The Adoption of Multiplayer Online Battle Arena to Introduce Wayang Character

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***Abstract*— Wayang is considered a cultural heritage that has been passed down from generation to generation in Indonesia. However, the younger generation known as digital natives shows a lack of motivation and interest in Wayang. Therefore, it became an important matter to introduce traditional Wayang to younger audiences in engaging formats. This paper proposes an adaptation of the multiplayer online battle arena or known as MOBA. This type of multiplayer game for the mobile market is gaining high popularity among the young generation because it embraces quick-paced, strategic, and intense battle scenes. We called our game "Wayang Tarung" or "Wayang Battle" in English. Furthermore, the game has several features supporting the narrative of the Wayang characters, such as simple digital motion comics and character briefing between loading screens. A mechanic-dynamic-aesthetic framework (MDA) is used as a guideline to assure the game has engaging gameplay.** The Wayang Battle is a multiplayer online game with an asymmetrical character design, meaning the character possesses different treats and capabilities. **Therefore, we also apply a game balancing strategy to ensure that each Wayang character has weak and strong points. In addition, we were adapting artificial intelligence from the Clash Royale game to dictate autonomous character behavior. The implementation of the Wayang Tarung game has been evaluated using a heuristic testing method adapted from the Norman Nielsen heuristic usability. We also conducted a direct observation in a controlled-lab condition and gathered the data using a pre-post test that evaluated player knowledge of Wayang's character. Based on the excellent mark pre-post test result, we believe that adopting the multiplayer game platform in introducing wayang characters to the young generation has enriched prominent to explore further.**

Keywords—strategy game, multiplayer online battle arena, wayang, puppet, MDA

I. INTRODUCTION

Indonesia has many traditional performing arts passed down from generation to generation to preserve the cultural heritage [32]. The responsibility for safeguarding the culture is the local government [33] and the community. One of them is Wayang art that has various forms of performance, including shadow and doll puppets. *Puppetry art* is a distinctive art that has many stories and characters that boost moral [34]. The Wayang used during the show will represent each character from the knowable stories and is mainly used as a storytelling method[6]. Based on the Indonesian language dictionary, Wayang itself is a doll resembling a person made of leather or wood and used to portray a particular character [34]. The famous characters in Wayang are Five Pandhawa and Kurawa. The Five Pandhawa themselves consist of Yudhisthira, Bhima, Arjuna, Nakula, and Sahadeva [35]. The five Pandavas represent the five brothers of Pandu Dewanata, namely Yudhisthira, Bima, Arjuna, Nakula, and Sahadeva. These five figures are the central characters of the Mahabharata story. These five figures are also depicted as good characters and used in everyday life stories [36]. The five Pandavas are known to have good characteristics. Yudhisthira is wise; Bima has a brave attitude; Arjuna has an intelligent personality; Nakula and Sahadeva are honest characters. In contrast, the Kurawa depicted evil characters that occasionally have a conflict with good characters.

Wayang, as a cultural heritage of Indonesia, needs to be preserved. However, the popularity of wayang art is fading, especially among younger audiences [18]. The problems have been investigated as several points. First, the younger generation has difficulty understanding the stories brought by the dalang (puppet master). Java island is where the traditional wayang performance is rooted. Because of that, the puppet master speaks the traditional Javanese language during the shows, and it is hardly understandable by younger audiences. Secondly, the younger generation feels bored because wayang shows are not blended with modern culture, and it contributes to building up the assumption that Wayang is considered an ancient culture [29]. Younger audiences known as digital natives and have preferences over more modern and interactive form of entertainment, such as playing mobile game and watching movies [6]. Thirdly, the show duration of shadow puppets is too long.

It became an important matter to introduce traditional Wayang to younger audiences in various interactive formats. Wayang knowledge can start at an early age. For example, the teacher has utilized the pop-up book of Wayang Pandawa in the Javanese language course for the elementary school level [4]. The introduction of wayang characters and the completion of the learning materials have been significantly improved with this format.

More technological approaches have been explored by Prahara and Hariguna's. Based on research, 90% of the

questionnaires agreed that interactive digital game is an exciting way to introduce wayang characters [26]. This type of multiplayer game for the mobile market is in great demand by young players. As a result, a more specific multiplayer game genre, namely multiplayer online battle arena (MOBA), has become a trendsetter for mobile games development [30]. This MOBA genre combines real-time strategic action with competitive gameplay to put players in an arena to fight each other. Popular MOBA-type game titles include mobile legends, clash of clans, clash royale, and so on [37].

Introducing Wayang characters to the younger generation is needed because of harmful and destructive external influences. This phenomenon causes the degradation of the moral values of the younger generation [38]. There have been many solutions with a modern approach to introducing Wayang. Despite these facts, many solutions tend to simplify or focus on teaching Wayang in the game. Moreover, these facts led to the research gap: there is a limited approach to applying engaging gameplay as part of the education of introducing Wayang characters. Therefore our main research question is how to introduce wayang characters to younger audiences with engaging formats? Furthermore, how is this new format effective to properly visualize Wayang characters? The content of this research paper is comprehensively written in the following structure: The methodology section uses a literature study to investigate the current solution related to tools to introduce Wayang to the younger generation. Additionally, we analyze the strategy aspects of MOBA and how it gained its popularity. We also used a random sampling questionnaire to obtain young audiences' knowledge and concern regarding the Wayang characters. Then, the results and discussion section discusses how to develop the solution on which we use game design theory and design thinking formulation based on the previous data collected and consideration from popular MOBA strategic aspects. We also presents the discussion of the game test results. Finally, the conclusion explains the findings and future works that are beneficial for the development of this research.

II. METHODOLOGY

Our methodology begins with an investigation of games as a platform for introducing wayang characters. Then in the next section, we address the MOBA strategy genre. Finally, we conduct data gathering and analysis to comprehend the respondents' prior knowledge of wayang.

A. Game as Platform to Introduce Wayang Characters

Various attempts have been made to convert, reinvent, and re-introduce Wayang to younger audiences. We conduct the literature study to investigate current trends and approaches that attempt to introduce Wayang characters to the younger generation. The selection criteria used are publications above 2015, proceedings or scientific journals, and publications in English or Indonesian. In addition, we use google scholar and connectedpaper tools to find affiliates papers and other trivial approaches that may be suitable to be included in the result. Finally, after thorough selection procedures, six publications were considered the base of our literature study. We comprehensively present the comparative result as in table 1.

The introduction of Wayang through virtual reality media has been proposed by Pratama & Subari [27] in a mobile virtual reality platform. The type of wayang introduced is wayang kulit. This study establishes three main functions, particularly wayang examination, learning wayang stories, and experiences of holding Wayang. These three functions were successfully applied immersively using a virtual reality headset. For example, players can hold a puppet as if acting like a puppeteer in a puppetry show. Ghani, et al [6] introduce The "Wayang Fighter" as a game application prototype that resembles the visual aesthetic of Wayang Kulit (shadow play) inspired from a fighting game series. The vectorized method was used to craft and assemble the Wayang characters and according to the respondents, it were look and feel almost similar to its original puppet. Pamungkas et al. [22] developed a puppet puzzle game to introduce the Pandhawa Lima character. These five figures are Punthadewa, Bima, Arjuna, Nakula and Sahadeva. The game displays various types of puppet images that are scrambled with a grid system. Then the player is expected to be able to complete the puzzle in the allocated time. Unfortunately, this game has limitations in bestowing background information on the story of Pandhawa Lima, so that attempting to introduce wayang characters is less than perfect.

Other attempts to bring Wayang into the mobile game domain have been known as well. For example, Muliawan et al. [19] was developed a single-player android-based "Wayang Fighter". This game uses an in-game basic probability algorithm to determine hit and damage probabilities and character traits such as the tendency to attack and run. In addition, the Wayang character is depicted from Mahabharata's story, and the player can access character information as a narrative way to induce Wayang knowledge. Nugraha et al. [21] introduced Ios based game that uses the puzzle genre instead of the typical fighting genre used by others. The basic gameplay is that the player must search for correct words from the pool of nouns/adjectives/verbs related to the Wayang context. This game provides general information about Wayang characters. However, it does not blend properly with the gameplay itself and merely serves as additional content . Another approaches from Kristus [17], that develop an android game with a side-scrolling adventure genre. It uses the popular character, Gatotkaca as the main protagonist of the game. The gameplay induces single-player experiences that seem familiar, like other side-scrolling stereotypes. The drawback of this approach is that the attempt to introduce Wayang's character is not achieved since there is a lack of context based on Wayang, and it is more like a side-scrolling game with a different skin. Findings show that all publications only use single-player aspects.

TABLE I. COMPARATIVE TABLE OF CURRENT RESEARCH

	Comparative Elements					
	Vis.	***Narratives***	***Chars.***	***Stories***	***Platform***	***Genre***
Interactive Media						
Pratama & Subari	✔	✔	10	Mahabharata	Android VR	N/A
Ghani	✔	✔	> 3	Various	Desktop	Fighting
Pamungkas	limited		5	Pandhawa Lima	Desktop	Puzzle
Mobile Game						
Muliawan	✔	limited	10	Mahabharata	Android	Fighting
Nugraha			N/A	N/A	IOS	Puzzle
Kristus	✔		2	Arjuna, Buto Ijo	Android	Side-scroller

B. Mobile Online Battle Arena

Smartphones are an inseparable personal possession in human life because of their multifunctionality, one of which is entertainment. Playing mobile games has been considered an engaging and fun entertainment purpose that is dominated by the young generation. Google play store records 477,877 games in the first quartal of 2021 which available to download from their platform [2]. There are various genres of mobile games; one of the most popular is MOBA which is a subgenre of strategy games. The MOBA genre has experienced a sharp increase in the last 2-3 years. In Q2 2021 it was recorded an increase of 14% in terms of commercial income [3]. The Arena of Valor game is the most profitable MOBA genre mobile game with a total achievement exceeding $10 billion. MOBA is in demand because the gameplay is simple, easy to play [16]. After all, it imitates sports matches in general. MOBA place two camps of players against each other to destroy the opponent's base. However, although MOBA is easy to play, it is challenging to master this game. This characteristic arises because the MOBA genre has unique characters/fighters with various attributes/abilities, playing styles, and the visual appearance of the characters.

MOBA gameplay offers the same mechanics and experiences between games titles. This genre offers teamfight based gameplay that each team pit against another opponent with the primary goal of destroying the opponent's base [30]. The player controls a fighter/character/hero that has various skills and archetypes. Before reaching the main bases, players must destroy the towers. This building automatically attacks players that are in its attack radius. To help players attack enemy bases, players get help by the game by periodically summoning a group of monsters or also known as creep [1]. These monsters have autonomous movement and are controlled by in-game artificial intelligence. Popular games that carry this kind of gameplay are League of Legends, Dota 2, Arena of Valor, and other popular titles. The MOBA genre starts from the PC platform and is played using keyboard and mouse peripherals.

In subsequent developments, the MOBA genre slowly shifted to the mobile domain starting in 2015. Mobile Legends game is known as the first popular MOBA genre game released for the smartphone market. The mobile version of the MOBA genre induces fundamental changes [20]. First, this genre uses touch and multitouch control schemes to control characters, attack, interact with the UI, make camera settings gestures (zoom in/out), and so on. Second, the mobile version of the MOBA gameplay has also changed. For example, the Clash Royale game eliminates automatic monster spawns, and the player controls what, when, and where to summon monsters into the battle map. This game also eliminates the concept of single-controlled heroes so that the strategic elements are prioritized on the timing and positioning of summoning monsters in the battle arena. Clash Royale combines the game mechanics of collectible cards, tower defense, and MOBA [7].

E-sport competitions bring excellent, challenging, and competitive video games and recognize how good the game is. E-sport player requires gaming skills, hand-eye coordination, quick/reactive thinking, and strategical and tactical comprehension between teammates [9]. The criteria required for a game contested in E-sports are games with minimal luck, balanced gameplay, games that prioritize strategy, and games that require the ability to think and react quickly. Popular MOBA games that fall into the esports category include League of Legends and Dota 2 on the PC platform and Mobile Legends games on the mobile platform [23]. The MOBA genre is considered an exciting genre because of the streamlined core of the game combined with competitive gameplay [31]. It means that players' excellence in the game is mainly influenced solely by their playing ability. On the other hand, the MOBA genre is also considered a genre that lacks autonomy because this genre does not have the freedom for players to explore games like multiplayer RPG games autonomously [15]. A typical MOBA genre offers simple gameplay and is straightforward to start, but to master and stay competitive requires quite a challenging effort.

C. Analysis of The Current Younger Generation Knowledge of Wayang Characters

To legitimize this study, we conduct the process of building the ground truth of the current conditions. First, we used a random sampling method to obtain young audiences' knowledge and concern regarding the Wayang characters. Finally, we analyze collected evidence and propose our solutions.

Questionnaires were distributed to respondents with an age range of 15 years to 30 years regarding their knowledge of wayang figures and characters. Respondents were given two sets of questions that asked their knowledge of Wayang characters. The first question set was used to check whether the respondent knows the Wayang characters in general. The second question set was used to determine adolescent understanding of a puppet character. There were 12 Wayang characters in total that we tried to investigate. The four puppets consist of Rama, Hanoman, Ravana, and Jatayu. The other eight

puppets consist of Duryudana, Yudhisthira, Bima, Arjuna, Nakula, Sahadeva, Karna, and Gatotkaca.

Questionnaires were distributed with a random sampling method and used a combination of online mediums like google and offline forms. In total, there were 63 data obtained, while the valid respondents were 60 respondents. The data results show that 36 respondents claimed to know Wayang characters generally, while the remaining 40% do not know wayang. Therefore, based on 36 respondents who know Wayang, we conducted further analysis to obtain respondents' knowledge of wayang characters.

Evidence indicates that there were prevalent and unpopular Wayang figures, as seein in Fig 1. For example, there are three characters that the respondents do not widely recognize. The three figures are Jatayu, Duryudana, and Karna. These three figures were only identified by 4 to 5 respondents. Moreover, there is one prevalent character, which is Gatotkaca, that Thirty-two respondents recognized. This fact shows that although 36 respondents know Wayang in general, they only know some popular Wayang characters. We conduct further investigation to obtain accurate knowledge of respondent Wayang Characters. Gatotkaca was the most popular character among other casts because major mainstream media often used Gatotkaca as "superhero" figures as the main protagonist of the story [8]. Therefore, we would like to know how respondents know the character in detail, like their nature, characteristics, motivation, background story, problems, etc. To validate respondent answers, we used open questions to determine the correct response from the respondent as the validation purpose. For example, we asked, "Do you know the Wayang character Nakula? " and this question was followed by another question, "What do you know about the puppet character Nakula?".

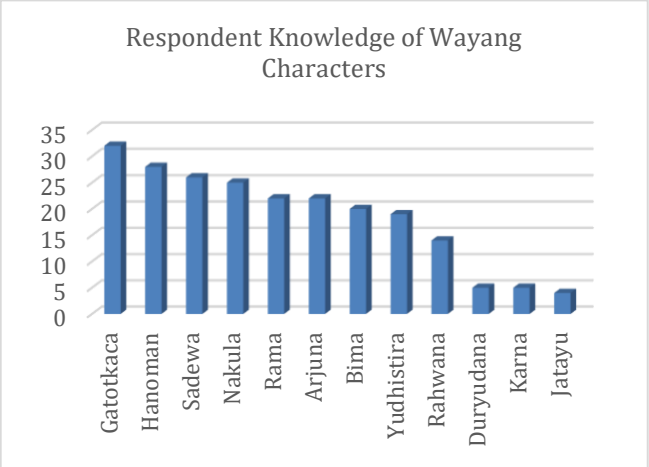


Figure 1. The Popular Wayang Characters According Young Audiences

Based on the previous analysis, it concludes several problem areas that this research aims to solve. First, many teenagers are still not familiar with wayang characters. The results of the questionnaire indicate this. Many teenagers only know the names of the Wayang characters or do not even know the Wayang at all. Secondly, there is various kind of Wayang-related games. However, the Wayang introduction in this platform is only limited to the Wayang character name. Additional attributes, such as character background, stories, nature, and weapons not entirely appropriately described. Finally, various gameplay mechanics were implemented on Wayang games, especially in the mobile platform. The common monetization strategy like in-app purchases and in-ads were applied to the game, and some of it has been successfully adopted, and others raise concern. For example, the in-app purchases strategy that enhances characters' ability may damage the game balance itself and eventually raises lousy user experiences [10].

III. Result And Discussions

In this section, we discuss the stages of game design using the MDA framework. We also carried out intensive playtesting with a transitive strategy to determine the attributes of a balanced Wayang character. Next, we will also explain the technological aspect, using the multi-threaded process to create efficient multiplayer games. Finally, we used two approaches at the evaluation stage, particularly usability heuristics evaluation and direct observations in controlled-lab conditions.

A. Game Design

The MOBA Wayang Tarung game design uses the MDA (Mechanic Dynamic Aesthetic) framework approach. Mechanic lays out the basic rules of the game, game algorithms, and essential components [11]. Dynamic describes the game's behavior in run-time and how players react to input and output and strategies that emerge during the playing session. Finally, aesthetic describes the emotional response sensed by players, which is considered a fun element of the game. The adoption of the MDA Framework in the design of the MOBA genre game is considered appropriate because MDA is the standard game design framework and is relevant to social-based games [13]. Each MDA framework element that uses as the base for game design can be briefly described in figure 2.

The Wayang Tarung MOBA strategy game requires two online players to participate in a game round. Both players will fight using Wayang characters to destroy the opponent's castle/base. The game runs for three minutes or until one of the player's castles is destroyed. In case of three minutes are depleted, and the castle is still intact, then the game will be considered a draw. In the game round, players will use energy to summon various Wayang characters. Initially, players will receive four energy and gradually increase by one energy per second.

The player may summon the Wayang characters if they have enough energy. At a time player can choose between 5 Wayang characters cards that are available to be summoned. These characters are randomly generated from the pool of 11 available characters. The Wayang characters in this game consist of Rama, Hanoman, Ravana, Jatayu, Yudhistira, Bima, Arjuna, Nakula, Sadewa, Duryudana, Karna, and Gatotkaca.

Therefore, each player may have a different arsenal of characters card.

The battle arena contains two distinguished playing areas. The top half is the opponent playing area, and the bottom half is the player instead. The player needs to drag the Wayang cards into their playing area in order to summon the character. After the character's summoned, it will start the behavior autonomously.

Each character cards have different statistics that comprise six base stats, which are walking speed (SPD), life (HP), armor (DEF), attack (ATK), cooldown (CD), and energy cost (COST). We adopted the game behavior from the popular MOBA game Clash Royale and produce our own autonomous character behavior [5]. The autonomous character behavior can be defined into four patterns: movement, targeting type, attack type, and targeting area. First, the movement pattern determines whether the character moves by flying or walking. These distinct features require different strategies in play; for example, some of the ground characters cannot attack flying characters. The second pattern is the targeting type which resolves if the attack targetting the nearest enemy or opponent's castle. This pattern can be used as a push strategy in which players can use high strength and armor characters that always target opponent castles as a barrier for other friendly characters. The third pattern is the attack type that defines the attack target as a single target or area known as area of effect (AOE). The character that has AOE has an explicitly single job to eliminate the enemy group. Finally, the last pattern is the targeting area that determines whether the character targets flying or ground enemies.

Aesthetic elements in the MDA framework are related to the player's response to dynamics. Aesthetics is associated with emotional sensations that develop and arise when playing the game [11]. The aesthetic element that players feel the most is the challenge sensation. The Wayang Tarung game requires a competitive strategy, quick thinking skills, and reaction. It means that every battle is decisive, and the outcome is considered challenging for both players.

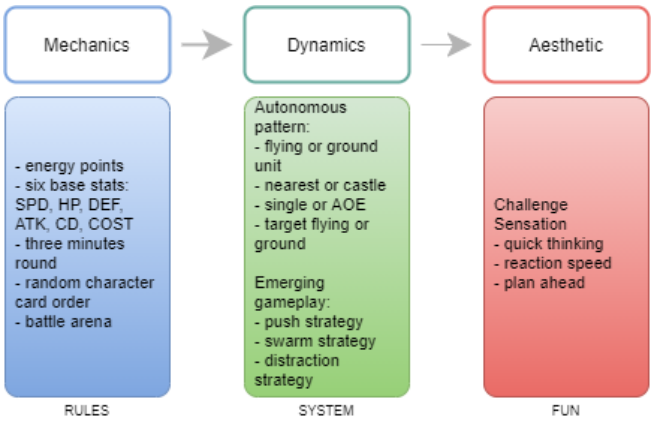


Figure 2. MDA Framework for Wayang Tarung Game

Game balance is a key in the MOBA genre. There are four reasons for balancing the Wayang Tarung game:

- Since the game runs asymmetrically, the starting condition for both players must be considered.
- Different character cards must have the same cost/benefit ratio.
- The stats distribution must depict the character narrative story to embrace the game's immersive quality and reciprocal with the research question to deliver introduction knowledge to younger audience about Wayang character.

The key in balancing game dynamics or mechanics in the MOBA genre is to prevent the occurrence of a dominant strategy, which is the type of strategy that has the most significant potential for victory. Unfortunately, players often exploit dominant strategies, which will hurt the fun aspect of the game [14]. Therefore, extensive playtesting was carried out to investigate the potential emergence of dominant strategies. In addition to the problem of dominant strategy, determining the price of character cards is another thing to consider. Balancing characters means that preventing characters that are useless and rarely summoned by players and also preventing characters that are too overpowered.

We use a transitive strategy to shape balancing character cards cost, often called a cost curve strategy [28]. The method is used to find the actual value of each stat from a cost-benefit point of view. Furthermore, the stats values of each character are summed up. Therefore we can compare each character's cost vs. benefit it produces. The point was distributed based on the depiction of the character's abilities in the stories. An instance is Arjuna, who is narrated to possess more potent archery abilities compared to other characters. To translate this narrative knowledge, we design that Arjuna's ATK points are higher when compared to other archery-based characters, i.e., Karna. Thus, Karna has 10 ATK points, while Arjuna has ATK points of 18 points. If there are no outstanding abilities, then the character stats distribution should use a standard template.

TABLE II. CHARACTER STATS DISTRIBUTION

	HP	**DEF**	**ATK**	**CD**	**SPD**	**BNF**	**CST**
	0.1	0.1	0.3	0.2	0.3		
Rama	50	2	15	2.4	0.3	10.27	4
Hanoman	50	3	12	3	0.3	9.59	4
Rahwana	70	4	13	3	0.3	11.99	5
Jatayu	65	3	10	3	0.5	10.55	3
Yudhistira	50	2	10	3	0.5	8.95	2
Bima	80	4	18	3.6	0.3	14.61	4
Arjuna	50	2	18	3	0.5	11.35	4
Nakula dan Sadewa	45	2	8	3	0.5	7.85	5
Duryudana	65	3	12	3	0.3	11.09	4
Karna	50	2	10	3	0.5	8.95	3
Gatotkaca	70	4	12	3	0.3	11.69	3

We distributed the initial stats on 11 Wayang characters in the game, as shown in table 2, based on their depiction in the wayang story narrative. We determined the actual value of each stat as follows: HP 0.1, DEF 0.1, ATK 0.3, CD 0.2 and SPD 0.3. In particular, ATK, CD, and SPD get higher scores because the MOBA genre has agile and reactive characteristics. The stat CD is a cooldown that describes how many seconds the character can act after being summoned. SPD is the character's movement speed; while ATK is quite obvious, it particularly describes the character's attack ability. Therefore that agile characters should have dominant in these three statistics. However, the rules of game balancing with the transitive method show an imbalance (fairness) in the statistical distribution. In figure 3, the transitive cost-benefit ratio, it can be seen that the characters of Bima and Gatotkaca have a greater benefit value than their energy cost characters. This condition can cause characters to be too overpowered and will be used by players too often. Based on intesive playtesting, the distribution of stats on these characters was already adjusted.

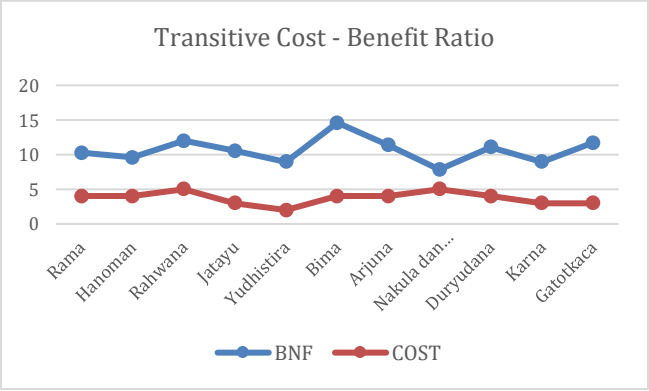


Figure 3. Transitive Cost-Benefit Ratio Chart

In addition, we also determine the selection of the autonomous character behavior pattern that has been described previously into each character. For example, the character Jatayu in the Wayang story is described as a bird who fights Ravana but dies while saving Sinta. In the game, Jatayu has flying behavior and has an above-average speed. Another example is the character of Ravana, who is depicted as an enormous giant and attacks the enemy using arrows. In the game, Ravana has an AOE attack behavior that can target a group of enemies.

B. Multiplayer Process Design

Wayang Tarung is realtime and onlne game MOBA genre. It means that the implementation requires a server that can handle both clients' sets of instructions. In addition, we use the Unity game engine to develop the overall game component more accessible. This game engine is vast, flexible, and generally used to develop numerous types of games, including multiplayer games such as MOBA genre [25]. Moreover, data transmission uses the standard TCP / IP protocol, and all instructions received are recorded. Eventually, the server sent synchronized action to both clients in the regular time interval.

The process on the server is described by dividing it into two parts, firstly when the client has first contacts to the server and secondly, how the thread works when the game starts. When the server starts, the server listens synchronously for the incoming client. When the client sends a request, the server will accept the request. Then the server will count the number of clients. The game requires two-player presents. Therefore if the number of clients is still not reached, the client cannot start the game. So the server will wait for other requests from the next client and only create a thread to receive messages and send messages belonging to client 1.

Figure 4 shows how multithread process flow in the game. The server starts the game when the condition where two players have connected. The server triggers this state to all connected clients, and the server provides a specific thread to receive messages and send messages belonging to both clients. After the round starts, game services create eight threads simultaneously, every four threads for each intensive client-server communication. Those threads are mainly used to handle game instructions from both clients. For example, if the server receives data, it will check whether it is an "EXIT" message. If the message is an "EXIT" message, the server will close the connection with the client. The program can also send messages such as "SPAWN", "DIE", and "TIMER". These messages are triggered based on the event that happened in the game. The automatic behavior pattern is triggered after the character is summoned and deployed into the playing field. It means all character movement and activities are autonomously calculated.

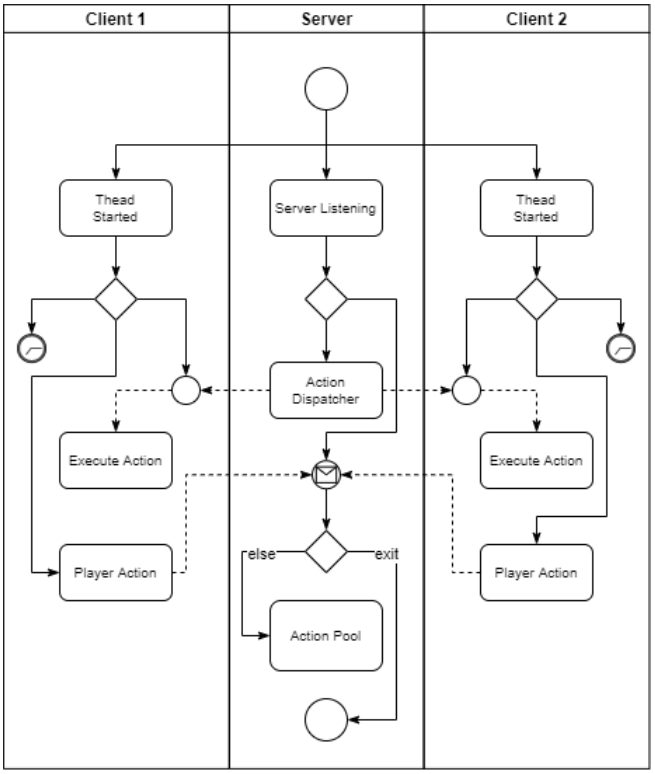


Figure 4. In-game Multithread Process Flow

C. Evaluation and Discussion

The implementation of the Wayang Tarung game has been evaluated using a heuristic testing method adapted from the norman Nielsen heuristic usability. There are ten components tested, as shown in the table III. Not all usability factors are considered homogenous. Therefore, we divide usability factors into two, namely major and minor. Major criteria are given for the dominant usability aspect and must be met. Meanwhile, minor criteria are given to aspects that do not require special attention. The major and minor usability factors division is determined manually by taking into account input from usability experts.

TABLE III. HEURISTIC USABILITY EVALUATION

Heuristic Principles	**Terms**	**Notes**	**Usability Factors**
Visibility of system status	Visibility	- well read HUD (Head Up Display) - game object positioning	Major
Match between the system and the real world	Affordance	- the game arena that resembles a board game in the real world - intuitive drag gesture	Minor
User control & freedom	Control	N/A	Minor
Consistency and adherence to standards	Consistency	- consistent approach to behavior and UI in similar MOBA genres - I.e. drag gesture, cooldown mechanic, lane	Major
Error Prevention	Error	- prevent player summon character if lack of energy	Major
Recognition rather than recall	Recognition	- loading screen shows quick recap about how the game works	Major
Flexibility and efficiency of use	Flexibility	- options to replay the game again with same opponent	Minor
Aesthetic and minimum design	Aesthetic	- stand out indicator - 90% UI composition mainly for battle	Major
Recovering from Error	Recovering	- immediate feedback that display energy points owned	Minor
Help and Documentation	Help	N/A	Minor

Visibility of system status indicates that the actions taken by players must be visible and have an immediate impact. Players must be able to see the status or condition of the game quickly. Figure 5a, shows a game visual that has a well-read HUD. The round timer indicator is located on the top left screen. It makes players aware of the remaining time in the round. Information on the amount of energy in each character card, the player's remaining energy, and the remaining life of each player's castle, each of those can be seen clearly. Feedback received by players must take place immediately. However, low connection or unstable internet stream makes the feedback not quickly shown on screen. This problem should be easily fixed by informing the player of unstable internet conditions. Figure 5c shows the results of positioning the Wayang characters in the game area for both players. The player's point of view is a vertical top-down view, with the opponent's castle located at the top of the screens. It means that the player's castle location is at the bottom of the screen. Therefore the positioning of characters and objects in the game must be rendered opposite between two players.

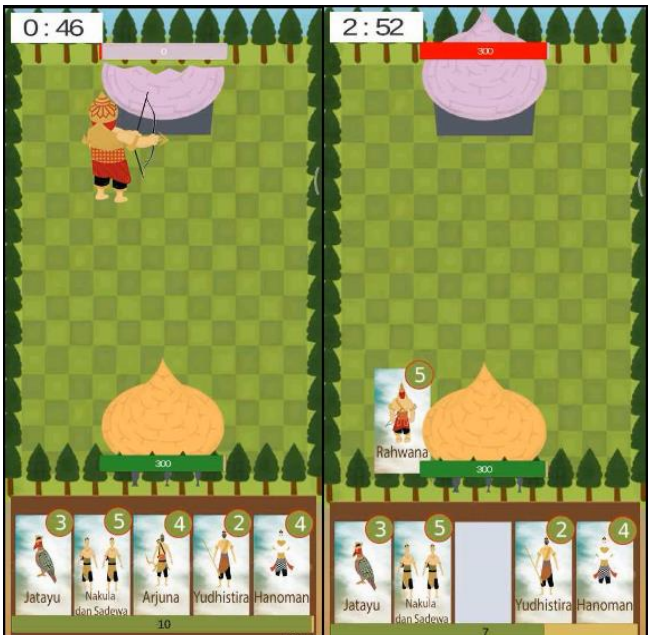
The second component is the match between the system and the real world. The implementation is visually visible in the design of the game arena that resembles a board game in the real world (i.e., chess game). For example, to summon characters, players can intuitively perform drag gestures onto the game board. This digital affordance is following actual conditions in the real world. The aspects of user control and freedom mean that the game provides freedom control facilities to players, for example, the ability to pause the game. However, this is not implemented in the Wayang Tarung game due to its multiplayer and real-time format. However, there are cases such as the game Dota 2, which allows players to pause the game temporarily, resulting in all other players being also in a pause condition. However, in official matches through esports events, the use of pause for no apparent reason is not permitted [12]. Furthermore, players must chat about the reason for pausing. If all players agree, then the game is allowed to pause.

Wayang Tarung follows a consistent approach to behavior and UI in similar MOBA genres. Subsequently, this consistency adapted into the gameplay of Wayang Tarung. For instance, in figure 5b, the process of summoning characters by dragging them into the game arena has been intuitively used by another game. Likewise, the cooldown mechanic, which gives delay time for character preparation upon summoned. The board design is also similar to the MOBA genre. At least, there is a lane as a path to the opponent's territory.

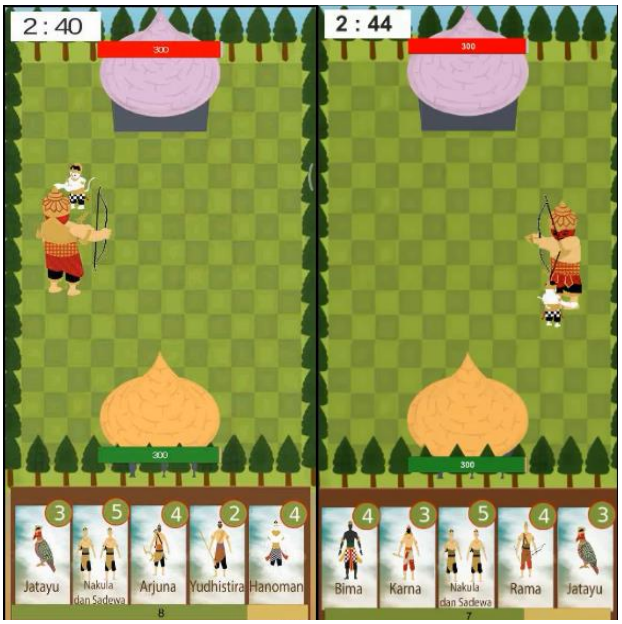
The aspect of error prevention, the Wayang Tarung game provides feedback when players try to summon characters, but it lacks energy. In conjunction with recovering from error, the game displays visual feedback that the energy owned is insufficient. Furthermore, this game gives players the flexibility to repeat the game after a game session ends in terms of flexibility and efficiency use. At the same time, the aesthetic and minimal design aspects can be seen from the HUD design

and the minimalist display screen with stand-out game indicators. The loading screen before the round begins shows a quick recap about how the controls work, the objectives, and winning the game—this associated with the aspect of recognition rather than recall. Finally, on the help and documentation aspect, this game does not have a tutorial or help documentation. However, there is a character legend menu to access information on character stats as shown in Figure 5d, character narratives, and short stories in wayang stories.

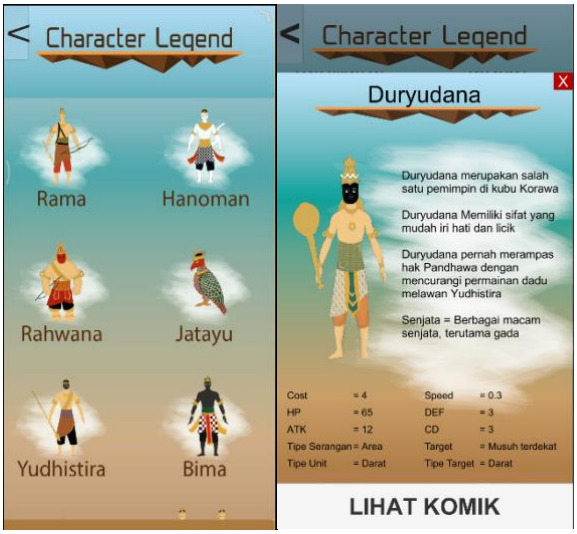
The game layout is designed vertically / portrait because it is for the user's convenience so that the user can play with one-handed control. Furthermore, interactive elements in the game are easily reachable by only the thumb since it layout on the bottom of the screen.



(a) (b)



(c)



(d)

(e)

Figure 5. Wayang Tarung Screenshot. a) in-game HUD; b) drag gesture; c) opposite game objects positioning for each

character screen; d) wayang character stories and stats; e) simple digital comic of wayang story

The validation process uses the pre-post test method to test the player's understanding of the Wayang characters. This method generally analyzes the difference of answered questions about the Wayang characters before and after the respondent plays the Wayang Tarung game. We chose 20 respondents aged 17 – 22 years old for these observations and were quite familiar with the MOBA genre game. However, we only targeted limited audiences that fit in and considered the young generation for current research since we plan to extend it to larger audiences in the upcoming project. The total number of questions is 50, divided into 12 parts. The questions mostly asked audiences' knowledge of Wayang Characters and how they could differentiate the character by looking at visual depiction and knowing the story behind each character. The questions consist of 5 questions for Rama, Hanoman, Yudhistira, and Nakula and Sadewa. As for the characters Ravana, Jatayu, Bima, Arjuna, Duryudana, Karna, and Gatotkaca each got 4 questions. In the last two questions, there are questions where the respondent guesses the character's name based on the image depiction of the character.

The observation took place in a controlled test lab, whereas the respondent played the game for at least 12 rounds. Respondents are expected to try to play all the Wayang characters in the game and fight each player alternately. The introduction of wayang characters in the game is shown through a simple digital comic before the game round begins, as shown in figure 5e screenshot. The post-test assessment inspects the respondent results for each Wayang character in the game. Figure 6 shows the comparison result of the pre and post-test. Again, the test result was normalized into 10 points ranged.

TABLE IV. CHARACTER VALIDATION TEST

	Mean		**SD**	**Diff**
Characters	Pre-test	Post-test		
Rama	5.6	8.1	1.4798649	2.5
Hanoman	7.05	8.4	1.4282857	1.35
Rahwana	2.2	6.9	1.6401219	4.7
Jatayu	3.1	6.4	1.933908	3.3
Yudhistira	2.8	4.75	1.8940697	1.95
Bima	5.65	7.6	1.496663	1.95
Arjuna	3.7	7.9	1.8681542	4.2
Nakula and Sadewa	2.45	6.4	1.496663	3.95
Duryudana	1.9	5.45	1.3219304	3.55
Karna	1.95	5.55	1.2835498	3.6
Gatotkaca	8.45	10	0	1.55

Based on the validation results shown in table IV, most of the respondents managed to get an increase in the scores on the post-test after playing the game. Additionally, there was no significant difference in test results for Wayang characters already popular in Indonesia, such as Gatotkaca and Hanoman. The Yudhistira and Jatayu character test shows that the distribution of respondents' answers is the highest, which indicates that these two characters require further research because the respondents' answers were not specific and vast. However, there are several cases where the respondent's scores were stagnant. For example, the respondent's score was the same between the pre-test and post-test occurred twice in the Hanoman character test. In addition, in the test of Jatayu, Yudhistira, Bima, Arjuna, Nakula and Sadewa, and Duryudana characters, there was a respondent each who gets the same score between the pre-test and post-test.

Based on the number of respondents who succeeded in increasing the test scores after playing the Wayang Tarung MOBA game, it can be concluded that the respondents have good feedback indicating that the game format that uses engaging strategic elements appeals to younger audiences. Additionally, this approach can be an introduction platform of Wayang characters and the stories. Improving character design and animation of the characters could be the next central research area. In addition, there are suggestions to deliver the game with solid narrative goals that help build a strong perception of good and evil characters. Finally, a game with compelling storytelling as the central part of each character's motivations should be essential for further investigations.

IV. CONCLUSIONS

Wayang, which is the traditional culture of Indonesia, must be preserved since it delivers positive moral stories and messages. In this paper, we use a game-based approach, the MOBA genre mobile game. This game's characteristics imply a quick-paced, strategic thinking, and multiplayer-centric game, making this genre have many fans, especially in the younger generation. Furthermore, we implement a multithreaded process design to make the games run well and adhere to the usability evaluation component. The limitation of this evaluation is that we do not use a usability heuristic specifically for multiplayer games [24]. Instead, we prefer to use the original version of the heuristic usability evaluation, which covers more things. In the future, it is necessary to evaluate this technique, especially related to the technological aspect.We also observed 20 MOBA gamers, and conducted pre-post testing. The validation results from this process show a positive increase in respondents' understanding of the Wayang characters.

Consequently, the results of our research have answered the main research question about how to introduce wayang characters to the younger generation in an engaging format. We conclude with solid confidence that games can be the best approach to induce wayang characters to the younger generation. Appropriate visuals and characteristics of Wayang translated correctly into game gameplay will become a proper form of visualization in the Wayang Tarung game. We found out that at least there are three things for future works

development; the first is the importance of immersing the depth of storytelling in the game to emphasize the good versus evil aspects that dominate the message of the Wayang story. Secondly, it is essental to implement this approach to other popular genres, such as the Battle Royale genre. The third is the importance of building a good and solid wayang game character ecosystem to foster a sense of belonging and care for the overall Wayang world.

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