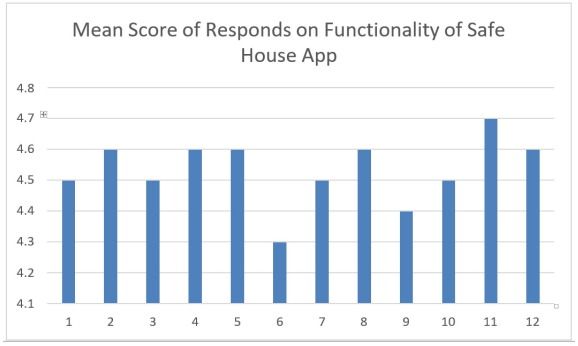

Figure 4. Mean Score of Response on Functionality of Safe House App Bar Graph

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Figure 4 is the mean score of response on the functionality evaluation of the safe house app bar graph. The horizontal axis represents the items number while the vertical axis is the mean score range from 4.1 to 4.8. The first item which is register function working well shows that 1 respondent choose neutral, 3 respondents choose agree and the remaining 6 choose strongly agree. The mean score for the first item is 4.5. For the second item, login function working well shows that 4 respondents choose agree and the remaining 6 strongly agree making the mean score for this item 4.6. Next, the third item, can the app info be access, a total of 5 respondents chooses agree and another 5 choose strongly agree. This makes the mean score for this item 4.5.

Table 1. Mean Score of Response on Functionality of Safe House App

No	Item	Scale					Mean Score
		1	2	3	4	5	
1	Register function working well			1 (3)	3 (12)	6 (30)	45/10= **4.5**
2	Login function working well				4 (16)	6 (30)	46/10= **4.6**
3	Can the app info be accessed?				5 (20)	5 (25)	45/10= **4.5**
4	Can the performance module be accessed?				4 (16)	6 (30)	46/10= **4.6**
5	Can the learn module be accessed?				4 (16)	6 (30)	46/10= **4.6**
6	Does the play button in Learn module work well?			2 (6)	3 (12)	5 (25)	43/10= **4.3**
7	Does clicking the check box and save button in Learn module syncwith the checkboxes in Performance module?				5 (20)	5 (25)	45/10= **4.5**
8	Can the practice module be accessed?			1 (3)	2 (8)	7 (35)	46/10= **4.6**
9	Does the selected level shown correctly during the quiz activity?			1 (3)	4 (16)	5 (25)	44/10= **4.4**
10	Does the right or wrong answer revealed after answering the question?				5 (20)	5 (25)	45/10= **4.5**

For the fourth item, can the performance module be accessed 4 respondents choose agree and the remaining 6 respondents choose strongly agree. The mean score for the fourth item is 4.6. Next for the fifth item, can the learn module be accessed, 4 respondents choose strongly agree and 6 respondents choose strongly agree. The mean score for the fifth item is 4.6. For the sixth item, 2 respondents choose neutral, 3 respondents choose agree and the remaining 5 choose strongly agree. This makes the mean score for the sixth item 4.3. Next for the seventh item, does clicking the check box and save button in learn module sync with the checkboxes in performance module, 5 respondents choose agree while the remaining 5 choose strongly agree. This makes the mean score of the seventh item 4.5. next, the eight item, can the practice module be accessed shows that 1 respondent choose neutral, 2 respondents choose agree and 7 respondents choose strongly agree. The mean score for the eight item is 4.6. For the ninth item, does the selected level shown correctly during the quiz activity shows that 1 respondent choose neutral, 4 respondents choose agree, and the remaining 5 choose strongly agree. The mean score for the ninth item is 4.4.

Next for the tenth item, does the right or wrong answer revealed after answering the question, 5 respondents choose agree, and the remaining 5 choose strongly agree. The mean score for the tenth item is 4.5. Next, for the eleventh item, does the correct result shown after doing the quiz activity, shows that 3 respondents choose agree and the remaining seven respondents choose strongly agree. This makes the mean score for eleventh item 4.7. Last but not least, the twelfth item, navigation buttons working well shows that 1 respondent choose neutral, 2 respondents choose agree, and the remaining 7 respondents choose strongly agree, which makes the item's mean score to be 4.6. The average mean score of Section B is 4.53. Some of the mean scores in this section is also high such as the second item, login function working well, the fourth item, can the performance module be accessed, the fifth item, can the module be accessed, the eight item, can the practice module be

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accessed, and the twelfth item, navigation buttons working well that have the mean score of 4.6 respectively. The eleventh item, does the correct result shown after doing the quiz activity, has the highest mean score of 4.7. This mean score indicates that the application functionality is working well as intended.

5. Conclusion

The analysis of feedback from respondents shows that the application got overall positive responses with a balance percentage between agree and strongly agree scale, and a small percentage on the neutral scale. However, some improvement can be done to improve user experience and better help users understand about household emergency.

Based on Software Requirement Specification Document, Safe House App has seven functions that had been developed: register user account, login user account, learn household emergency type, learn handling household emergency, learn harmful accidents from household emergency, view learning performance, and play game. All of these functions are then developed into a complete program, Safe House App. The functionality is then evaluated by selected target users, who are adults aged 18 and above and mostly are AC10's students through Google Form questionnaire. From the responds collected, mean scores were calculated for each items asked. Five out of twelve items have the mean score of 4.6 which were the second highest mean score amongst the items asked. The eleventh item, does the correct result shown after the quiz activity have the highest mean score which is 4.7. Lastly, the average mean score of all items asked was calculated and it is 4.53.

Some of the advantages of Safe House App are:

- Easy to use where it is easy for the user to learn using it the first time
- User-friendly interface
- Have many multimedia elements
- Suitable interesting videos about the topic to learn from
- Can track user learning performance so that users know which video they have watched and which they have not watched yet
- Have a quiz game about the topic and six levels for it

Some of the disadvantages of the Safe House App are:

- The user had to enter their username and password every time opening the app despite not logging out
- Have no logout button
- Cannot go to the next quiz level right away after finishing a level

References

[1] Y. Sharma, B. Kumar Dak and N. Acharya. "Emerging trends in mobile apps market and their potential impact on mobile user engagement in the global economy," *Annual Research Journal of Symbiosis Centre for Management Studies*, vol. 5, pp. 61–81. 2017.

[2] M. R. Samsudin, *Keberkesanan Model Pengajaran dan Pembelajaran Menggunakan Aplikasi Mudah Alih Terhadap Pelajar Pekak Bisu*, Kelantan: Universiti Malaysia Kelantan, 2019.

[3] C. Y. Chen, W. Xu, Y. Dai, W. Xu, C. Liu, Q. Wu, L. Gao, Z. Kang, Y. Hao and N. Ning, "Household preparedness for emergency events: a cross- sectional survey on residents in four regions of China," *BMJ Open*, vol. 9, no. 11, 2019.

[4] R. A. Shawon, J. Ferdoush, A. H. Ali, A. Biswas, A. F. Rahman and S. R. Mashreky, "Alarming rise in fatal electrocutions in Bangladesh: Comparison of two national surveys," *Burns*, vol. 45, no. 6, pp. 1471–1476, 2019.

[5] A. Phongtraychack and D. Dolgaya, "Evolution of Mobile Applications," *MATEC Web of Conferences*, pp. 1027, 2018.

[6] Y. Hao, K. S. Lee, S. T. Chen and S. C. Sim, "An evaluative study of a mobile application for middle school students struggling with English vocabulary learning," *Computers in Human Behavior*, vol. 95, pp. 208–216, 2019.

[7] M. H. Cho and D. A. Castañeda, "Motivational and affective engagement in learning Spanish with a mobile application," *System*, vol. 81, pp. 90–99. 2019.

[8] H. Scheper, R. Derogee, R. Mahdad, R. Wal, R. Nelissen, L. Visser and M. Boer, "A mobile app for postoperative wound care after arthroplasty: Ease of use and perceived usefulness," *International Journal of Medical Informatics*, vol. 129, pp. 75–80. 2019.

[9] J. Han, W. O. Oh, I. T. Park and A. Lee, "Development and Effects of a Mobile Application for Safety Incident Prevention among Hospitalized Korean Children: A pilot Study of Feasibility and Acceptability," *Journal of Pediatric Nursing*, vol. 51, 2020.

[10] Anonymous, Merriam-Webster Collegiate, *Dictionary. (n.d.)*. 2020. [Online] Available: https://www.merriam -webster.com/dictionary/citation. [Accessed: Dec. 18, 2022].

[11] B. Klimova, "Evaluating Impact of Mobile Applications on EFL University Learners' Vocabulary Learning – A Review Study," *Procedia Computer Science*, pp. 859–864, 2021.

[12] A. Cruz and C. Lam, "Risk analysis for consumer-level utility gas and liquefied petroleum gas incidents using probabilistic network modeling: A case study of gas incidents in Japan," *Reliability Engineering & System Safety*, vol. 185, pp. 198–212. 2019.

[13] M. Ralevski and B. R. Stojkoska, "IoT based system for detection of gas leakage and house fire in smart kitchen environments," *Telecommunications Forum (TELFOR)*, 2019.

[14] M. Parihar and M. K. Bhaskar, "Review of Power System Blackout," *International Journal of Research and Innovation in Applied Science (IJRIAS)*, vol. 3, no. 5, pp. 8–13, 2018.

[15] Portal Data Terbuka Malaysia. *Statistik Kebakaran Mengikut Jenis Bagunan*, 2019. [Online] Available: https://www.data.gov.my/data/ms_MY/dataset/statistik-kebakaran-mengikut-jenis-bangunan-di-malaysia.