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Resource Allocation and Management in Disaster Relief

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SERIOUS GAME INTRODUCTION

INTRODUCTION

Games has always been associated with fun, entertainment, leisure and more. According to Salen and Zimmerman, "a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome." [21]. Game characteristics can include competition and goals, rules [3], challenging activities [17,20], choices [11], and fantasy elements [4,13] as summarized in Figure 1.

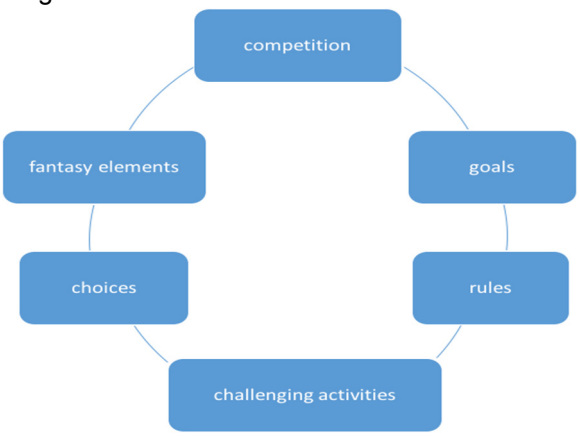


FIGURE 1. GAME CHARACTERISTICS

Besides games that are purely entertaining, games have also been used in the educational sector, since early 1960s [27,22] as illustrated in Figure 2. The rapid growth of technologies has contributed to the design and development of games especially digital game (as illustrated in Figure 3), increasing its use to motivate students in learning [7,9]. It is able to provide learners with a safe environment to practice their skills without the threat of real-world consequences, increases classroom interactivity between students and allow students to learn at his/her own time [19,25]

FIGURE 2. BOARD GAME IN EDUCATIONAL SECTOR

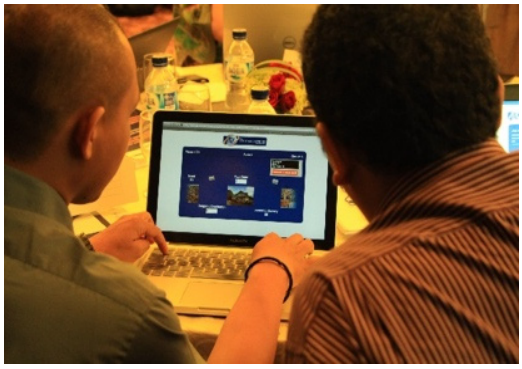


FIGURE 3. DIGITAL GAME

and revisit the problem over and over again, all these whilst having fun. This may also help in building students' self-confidence [8].

This has given birth to a new area of game based learning, commonly known as serious games. The term was first introduced in 1970 [2], but it wasn't popular till 2002 when Serious Game Initiative[1] coined it. Serious game is a game with primarily purpose other than just for entertainment. Serious game is used in the realm of educational, learning, health and hands-on experiences with examples of applications in education and training [16,26], healthcare [15], military applications [5], and

[1] http://www.seriousgames.org

city planning [1]. With this in mind, we are inclined to use the definition of serious game as "a pedagogical tool with a purpose, moving beyond entertainment to deliver engaging interactive media to support learning it its broadest sense" [6]

> *"Serious game is a pedagogical tool with a purpose, moving beyond entertainment to deliver engaging interactive media to support learning it its broadest sense"*
>
> *De Freitas [6]*

Serious games usually will be used to teach specific concepts. The concepts will be translated to the game's learning objectives and then embedded in the game itself using carefully crafted gameplay and game tools. By playing the game, students may grasp new concepts or ideas better. Marzano [18] in an article said that in all the studies that he was involved in the effects of using academic games resulted in an increase of 20 percentile gain in students' achievement. This shows that games in line with teaching materials enhances the student's ability to grasp concepts. By using serious games as a learning tool, students are able to access learning experience any time any place [12,6]

Serious game can also be used to simulate and try-out different scenarios without the need to have the real environment which may be difficult to replicate such as in disaster relief operation in a particular area. In Thailand for example, severe flooding occurred during the 2011 monsoon season. As a result of this, people had to be evacuated from the affected zones. The humanitarian agencies have to get the right assistance to the right place at the right time at the right cost whether there is an actual or potential large-scale displacement [10]. In order to provide assistance to the people who are in need of food and shelter, choice and amount of supplies and the route of delivery is imperative. Wrong decisions are costly and might even be life threatening in humanitarian logistics during crisis. To replicate such a scenario will be close to impossible and will need large-scale involvement from all parties and a huge amount of time and resources for preparation and execution.

By using gaming, these scenarios can be simulated and tested. The player can execute a disaster relief plan to determine if the plan is feasible. If there is a flaw in the plan, they can redo the plan easily without affecting impact. By providing a realistic environment in games, players can acquire advanced complex knowledge of necessary skills focused on problem solving, critical reasoning and meta-cognition [9]

We can also eliminate or reduce the resources and time needed to simulate the required scenario. On top of that, we can even simulate different crisis with different disasters easily.

This is just one example of the benefits of serious gaming.

TYPES OF GAMES

Games, including serious games, can be classified based on different criteria. For simplification in this whitepaper, we classified the games using three criteria: genres, number of players and number of scenarios.

GENRES

There are many genres of games available, like action, adventure, sports, puzzle, simulation, strategy, role-playing as shown in Figure 4. In this whitepaper, we'll be looking at three types of games – simulation, strategy and role playing.

FIGURE 1. GAME TYPES

Simulation games provide a simulation environment of real world experience into fantasy world in the game. It is often used to train people like in Flight Simulators[2], The Sims[3], etc.

In strategy games, players are required to strategize to solve challenges or to achieve a game objectives. The desired outcomes of the games are achieved by the strategic decisions made by the players. Examples of strategy games are chess[4], Civilization[5], etc.

As the name suggests, role playing games (RPG) allow the players to assume the role of the character in the game. These games are usually sets in virtual world setting with a storyline that focuses on the players' character development. Titles of RPG includes Dungeons and Dragons[6], Final Fantasy XV[7], etc.

NUMBER OF PLAYERS

Games can also be categorized as a single-player or multi-player games. Single-player games are stand-alone games, where the decisions and outcome of the game has no implications on other players. A multi-player game usually involves 2 or more players, playing simultaneously. The decisions or actions of one player usually affects the other players.

NUMBER OF SCENARIOS

Games can also have a single or multi-scenarios. In a single scenario, players will be

[2] https://www.microsoft.com/Products/Games/FSInsider/product/Pages/

[3] https://www.ea.com/games/the-sims

[4] https://www.chess.com/

[5] https://www.civilization.com/

[6] http://dnd.wizards.com/

[7] https://www.finalfantasyxv.com/

presented with the same scenario or environment each time they play. But the narratives of the game may change during the play, depending on the game decisions or actions made by the players during gameplay. For multi-scenario games, players usually are given an option to choose or are randomly presented with a different game environment each play. This give a dash of 'freshness' with a new set of challenges each time.

DISASTER RELIEF GAME

SERIES OF DEVELOPED GAMES FOR SUPPLY CHAIN MANAGEMENT

To help facilitate teaching and learning in Supply Chain Management (SCM) and logistics, we developed a series of serious games, namely:

1. Humanitarian supply chain game
2. Disaster relief game
3. Interactive board game THINKLog
4. Urban logistics game.

Each game would cover specific concepts in SCM which translate into the games' learning objectives and are then converted into the game design and game play. The gameplay is carefully designed to fit the learning objectives and help players understand specific SCM concepts.

These games fall into three games genres: simulation, strategy and role-playing. Each game has a different weightage of the genres to best deliver the game's main objective, as illustrated in Figure 5. These games also fall into different categories in term of number of players and scenarios, as illustrated in Figure 6.

DISASTER RELIEF GAME OVERVIEW

In this whitepaper, we describe in more detail one of the serious game that we developed, namely the Disaster Relief Game. The Disaster Relief Game serves as an innovative learning tool to enhance the learning experience of participants in the humanitarian supply chain.

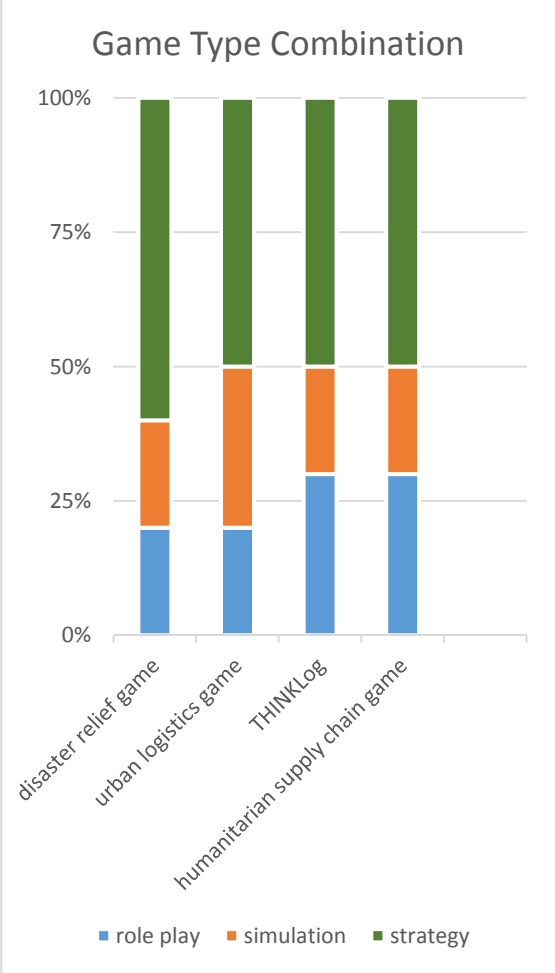


FIGURE 2. COMBINATION OF GAME TYPES

	Single scenario	Multi-scenario
Single Player	**Logistics Rush**	**Disaster Relief**
Multi-Player	**Online Humanitarian Supply Chain Game**	**THINKLog**

FIGURE 3. SINGLE PLAYER VS MULTIPLAYER; SINGLE SCENARIO VS MULTI SCENARIO

HUMANITARIAN LOGISTICS SCENARIO

The number of humanitarian crises are predicted to increase. This includes both man-made and natural disasters. Some of the factors that contributed to this are for example, climate change, unplanned urbanization, war etc. Such crises includes recurrent floods, cyclones, earthquake, tsunami, etc. Asia has been reported as one of the most incidences of such crisis and has the highest number of victims. Between 2005 and 2014, the Asia Pacific region has the lion's share of natural disasters [23] that occurred globally. It is crucial for humanitarian disaster relief operations to be efficient and effective. The humanitarian community has begun to recognize that one of the most critical factors in the success of the disaster relief operations is logistics [24].

One of the major challenges the humanitarian community faces at the onset of an emergency is the provision of necessary logistics support to manage the complex supply chain process of relief supplies. In a continuously changing humanitarian environment the required skill-set for humanitarian logisticians is quite diverse and it goes far beyond the technical expertise of moving, storing and distributing commodities. The current requirements also include coordination, collaboration, communication and team management. To optimize efforts for coordination, maximize usage of donor funding and ensure that humanitarian logisticians develop a certain level of common language and common practice, specific training programs are of utmost value.

GAME DESIGN OF DISASTER RELIEF GAME

Key objectives of the disaster relief game include creating awareness and understanding for participants of the importance and complexity of supply chain management planning and execution in the context of humanitarian crises. The game allows players to be in a risk free environment whereby they can practice the acquired knowledge and apply it to a simulated real world disaster crisis scenario. By incorporating both a theory and a fun component, the game will be concurrently educational and entertaining, enhancing significantly the quality of the learning experience. Using games, players from interdisciplinary groups can work together for a best-fit plan, whilst also acting as communication medium for better networking among the stakeholders. The players' plans are also affected by the introduction of random emergency events during the execution phase. This will further test the player's ability to think on their feet and ability to react to unexpected sudden changes.

The results of the planning activities, and then of the players' performances, can be also be assessed from factors such as usage of available resources and management of limited money, two variables heavily affected by upstream decision making. Gamification elements are also included in the game, and scores are given at the end of each gameplay to helps motivates the players. Players are able to replay the same scenario over and over again. And with the option of mobile play, we'll be able to extend the learning circle to beyond the classroom and reach a wider.

BUILD PROCESS

This disaster relief game is developed based on our humanitarian case study in Local Capacity Building Asia Pacific Series 2013[8]. The main learning objective of the case study is to help the participants in their thought process of planning and designing a coordinated and uninterrupted supply chain of life saving relief items to the affected areas including cargo and information flows starting from assessment, sourcing (stocks and procurement), transportation, warehousing up to distribution.

Documented case study received a lot of positive feedback from the participants. But the constraint is that the case study is static, hence not many variations can be executed. The participants can also only do it once. We also realised that even when the case studies were 'localised' with disaster cases for that country, the methodology and steps towards the planning are constant and convincing the donor to pick their plan meant one could not see it in action and whether the plan actually worked.

To generalize the case study and make it applicable in different environment, we decided to gamify the process in the Disaster Relief Game by using the existing case studies as the basis of the game mechanics. The learning objective in the case study becomes the one of the foundations for the game. Our game will have two stages, the Planning Phase to simulate the Preparedness stage and the Execution Phase to simulate the Response stage of the Disaster Management Cycle.

The main learning objective of the disaster relief case study is to help the participants in their thought process of planning and designing a coordinated and uninterrupted supply chain of life saving relief items to the affected areas. This becomes one of the foundations for the Disaster Relief Game.

GAMIFICATION OF DISASTER RELIEF GAME

We first identify the objectives and the rules of the game. The main objective of this gamification is to provide a safe environment for disaster management planning exercise, which can be played many times without the hassle, danger and limitation of physical large-scale setup.

As such, the game should also incorporate features that is playable as a stand-alone or in a classroom environment. We decided in using fictitious maps and city names instead, so that we can 'create' different types of disaster to occur. There is also a need to be able to introduce random events to simulate the

8 http://tliap.nus.edu.sg/humlog/publications.html

uncertainties of what may happen during an actual disaster. There should also be a scoring system to encourage the players to improve on their play. The scoring system can also be used to compare results to create a competition among the players.

The summary of gamification of the game is summarized and the game flow are summarized in Table 1 and Figure 7 respectively. The technical design of disaster relief game is summarized in Table 2.

Table 1. The Gamification of Disaster Relief Game

Goals (Game Objectives)	To rescue and provide as many victims with supplies of uninterrupted supply chain of life saving items within the stipulated time
Rules	Need to plan for each turn. Once the plan is executed, player is unable to change his/her past plan
Challenging activities	Random events such as road closure, missing resources, epidemic and many others may occur during the execution phase. Level of difficulties can be determined by limiting the number of available resources and increasing the mortality rate.
Fantasy elements	The game map and name are fictitious.
Choices	Player can choose to spend available funds on vehicles, lifesaving kits (LSK) or distribution points. Player can choose to move the survivors to other towns or safe locations
Competition	At the end of the game, player will be presented with the results, which can be used to compare with other players.

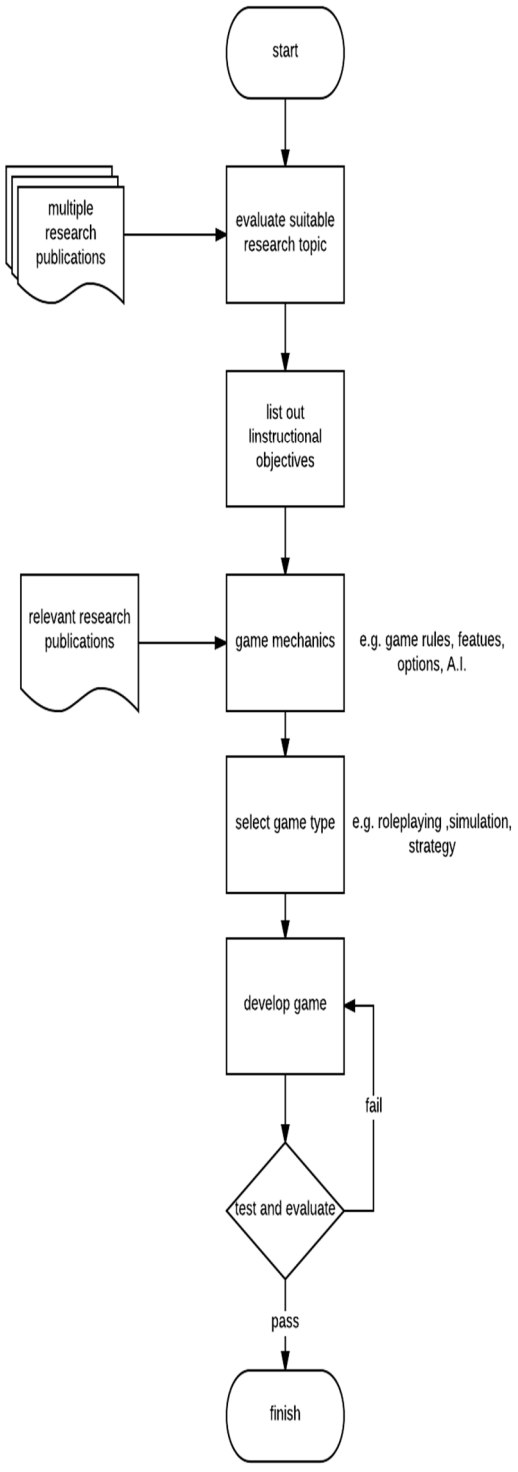


FIGURE 4. GAME DESIGN FLOW

Table 2. Disaster Relief Game Technical Design

Target Platform	Desktop & Android mobile tablets
Development Game Engine	Unity 3D
Artistic Elements & Animation	Photoshop, Maya

MORTALITY AND SURVIBALITY COUNT

Point-Of-Interest (POI) are locations that can host Survivors, Supplies and Vehicles. POI includes the Towns, Warehouses and Ports. Number of survivor in one POI is *N*. At the start of the game, the condition rate of the POI (CR_{POI}) are generated according to the severity of the disaster for that particular POI.

In each POI, any random disaster event may occur in any game turn (e.g. epidemic). A value, referred as Disaster Event Rate (R_{DE}), is assigned to a disaster event depending on the severity of the disaster event.

Each unit of lifesaving item can last 1 survivor for 7 turns or 7 survivors for 1 turn. If survivors are not fed, they can only last not more than 2 turns on perfect condition. Days without access to lifesaving item for a survivor is referred as DNF_i. Without access to lifesaving item ($DNF_i >= 0$), the survivability rate for survivor *i* will be lower.

The POI Survivability Rate (SR_{POI}) of each survivor is calculated as follows:

$$SR_{POI} = \frac{\sum_i^{i=N}\{CR_{POI} \times R_{DE} \times \alpha_i\}}{N} \quad (1)$$

where:

$$\alpha_i = f(DNF_i) = \begin{cases} 1 & DNF_i \leq 1 \\ 0.9 & DNF_i = 2 \\ 0.7 & DNF_i = 3 \\ 0.4 & DNF_i = 4 \\ 0 & DNF_i > 5 \end{cases} \quad (2)$$

Once we have the POI Survivability Rate (SR_{POI}), we can calculate the number of death (D_c) occurs in that turn using the following formula.

$$D_c = 100 \times \left(1 - \frac{SR_{POI}}{N}\right) \quad (3)$$

LEARNING OBJECTIVES

The main learning objective of this game is creating awareness and understanding for participants of the importance and complexity of supply chain management planning and execution in the context of humanitarian crises.

Other objectives include:

- Lead time when ordering supplies
- Working with limited time, budget and resources
- Delay in delivery of lifesaving kits or survivors' rescues will lead to loss of lives
- Condition of incident area affects mortality rate
- Always prepare for unplanned events that could affect he relief plan

PLAY STRATEGY

Player may adopt this 4 steps strategy when playing the game – Discovery, Analyse, Resource, Transport (D.A.R.T.), for each turn.

Table 3. Disaster Relief Game Technical Design

D Discovery	Move around the map. Discover where the survivors, vehicles, supplies are located.
A Analyse	Analyse the situation; which town is in dire need of evacuation or lack or supplies. Analyse which unaffected town will be your 'safe' zone
R Resource	Plan how much resources you require and where to drop them. Make the necessary purchases of vehicles, supplies if required, from the shops.
T Transport	Transport the survivors out of the disaster-strike town. Transport supplies to survivors.

This strategy need not be in sequence. Player may skip or re-order the steps according to their own play style. This strategy only serves as a guideline to play. Players are free to form their own strategy to play this game.

KEY FEATURES

Besides the Artificial Intelligent (AI) engine that is built into the game to simulate the 'environment', the 'demand and supply' and the 'urgency' of the rescue mission, the game also includes features that can help players in their planning, to react to 'unexpected' events during the Execution Phase and to analyse the outcome of their plan and its results at the end of each game.

An example of the AI built into the game is the mortality rate of the survivors. It is dependent on the condition of the cities and the number of Life Saving Kits (LSK) available to where the survivors are located. Another example is the random occurrence and type of events that may take place during the Execution Phase. The following are some of the key features available in the game.

Activity Planner

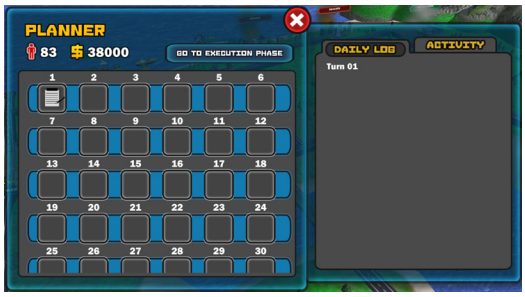


FIGURE 5. PLANNER PANEL

The Planner Panel allows the players to plan their actions for each turn during the Planning Phase. They can either plan for all thirty (30) turns or skipped a few turns due to vehicles travelling time on the road or the supplies delivery time. Each turn is categorized into 2 categories: Daily Log and Activity Log. Daily Log refers to the activities that has happen in that turn. Activities includes: number of death, vehicles arrived at a certain location, supplies purchased has reached, random events, etc.

Activity Log, on the other hand, refers to the actions that the players have took such as, purchasing of supplies, unlocking of warehouse, etc.

Important information such as number of survivors, amount of money left and the current turn that the player is planning for is also shown on the Planner Panel.

We anticipate that most of the game playing time will be spent on the Planner Panel. Once the player is satisfied with the arrangement, they can then proceed to the Execution Phase. During the Execution Phase, 'unexpected' random events may occur and when it does, the game will be paused, allowing the player to make any adjustments, if necessary, to their plan for the subsequent turns.

Key features in the Disaster Relief Game are:

1. *Activity Planner*
2. *Resource Management*
3. *Random Event*
4. *Gamification*
5. *Historical Records*
6. *Game Result Analysis*

Resource Management

FIGURE 6. INFORMATION PANEL

The Information Panel is where player can easily retrieve detailed information regarding the different places on the map, such as the number of supplies and survivors in that area, etc. The panel is also used to locate the position of places of interest, like warehouses, cities, ports, supplies, etc. on the map easily.

Random Events

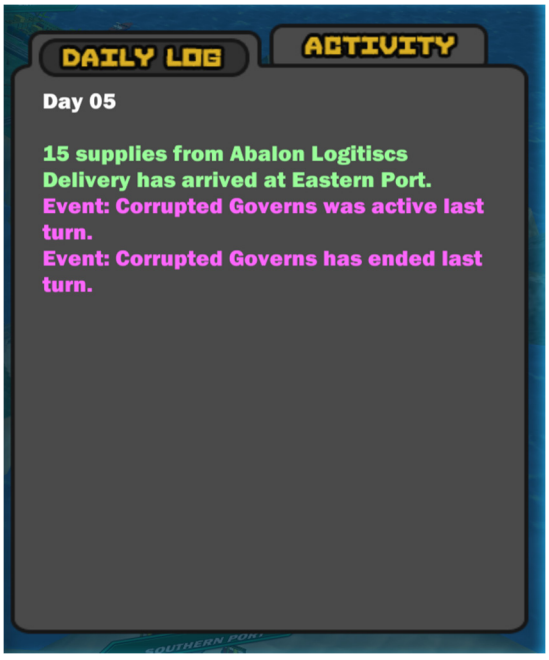


FIGURE 7. EVENT HAPPENING

There is a set of pre-defined events that may occur during the game play. These events will appear 'unexpectedly' during the Execution Phase and can either provide some reliefs for the player, for example receive donations from members of public, or poses a challenge to the player 's relief plan, for example loss of supplies due to warehouse robbery. This adds a little fun element to the game as it adds a bit of mystery to the execution of the player's relief plan.

Gamification

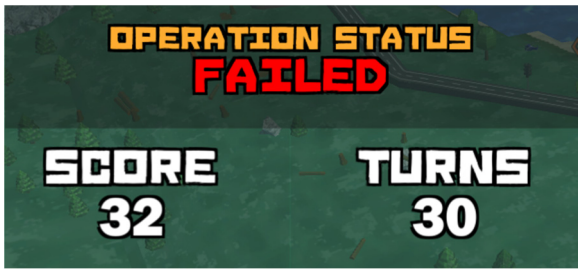


FIGURE 8. END GAME SCORE

By implementing a scoring system, players will be motivated to play the game as there is going to be a sense of achievement at the end. There will be a total of 2 scores at the end of each map. They are the planning score and the execution score. The planning score refers to the score that the players will get for the plan they have draft up in the planning phase. The execution score refers to the score that the players will get for the execution phase. The reason why both the planning score and execution score will be different is due to random events such as lost of funds due to theft, or received additional donations in terms of funds or resources, and many more. Even if 2 players have the same plan, they may not have the same contingency plan to solve the issue. Using this, we can see which players has

done better in terms of adapting to the 'unexpected' events that occurred.

There are a couple of requirements to get a good score. Firstly, able to save at least 1 group of survivors and secondly not overspending the budget.

Historical Records

The history screen records down the information on the levels that the player has played.

FIGURE 9. HISTORY SCREEN (SCHEDULE)

By having this screen, the player can go back and review on their plan so that they can know what have they done well and what went wrong. This helps to provide a cycle of learning through mistakes.

FIGURE 10. HISTORY SCREEN (RESULTS)

Important information such as when and how much supplies are purchased, the final number of used and unused supplies can help the player scrutinized their own plan to see if they could have planned better.

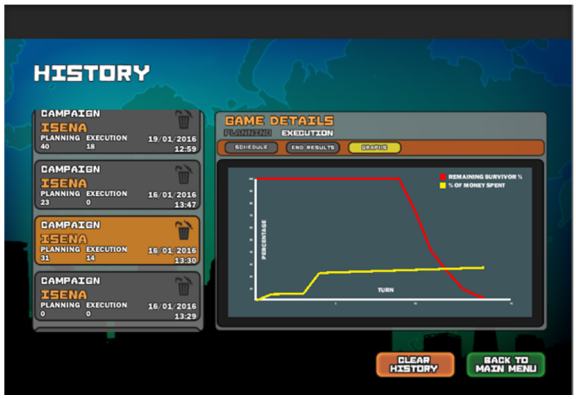


FIGURE 11. HISTORY SCREEN (GRAPHS)

By having a graph of percentage against turns, the player can easily see at which turn have their plan starts to have major influence to the result.

Game Result Analysis

FIGURE 12. ANALYSIS SCREEN (OVERALL)

At the end of the gameplay, the player will be presented with the Analysis screen. On this screen, the players will have information consisting of a graph of percentage against turns, scoring and the resources that have been touched by the players.

With the help of the analysis, players can check important information such as resources used, unused and total of survivors left.

Players can also compare with other players and 'exchange' notes on the thought-behind process that took place during the planning of the rescue. Thus, they may be able to learn from each other the best possible approach to a particular emergency scenario.

GAME RESULTS

There are a few conditions whereby the game can end during the Execution Phase (or what is known in the game as OPERATION ENDED).

1. Run out of money; or
2. No more survivors; or
3. Completed 30 turns

The player will be awarded with status COMPLETED if he/she has completed 30 turns in the Execution Phase, achieved the game objectives, without running out of money and survivor count at the end of the game must be more or equal to 60% from the initial count in the beginning of the game.

There are two end game results – either OPERATION STATUS: COMPLETED or FAILED. Player will be presented with the score and a detailed summary of the resources ending.

OPERATION STATUS: FAILED

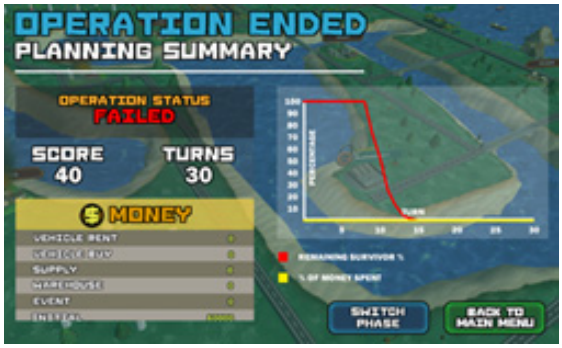


FIGURE 13. OPERATION STATUS (FAILED)

The game will end when the player runs out of money or no more survivors, regardless whether or not they've completed 30 turns. If this happens, it is considered as 'sudden death' and the operation will be deemed as a failure.

Another condition can serve the player with the fail status, is when the player managed to complete the whole 30 turns but the percentage of the survivors at the end of the game is less than 60% of its initial number. This will also be considered as a failure.

OPERATION STATUS: COMPLETED

In order to 'win' in this game, the player has to complete 30 turns in the Execution Phase, achieved the game objectives, without running out of money or losing all the survivors life. AND the survivors count at the end of the game must be at 60% from the initial count.

FIGURE 14. OPERATION STATUS (COMPLETED)

The game will calculate the game score and present the player with the final detailed summary.

If all of the conditions are met, the player will be awarded with the status COMPLETED, else the player will received status FAILED.

We can use the Challenge Mode to create a competition among players playing simultaneously when every player selects the same map. If there is a tie in the end score, we can use the Executive Summary, to decide whether on one of these points to decide the winner:

- Higher number of survivors; or
- More funds left; or
- Less unused of life savings supplies (good forecasting)

SUMMARY

SUMMARY AND KEY TAKE-AWAYS

In this white paper, we have discussed the reasons as to why the proposed game can be used as an innovative learning tool for humanitarian logistics relief. It may also help in assisting and complementing the training workshops, by creating awareness on the complexity and uncertainty in humanitarian logistics relief, which ultimately cultivate awareness and interest to mass public in general, in the area of humanitarian relief.

"Serious game is a pedagogical tool with a purpose, moving beyond entertainment to deliver engaging interactive media to support learning it its broadest sense"

De Freitas [6]

The main learning objective of the disaster relief case study is to help the participants in their thought process of planning and designing a coordinated and uninterrupted supply chain of life saving relief items to the affected areas. This becomes one of the foundations for the Disaster Relief Game.

Key features in the Disaster Relief Game are:

1. *Activity Planner*
2. *Resource Management*
3. *Random Event*
4. *Gamification*
5. *Historical Records*
6. *Game Result Analysis*

APPENDICES AND REFERENCES

APPENDIX I: GAME ELEMENTS

In this section, we describe the different graphical user interface and elements available in the disaster relief game. We also describe its usage and functions in the game.

HUD Overview

Heads Up Display (HUD), is the display area on the game where players can view important information and access the game's functions.

- **Turn Indicator:** Display the current turn the game is in and show which phase is currently on

- **Survivor and Funds Bar:** Display current amount of Survivors and Funding left

- **Control Panel:** Select to display more options

- **Planner:** Choose which turn to select and access all info about the turn here

Survivor & Supply

Survivors need Supplies to survive. Without it, survivors will slowly die. This means that there must be enough supplies wherever there are survivors, whether it is in a POI or in a Vehicle

1 Supply can feed 7 Survivors in 1 day or feed 1 Survivor in 7 days

If survivors are not fed, they can only last not more than 2 turns on perfect condition

Phase and Turn

Planning and Execution Phase

- Planning Phase

In Planning Phase, you may create actions and keep changing different turn to see the outcome. You can undo any actions and try different actions to achieve the proper results you desire. The projected outcome from the Planning Phase, however may not necessarily be the same in Execution Phase.

Actions includes:

- Vehicles can be moved around
- Survivors and Supplies can be transported using Vehicles

- You can access the Shops to purchase Supplies and Vehicles

- Execution Phase

During Execution Phase, you will see your plan in action. During this phase, you cannot make any changes to your current plan, unless an Event has occurred. When an Event occurs, the Execution Phase will be paused, this gives you a chance to edit your plan to fit according to the event. After the last turn, the game will end

Control Panel

Click on the control panel to access an array of additional options

Info Panel

You can access the Info panel from the Control Panel

The Info panel shows every POI inventory and its location. The POI inventory will contain its total number of Survivors, Supplies and Vehicles stored within it.

The map will display all the current POI location. You can navigate the map by tapping and dragging the map around.

To find the location of a specific POI, select its name and an indicator will appear on the map to reveal its location

Shop

You can access the Shop from the Control Panel

There are two different type of shops. The Green shop icon sells Supply while the Blue shop icon sells Vehicle

- Icon
  - displays time taken to arrive after purchased

- displays current Price of the product

- displays amount of supplies bought after purchased (Green Supply Shop only)

- shows whether it is a Local Delivery or an Oversea Delivery

- Price and Rental
  - Certain products such as Vehicle has a daily rental price. This cost shows how much the vehicle rental cost per turn, hence reducing your total funds per turn

- Delivery System
  - For Local Delivery, you can send the product directly to both POI: Supply Point (**Green Banner**) or POI: Warehouse (**Blue Banner**).
  - For Oversea Delivery, you can send the product directly to POI: Supply Point (**Green Banner**) only

Planner

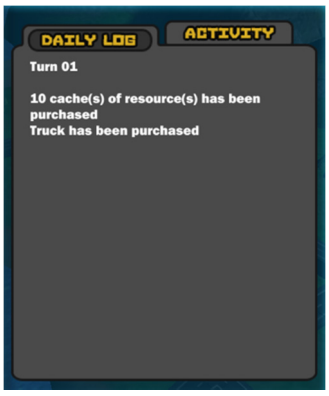
The Planner is where you can choose which turn you want to edit. Switching between turns will allow your actions to play out as you planned and you get to see results of your actions. All of your actions

done can be reverted so there will always be time to re-plan. You can access both the Daily Log and Activity Log in Planner

Switching different turn

- To switch turns, double tap on the button below the turn you want to select

Daily Log



- Daily log will display any past actions that has occurred during the current selected turn. These actions can include things that has happen that was indirectly affected by your actions.

Activity Log

- Activity Log will display all actions you have made during the current selected turn. You can undo any actions you done in this Activity Log

POI Panel

Point-Of-Interest (POI) are the locations that may host Survivors, Supplies and Vehicles. You can view more detailed information of the POI by tapping on its Banner

Types and Differences

- There are 3 different type of POI; City, Supply Point and Warehouse
- City POI are indicated as **Red Banners**. They may host Survivors, Supplies and Vehicles.

- Supply Point POI are indicated as **Green Banners**. They may host Survivors, Supplies and Vehicles. You can send in new Supplies and Vehicle to Supply Point after purchasing them from the shop.

- Warehouse POI are indicated as **Blue Banners**. They may host Survivors, Supplies and Vehicles. You can send in new Supplies and Vehicle to Supply Point after purchasing them from the shop but only if the product has Local Delivery.

Icons and Details

- On the Left panel, this is where all the vehicles parked will appear. You can interact them here as well
- On the Right panel, you can see the amount and the max Capacity of Survivors and
- Supplies hosted here
- Also on the Right panel, you can find the Survivability bar which helps show how well the survivors are doing. The lower the bar, the higher chance they will die.
- Within the Right panel, you can find the City Condition bar which helps show the living condition of the POI. The lower the bar, the worst the condition of the POI is. The City Condition bar will also influence the Survivability bar

Transferring Resource

- To transfer Survivors and Supplies between Vehicles and the POI. Tap on the '+' to transfer Survivors and Supplies from the POI to the Vehicle.

- Tap on the '-' to transfer Survivors and Supplies from the Vehicle to POI

Deploying Vehicle

- To send out and deploy your Vehicles within the POI, tap on the 'Deploy' Button and tap on the POI Banner to select the POI of your choice to define its destination.

- Once a destination has been chosen, pick between Efficient and Responsive Routes.

- Efficient route: Your vehicle will move to its destination via a route where they have a lesser chance on entering into an accident

- Responsive route: Your vehicle will move to its destination via the quickest way possible, possibly ignoring any threat

Vehicles

Vehicles are used as the transportation for both Survivors and Supplies. They can be parked in any POI available

Types and Differences

- There are currently 3 different types of vehicles
- Trucks: These are the ground based vehicle, they can travel between POI, as long as they are connected via Roads
- Boats: These are the water based vehicle, they can travel between POI, as long as they are connected via water paths
- Helicopters: These are the air based vehicle, they can travel between any POI regardless



APPENDIX II: EVENTS

Events

During the **Execution Phase**, a set of small events that can take place anytime randomly as the players progress through within the level. This random events will give side objectives that player may or may not complete. This will also be shown as side objectives.

Failing this random events will NOT cause player to lose the level in anyway however it may add some extra annoyance as the player plays the level.

Campaign Mode has scripted Event that is bound to the level as this levels must be consistent

Pre-set and scripted events will be triggered.

E.g. Rock slides occurs near a large path. If the player clears it, then he/she will have a clear path. If player fail/ignores it, no points deduction but the path is no longer passable.

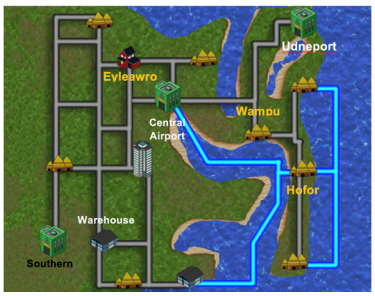
Types of Events

Good Events	Bad Events	Seriously Bad Events	Super Bad Events
Donation: + $3000 Funds	Landslide: 1 Random Road Node is not walkable	Forest Fire: Small POI City Condition decays faster	Epidemic: Survivors has a higher % of dying.
Donation: + 2 Free Random Vehicles	Vehicular Accident: Lose 1 Random Vehicle	Inflation: Increase cost for all product from the stores by 25%.	Drought: All POI condition decays faster
Donation: + 20 Cache Supplies	CAT 2 Storm: Ground all air vehicle for 1 day		
Good Favour: + $1200 Funds, 1 Free Random Vehicle, 5 Cache Supplies			

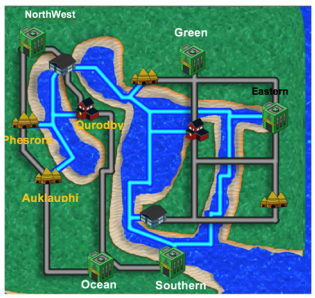
APPENDIX III: LEVEL DESIGN

The game provides 3 fictitious island maps, ISENA, SAGARA and HAIDO, with two different game play modes, CAMPAIGN and CHALLENGE.

ISENA



SAGARA



HAIDO

Campaign mode provides an open play with 3 levels of difficulties (EASY, MEDIUM, HARD) for each map to choose from. In this mode, the player may experience different challenges each time.

Challenge mode, on the other hand, provides scripted events and is most suitable to be played in a classroom setup. In this mode, players may compare end game results with each other. There are 4 scenarios to choose from in this mode. The first 3 scenarios use the different maps to depict the different types of disasters. The 4th scenario uses the ISENA map but with a slight increase in its level of difficulty.

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