DEVELOPMENT OF HIGH RISE BUILDING FIRE EMERGENCY EDUCATIONAL GAME

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ABSTRACT
Fire in high rise building holds a significant threat to human lives, especially for those who live and doing daily activities in high rise building. In a crowded environment, it has been observed that most victims were injured or killed by the so-called non adaptive behaviors of the crowd, rather than the actual cause of the disaster. To avoid this condition, a standard evacuation procedure on high rise building should not only become any regular information, but also a well-trained tacit knowledge. One of the common solutions to transfer this knowledge is by conducting evacuation drill. However, evacuation drill has its own downside, which is tenant losses and lack of reality. Based on those problems, this research aims to create a viable alternative by developing an emergency educational game in the event of fire in high rise building that consider human behavior and standard evacuation procedure. This research starts with requirement gathering phase, which was conducted to create the ideal configuration of the game, continued by functional design to create the game scenario, scoring system and also evaluation system. The next phase is initial interface design, which is the software development phase. After the software is completed, the next phase is usability analysis using heuristic evaluation and the last phase is evaluation and suggestion for the future works. The result of this research is a fire emergency educational game which considers human behavior and standard evacuation procedure. According to usability analysis, it was found that the game has low score on the clarity of game play and high score on match with real world, contribution to fire emergency problem and clarity of game evaluation.

Keywords: Fire, High Rise Building, Educational Game, Human Behavior, Standard Evacuation Procedure, Heuristic Evaluation

1. Research Background
High rise building has become an essential part of life in modern society. It is not only a place to live, but it also growth into a center of various activities, such as business, sports and also recreational. With its wide usability, high-rise building successfully attracts a large number of people into it. The higher the number of occupants of a high-rise building, the more attention should be given by building management to the safety regulations (Rahman, Mahmood, & Schnedier, 2007). One of safety problem in high rise building is fire-involving incident. According to Rahman and Mahmood (2007), approximately 10% of emergency situation in high rise building was triggered by fire. During the last decade, fire incident in high rise building with high casualties take place in several countries all over the world as shown in table 1.1.

The statistic shows that fire in high rise building holds a significant threat to human lives, especially for those who live and doing daily activities in high rise building. In a crowded environment, it has been observed that most victims were injured or killed by the so-called non adaptive behaviors of the crowd, rather than the actual cause (such as fire or explosion) of the disaster (Pan, Han, Dauber, & Law, 2006). Non adaptive crowd behavior refer to the destructive actions that a crowd may experience in emergency situations, such as stampeding, pushing, knocking and trampling on others.

To avoid this condition, a usual approach by the building management is by placing a safety codes around the building. However, Still (2000) concludes that these codes only provide basic guidelines, are not exhaustive and are often insufficient for many practical situations. Therefore, a standard evacuation procedure on high rise building shouldn’t only become any regular information, but also a well-trained tacit knowledge for its occupant and ordinary people as well.

Table 1.1 Fire Incident in High Rise building

<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Location</th>
<th>Fatality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2-Aug-04</td>
<td>Torres Bolanos, Paraguay</td>
<td>364 people</td>
</tr>
<tr>
<td>2</td>
<td>24-Mar-09</td>
<td>Quezon City Manor Hotel, Philippines</td>
<td>75 people</td>
</tr>
<tr>
<td>3</td>
<td>15-Nov-10</td>
<td>Shanghai Apartment, China</td>
<td>53 people</td>
</tr>
</tbody>
</table>
One of the common solutions to transfer this knowledge is by doing evacuation drill. On one of their articles, National Safety Council says that fire prevention, fire protection, adequate evacuation programming and planning, and complete “rehearsal for survival” are needed to make sure losses will be minimal in the event of fire.

In spite of that, evacuation drill has their own downside. First of all is the incurrence of losses felt by building tenants by having to vacate their place of business for any period of time (Fenwick, 2006). According to Butler (1987), evacuation drills held in the middle of the day, with pre-warning, typically have three phases. They are the “winding down” period in anticipation of the drill, the actual drill itself, and a “winding up” period where employees get back into their work. Time is placed in relevancy with business cost, or in this case a business lost. In addition, there is an inherent lack of realism in evacuation drill, and, therefore, only limited confidence can be placed in any data gathered (Johnson, 2005).

Dealing with these shortcomings, a computational based evacuation model could serve as a viable alternative. Although a number of researches have been conducted in this area, all of them mainly focus on simulation model. In simulation model, the player only acts as a spectator, thus making the idea of actively involving players into the model to get a practical experience remains unfulfilled. To compromise with this downside, another computational model could be a consideration. Another computational model is an educational game.

According to Rachman (2009), educational game could be used as an educational tool which drives the passion of learning by doing to its player. Game status, instruction, and tools provided by the game will actively guide the player to search for more information in which will enrich knowledge and strategy when playing the game. Another researches, such as (Tekin & Tasgin, 2009) and (Cankaya & Karamete, 2009), stated that educational games proved to be a good supporting system for educational process. Table 1.2 stated the advantage of simulation games by comparing it with conventional education process.

<table>
<thead>
<tr>
<th>Paradigm</th>
<th>Conventional</th>
<th>Simulation Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher’s Role</td>
<td>Agent</td>
<td>Promoter</td>
</tr>
<tr>
<td>Student’s Role</td>
<td>Receptive</td>
<td>Active</td>
</tr>
<tr>
<td>Contents</td>
<td>Predominantly Theoretical</td>
<td>Real</td>
</tr>
<tr>
<td>Motivation to Learn</td>
<td>Contents Sequence</td>
<td>Curiosity, desire to solve the problem</td>
</tr>
</tbody>
</table>

Based on those problems, this research aims to develop an evacuation education game in the event of fire emergency in high rise building with the considerations of human behavior and phenomena in emergency situation, standard evacuation procedure and also usability factors. Human behavior and phenomena in emergency will create the atmosphere of the game. Whilst the standard evacuation procedure become the key educational aspect and also the baseline to decide how many stages will be deployed in this game, usability factors will become the platform to accomplish efficiency. According to Rahman, Mahmood, & Schnedier (2007), a standard evacuation procedure could be defined into a series of timeline shown in figure 1.1.

![Evacuation timeline](https://example.com/figures/1.1.png)

By translating real emergency situation into virtual environment, including human behavior and phenomena in emergency situation, standard evacuation procedure and also usability factors, this education game aims to increase people awareness and understanding towards the appropriate manners and actions in case of fire emergency in high rise building.
2. Research Methodology

This research conducted in six stages. The first step is literature review, which is conducted to obtain information and methods on how an educational game of fire emergency situation in high rise building should be made. The next step is requirement gathering, which is conducted to create the ideal configuration of the game. The next step is conducting functional design, which emphasizes on functional aspect required by the system. Functional aspect obtained from conducting analysis on human behaviour and phenomena in emergency situation and standard evacuation and emergency procedure. The next step is initial interface design, where in this stage a prototype of the game will be built. This prototype will be evaluated using usability analysis with heuristic evaluation. If the result shows inadequate usability, the prototype will be reconfigured. After conducting all of the previous stage, the last step is conducting the evaluation, where a set of conclusion and suggestion will be generated.

3. System Design

3.1 Requirement Gathering

The purpose of this phase is creating the ideal configuration of the game by conducting identification and analysis on user’s characteristic. The result of this phase is game objective, game concept and also game play.

3.1.1 Game Objective

The main target of this game is ordinary people who don’t have specific responsibility other than escaping the building when fire emergency happens. Therefore, the objective of this game is to increase the player’s knowledge and ability about appropriate action that should be taken to survive in case of fire emergency situation in high rise building.

3.1.2 Game Concept

- The name of the game is R.E.D, stands for React Evaluate Decide
- The tagline of the game is “Be the Part of The Solution, Not the Problem”. This tagline was created to encourage the player to grasp the main purpose of this game
- The type of the game is stand alone and single player

- The main idea of the game is placing the player as an occupant in high rise building that caught up in fire, where the player’s objective is to survive by answering series of question that if answered correctly will lead them to safety
- The game divided into two scenarios, first scenario take places in an office building, while the second scenario situated in a hotel

3.1.3 Game Play

This section explains about game play. This section consists of three parts, rules, strategic situation and player’s payoff.

3.1.3.1 Rules

There are two major rules in this game
- The player should choose one of the actions provided in the question list in each scenario
- There will be time limit in each stage of the scenario. If the player fails to finish the scenario

3.1.3.2 Strategic Situation

The player will face fire emergency situation in which he/she has to survive on his/her own. Each scenario will be deployed from the moment fire alarm rings until evacuation process is completed. During the game, the player will be asked a series of question related to human behavior and phenomena in emergency situation and also standard evacuation and emergency procedure.

3.1.3.3 Player’s Payoff

Every option chosen by the player will generate point, of which will be accumulated in the end of the scenario. The right action will add points, while the wrong action subtracts the player’s score. If the player fails to complete the scenario in given time, the game will be over.

3.2 Functional Design

This phase emphasize on defining functional aspect of the system. Functional requirement obtained by conducting analysis on human behavior and standard evacuation procedure in case of fire emergency situation in high rise building.
### 3.2.1 Main Menu Design
This is the first screen that will welcome the player to the game. In this part, game’s name and tagline will be displayed, alongside with several option. The main menu will provide 3 options for the player to choose for.
- **Start New Game**
  Choosing this option will lead the player to play the game starting in basic mode scenario
- **About**
  This option gives the player the overview of the game and also about the game play
- **Exit**
  Choosing this option will take the player out of the game

### 3.2.2 Human Behavior and Standard Evacuation Procedure Identification
This phase will provide the list of human behavior and standard evacuation procedure in fire emergency situation in high rise building. This list divided into two phase in accordance to evacuation time line introduced by Rahman & Mahmood (2007).

<table>
<thead>
<tr>
<th>Stage</th>
<th>Source</th>
<th>Recognition and Response Phase</th>
<th>Path Investigation, Moving and Waiting Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rahman &amp; Mahmood (2007)</td>
<td>Run immediately to emergency exit (A11)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Call the reception or anybody to verify the situation (A12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Save their own valuable (A13)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Save important and confidential files, data (A14)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Yang, Zhao, Li &amp; Fang (2005)</td>
<td>Waiting for others ready to evacuate together (B11)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Backtracking behavior (B21)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pan, Han, Dauber &amp; Law (2006)</td>
<td>Waiting for others ready to evacuate together (B11)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pushing against each other (C21)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fleeing blindly towards blocked or forbidden exit (C22)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignore alternatives routes and stick to familiar routes despite the unknown danger (C23)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased stress level when exposed to intense and strong noises (C24)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Becomes individualistic, nonsocial, unable to cooperate with others (C25)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avoid physical contacts with others (C26)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Herding behavior, follows other almost blindly (C27)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tends to stay together in group (C28)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emotion Arousal (C29)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3.2 Standard Evacuation Procedure

<table>
<thead>
<tr>
<th>Source</th>
<th>Stage</th>
<th>Stage 1 Recognition and Response Stage</th>
<th>Stage 2 Path Investigation and Moving Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Disaster Education Coalition</td>
<td></td>
<td>Save certain belongings and/or important data (X11)</td>
<td>Feel the door, cracks and doorknob using the back of the hand to identify fire (X21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use second way out, if smoke or fire is seen in the initial route (X22)</td>
</tr>
<tr>
<td>National Disaster Education Coalition</td>
<td></td>
<td>Crawl low under the smoke to get pass through (X23)</td>
<td>Close the door behind to delay the spread of the fire (X24)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If stuck in a room, try to open the ventilation, close the door and close the crack with wet towel (if any) to stop the smoke entering the room. Also try to hang a sheet outside the window as a sign to the firefighter (X25)</td>
</tr>
<tr>
<td>Texas Department of Insurance Division of Workers' Compensation</td>
<td></td>
<td>Do not use elevator to evacuate during fire, even in two storey building (Y21)</td>
<td>Do not go to the roof to survive against fire, in any condition (Y22)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Do not break window in the room when staying there is the only available option (Y23)</td>
</tr>
</tbody>
</table>

#### 3.2.3 Scenario Generation

This game will deploy two scenarios. First one is basic scenario and the second is advance scenario. Scenario deployed in this game was created based on real fire emergency situation that might happen in high rise building.

Each scenario will be divided into two stages, the first is recognition and response stage, the second is path investigation, moving and waiting stage. The second stage will be divided again into several sub stages. This division was based on evacuation timeline which was introduced by Rahman & Mahmood (2007).

- **Basic Scenario**
  This is the first scenario that occurs in the game. The idea of this scenario is to introduce the very basic and standard evacuation procedure in case of fire emergency situation in high rise building.
  
  - **Game Story**
    In this scenario, the player acts as an office worker in a 10 stories high rise building. The player is in 7th floor when the fire alarm rings. The objective of the game is surviving by successfully exiting the building.
  
  - **Human Behavior List**
    - **Stage 1 Recognition and Response Phase**
• Run immediately to emergency exit (A11)
• Call the reception or anybody to verify the situation (A12)
• Save their own valuable (A13)
• Save important and confidential files, data or document (A14)
• Order/notify someone or others to evacuate immediately (A15)
• Waiting for others ready to evacuate together (B11)
• Ignore the alarm (A16)

Stage 2
Path Investigation, Moving and Waiting Phase
• Pushing other down (C21)
• Ignore alternative routes and stick to familiar routes despite the unknown danger (C23)
• Herding behavior, follows other almost blindly (C27)
• Backtracking (B21)

➢ Standard Evacuation List
Stage 1
Recognition and Response Stage
• Save certain belongings and/or important data (X11)

Stage 2
Path Investigation and Moving Stage
• Do not use elevator to evacuate during fire, even in two storey building (Y21)

• Advance Scenario
To be able to play this scenario, the player must complete the basic mode first. The idea of this scenario is to introduce a more complex and challenging situation of fire emergency situation in high rise building.

➢ Game Story
This scenario takes place in a hotel building, where the player stayed in 7th floor. The objective of this scenario is to survive by successfully escape the initial floor and stayed in a room above it.

➢ Human Behavior List
Stage 1
Recognition and Response Phase
• Run immediately to emergency exit (A11)
• Call the reception or anybody to verify the situation (A12)
• Save their own valuable (A13)
• Save important and confidential files, data or document (A14)
• Order/notify someone or others to evacuate immediately (A15)
• Waiting for others ready to evacuate together (B11)
• Ignore the alarm (A16)

Stage 2
Path Investigation, Moving and Waiting Phase
• Pushing other down (C21)
• Fleeing towards blocked or forbidden exit (C22)
• Ignore alternative routes and stick to familiar routes despite the unknown danger (C23)
• Herding behavior, follows other almost blindly (C27)
• Tends to stay together in group (C28)
• Backtracking (B21)

➢ Standard Evacuation List
Stage 1
Recognition and Response Phase
• Save certain belongings and/or important data (X11)

Stage 2
Path Investigation, Moving and Waiting Phase
• If you see smoke or fire, use the second way out (X22)
• If go through smoke is the only way, crawl low under the smoke (X23)
• If you stuck in a room, try to open the ventilation, close the door and close the
crack with wet towel (if any) to stop the smoke entering the room. Also try to hang a sheet or any other thing outside the window as a sign to the firefighter (X25)
- Do not use elevator to evacuate during fire, even in two storey building (Y21)
- Do not go to the roof to survive against fire, in any condition (Y22)
- Do not break window in the room when staying there is the only available option (Y23)

3.2.4 Scoring System
This section explains about the scoring system used in this game. This scoring system was developed based on the result of risk analysis. The risk analysis process was conducted under the assistance of Surabaya Fire Department using the standard of AS/NZS 4360:2004. The result of the risk analysis will be displayed in the following table, where L and C stand for likelihood and consequences value.

<table>
<thead>
<tr>
<th>Behavior</th>
<th>L</th>
<th>C</th>
<th>LxC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignorance towards warning and danger</td>
<td>3</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Carry unimportant items</td>
<td>4</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Using elevator</td>
<td>4</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Heading to forbidden exit</td>
<td>3</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Aggressive Actions</td>
<td>5</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Run through thick smoke</td>
<td>4</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Jumping from height</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Using item inappropriately</td>
<td>3</td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

From the obtained result, the scoring configuration was made. The configuration divided into three categories:
- Correct Answer
  Each correct answer will give the player 100 points. This is default in every scenario and stage.
- Wrong Answer
  Each wrong answer will subtract the player’s score in various points according to the risk level. The higher the risk level, the bigger the subtraction. The value of the subtraction will be shown in the following scheme:

<table>
<thead>
<tr>
<th>Risk Level Score (LxC)</th>
<th>Point Subtractions</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-25</td>
<td>100</td>
</tr>
<tr>
<td>6-14</td>
<td>50</td>
</tr>
<tr>
<td>1-5</td>
<td>25</td>
</tr>
</tbody>
</table>

- Bonus Point
  The player will get a bonus point when they take the right item in the first phase of the scenario. The point configuration will be shown in the following table:

<table>
<thead>
<tr>
<th>Item</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wallet</td>
<td>+50</td>
</tr>
<tr>
<td>Hand phone</td>
<td>+50</td>
</tr>
<tr>
<td>Laptop</td>
<td>-100</td>
</tr>
<tr>
<td>Private bag</td>
<td>-100</td>
</tr>
<tr>
<td>Fire Extinguisher</td>
<td>-100</td>
</tr>
</tbody>
</table>

3.2.5 Evaluation System
The evaluation screen appears when the player successfully finished each scenario. The evaluation system consists of two components. The first component will explain to the player
about the correct answer that should be chosen in each scenario, while the second component will explain about the bonus point the player can obtained in each scenario. Alongside the correct answer, the evaluation system will also provide some summary to help the player understand the objective of each scenario.

4. Software Development and Evaluation

This part presents the interface of the game and also the process and the result of usability testing.

4.1. Software Development

These are some examples of in game interface.

4.2 Usability Testing

Heuristic evaluation was conducted to evaluate the ease of use factor of the game. The usability test was conducted in 3 phases and involving 25 users. The first phase is test explanation, the second is game trial, and the last phase is answering the questionnaire.

- **User Data**
  - There are 22 respondent in the age of 20-30 years and 3 respondent whose age are more than 30 years old
  - There are 22 male respondent and 3 female respondent
  - 10 respondents are private worker that works in high rise building and also have the experiences of fire emergency drill.
  - 15 respondents are college student that used to play simulation games and never been involved in fire emergency drill

- **Evaluation**

The evaluation parameter in this questionnaire is based on Nielsen’s Ten Heuristic.
## Table 4.1 Usability Test Result

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Importance Level</th>
<th>Satisfaction Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Med</td>
<td>Mod</td>
</tr>
<tr>
<td>1</td>
<td>Clarity of Game Status</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Match With The Real World</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Clarity of Game play</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Cursor Movement</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Restart and Exit Option</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Option Selection</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Scenario Standardization</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Font Standardization</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Clarity of Question and Instruction</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Clarity of Option</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Contribution to Fire Emergency Problem Understanding</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Game Design in General</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Colour Composition</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Image Quality</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>Back sound Quality</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Fire Alarm Quality</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Clarity of Evaluation</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>Help Feature</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

- **User Opinion Exploration**
  - Alongside the questionnaire, the respondent also gave some opinion towards the performance of the game of which doesn’t appear in the questionnaire.
    - Add voice guidance in evaluation screen to increase effectiveness
    - Create the portable version of the game
    - Expand the story line in other disaster areas

### 5. Discussion
The test result shows that some parameters are considered to be extremely important by the respondent. They are match with the real world, clarity of question and instruction, clarity of option and clarity of game evaluation. This result shows that the respondent prefers realism, clarity and certainty aspect rather than graphical issues.

The test result also shows that the respondent is unsatisfied with the clarity of game play. From the further exploration, it is found that the game play is quite interesting but somewhat confusing. The confusion occurs due to lack of instruction that appears in the game screen and also the color similarity between the question and the answer option.

From the test result it is also found that the parameters that are considered to be extremely important also score a maximum point in satisfaction level. As an addition, the contribution parameter, which represents how this game helps people understand about what should be done in fire emergency situation, scores a maximum point. Therefore, it can be concluded that as an overall, this educational game has an adequate usability.

### 6. Future works
These are some ideas that can be explored for further work:
1. Develop other disaster scenario, such as earthquake, flood, tsunami and also eruption and put it in a single disaster survival game pack.
2. Enhance the animation system to create more realistic game atmosphere
3. Add voice guidance in evaluation screen to increase effectiveness
4. Create a scenario that place the player as a floor warden to explore more educational aspect.

### 7. Bibliography
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