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UMN Sims: Development of Student Life Simulation Game to Introduce Onsite Campus Activities using React.js

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ABSTRACT

After two years of the implementation of the online learning mechanism due to the Covid-19 pandemic, Universitas Multimedia Nusantara, a private university in Tangerang, Indonesia, has again implemented an onsite learning mechanism. Based on the initial survey conducted, it was found that many students were not aware of various academic and non-academic activities that could be carried out on campus and its surroundings. Therefore, in this paper, we try to make a simulation game to introduce students to various activities that can be done on campus and its surroundings. Simulation games are developed mainly using React.js with the Axioos library to perform HTTP requests to access web services. We evaluated this game using the Hedonic-Motivation System Adoption Model or HMSAM to determine the level of player satisfaction. We conducted experiments on high school students, freshmen and sophomores and found that high school students' HMSAM scores were higher, assuming high school students had a curiosity about life as university students. Behavioral intention to use and immersion obtained using HMSAM were 80.25% and 80.31%, respectively, this means that these games strongly agree that respondents are interested in playing UMNSims and playing it immersively.

Keywords: HMSAM, ReactJS, Simulation Game, university, web-based

INTRODUCTION

Since the Covid-19 pandemic, most student activities on campus have been shifted to online activities [1]. The pandemic has caused changes in student behavior [2][3][4], habits [5][6], and preferences [7][8] for their activities related to campus. When the pandemic began to subside, student activities were shifted back to onsite activities on campus. Universitas Multimedia Nusantara is one of the private universities in the Banten province, Indonesia which has also begun to open campus area for full use of activities by the entire academic community since first semester of the academic year 2022/2023. Through a survey distributed to 120 second-year and third-year students from various study program who started their university journey during the pandemic and never carried out activities in the campus area, it was found that 53% of students did not know all the facilities provided by the university and the non-academic activities they could participate in the campus area.

In addition to active students, information related to facilities and activities that students can do in the campus area also needs to be known by prospective new students who have never visited campus, because the location of their current residence is too far away. Currently, information regarding facilities and student

activities can be viewed on the university's website. We proposed a simulation game as a complement to introduce facilities and various activities that student can do on campus. Through simulation games, student can perform various activity options before actually involved in the activity [9][10]. After experiencing various activities in the simulation game, students are expected to be more confident to be involved in real life. Simulation games are types of games that copy real-life activities for specific purpose, such as training, analysis, prediction, or entertainment [11]. Several studies have found that simulation games have a behavioral change effect on the people who play them [12][13]. Simulation games can be a medium to convey complex concepts so that they are more easily accepted [14][15]. The simulation game is built with a Single Page Application (SPA) approach. With SPA approach, website contents do not need to be reloaded entirely, but only part of the content that has changed [16].

React.js is a JavaScript library that allows developer to develop web applications with the SPA approach, through a component-based architecture [16]. Besides being widely used to develop web applications, ReactJS is also widely used to create web-based games. With ReactJS developers can reuse various components in the game in different contexts [17].

Game Design

The game is designed as a single-player simulation game. The main character is a freshman who has to survive his first week as a student. Player has four statuses that must be maintained to stay within safe limits, namely Meal, Sleep, Happiness, and Experience. The value of each status is determined by the activity the player performs. An activity can increase the value of certain statuses and decrease others, for example learning activities will increase Experience, but will decrease Meal and Sleep status. The value of each status will also decrease over time if the player is idle or not doing any activities. Activities that can be performed by player are determined by the current time and location of the player.

The game starts with the user entering the player's name and selecting the study program (Fig. 1). Then the user will be taken to the game area, which displays the status bar, day and time, greetings, activity buttons that can be performed by player, and a choice of places that player can go to on the left (Fig. 2).

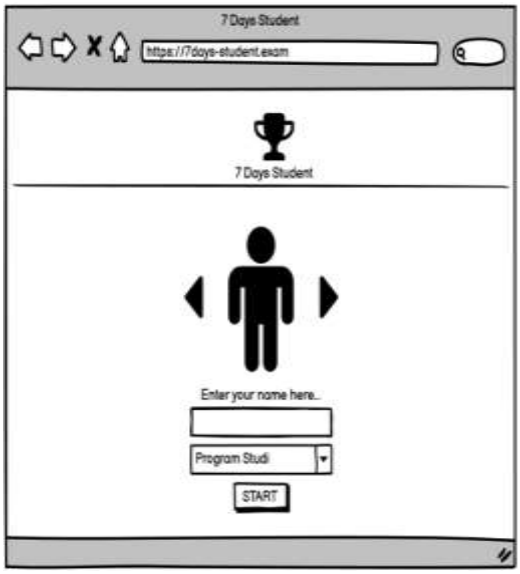

Figure 1. Initial Game Design

In the game area there is also a simulation of a student's smartphone, where players can view information related to the day, hour, weather and simple games. Players can turn on the smartphone by clicking the smartphone symbol in the lower left corner, as shown in Figure 2.

At the beginning of the game students will be at home and can do several activities, namely eating, cooking, sleeping and playing. Each activity selection will display several sub-choices that the player can choose from. For example, when a player wants to eat, he can choose one of several types of food, and the food selected will determine the level of his eating status. In addition to the house, there are three other places, namely the mall, cafe and campus. Each of these three places has a certain open schedule, so players can't go to that place all the time. In each place there is also a set of

activities and sub-activities that players can do.

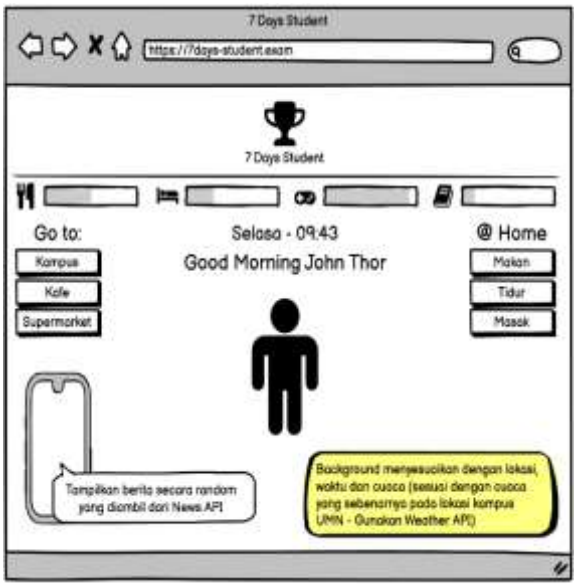

Figure 2. Main Game Stage Design

Implementation

The game is implemented using JavaScript as the main programming language by utilizing the ReactJS library and Axios library to access web services. The workflow of the React application is visualized in Figure 3. React app calls ReactDOM.render method by passing the user interface created using React component which is coded in either React element or JSX format and the container to render the user interface. ReactDOM.render processes the React element or JSX and emits Virtual DOM and then Virtual DOM will be merged and rendered into the container.

This game accesses two web services, namely NewsAPI to get real-time news data to be displayed on the player's smartphone, and Open Weather Map to access real-time weather information that will affect the background display in the game area. Code 1 displays the code to access real time weather information from the Open Weather Map API.

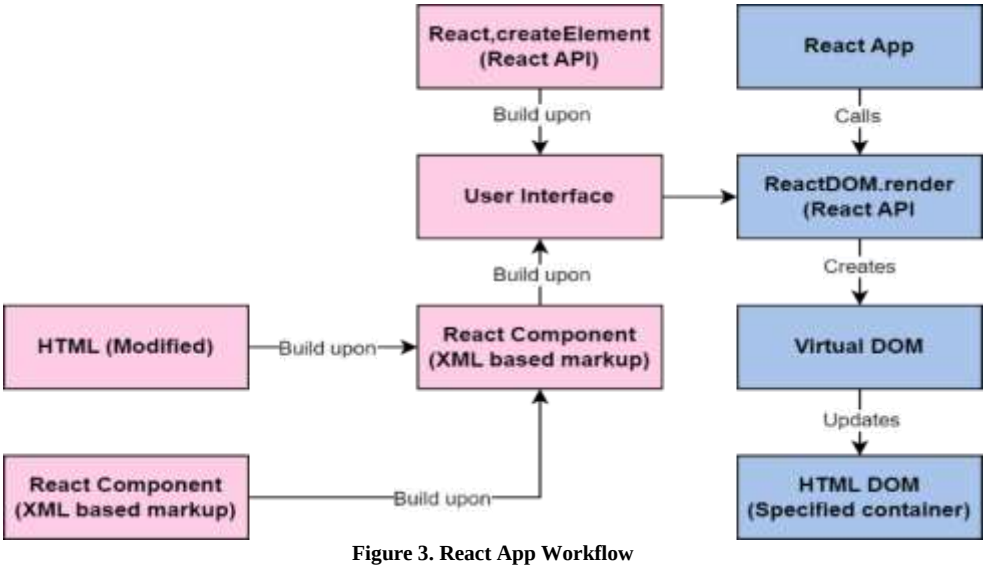

Figure 3. React App Workflow

Code 1: Open Weather Map API Implementation

```
const getWeatherData = (city, country) => {
  axios({
    method: 'GET',
    url: `http://api.openweathermap.org/data/2.5/weather?q=${city},${country}&APPID={APP_ID_HERE}`,
  })
    .then(response => {
      console.log(response.data.main.temp); setTemperature(response.data.main.temp - 273.15);
setDesc(response.data.weather[0].main); setWeather(response.data.weather[0].main);
    })
    .catch(error => {
      console.log(error);
    });
};
```

Figure 4 shows four player character options that can be selected by the user. Each character is formed from a combination of images of separate body parts, namely front and back hair, face, left and right hands, body, and legs as shown in Figure 5. Code 2 displays a snippet of the function code to create a character using React useState() hook.

Figure 4. Player Characters

Figure 5. Character body parts

Code 2: Create Character Function

```
export function CreateChar(props){
 const {character, setCharacter} = useContext(AllContext);
 const [hairfront, setHairFront] = useState('');
 const [face, setFace] = useState('');
 const [lefthand, setLefthand] = useState('');
 const [body, setBody] = useState('');
 const [righthand, setRightHand] = useState('righthand'+{});
 const [hairback, setHairback] = useState('hairback'+{});
 const [feet, setFeet] = useState('feet1');

 if(character == 1){
 }
 return(
  <>
  <CharacterModule
  feet = {'feet1'}
  />
  </>
 );
}
```

RESULTS

The simulation game begins by filling in the player's name and selecting the character along with the study program of the character. Each character will have its own characteristics that affect the increase in the player's status every time they carry out certain activities. The choice of study program also affects the types of activities and courses they can participate in on campus. Figure 6 shows the display of character selection and study program selection. Information related to each character can be read by clicking on the information icon next to the character name.

When the play button is clicked, the player will start his life at midnight in their house (Fig. 7). Players can do several activities at home, including sleeping, playing, eating, and cooking. At the top left there is a map icon which when clicked will open a map of places that can be visited by players. Because other places have a certain schedule, so it can't be accessed all the time. Figure 8 shows a map where some places are closed so that players can't visit them. In addition, in the upper right corner there is a circular status bar that shows the player's status, namely eating, sleeping, happiness and specifically for experience in the form of a linear status bar.

Figure 6. Start Game

Figure 7. Player at Home

When a certain place has entered the opening schedule, the icon of that place will be active on the map and can be visited by players. One of the places that players can visit is the campus which is open from 7 am to 6 pm. While on campus the user can perform various academic and non-academic activities. The selection of activities that players can do at a certain place can be selected at the bottom right. Figure 9 shows players who are on campus.
In the lower left corner, there is a smartphone icon which when clicked will display the smartphone of the player. Through this smartphone players can view the day and time, weather information, news and play games. Figure 10 shows the smartphone display when the smartphone icon is clicked.

Figure 8. Map

Figure 9. Player at Campus

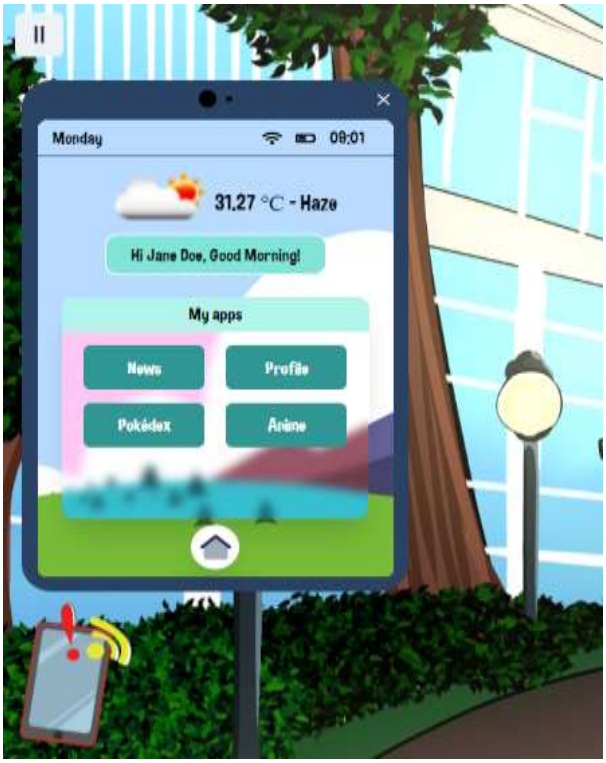

Figure 10. Player's Smartphone

Evaluation

The evaluation was carried out by distributing questionnaires using Hedonic-Motivation System Adoption Model (HMSAM) to 50 respondents who had tried playing UMN Sims. HMSAM (Fig. 11) is a model used to measure an information system in meeting the intrinsic needs of users. HMSAM is a development model from Heijden [18] combined with cognitive absorption by Lowry called the Hedonic Motivation System Adoption Model (HMSAM) [19]. Respondents were selected purposively consisting of 15 first year students, 15 second year students, and 20 high school students.
Table 1 displays the results of calculating the questionnaire based on the group of respondents, namely high school students, freshmen and sophomores. It can be seen that the scores of high school student respondents are consistently higher than those of freshmen and the scores of freshmen respondents are slightly higher than those of sophomores.

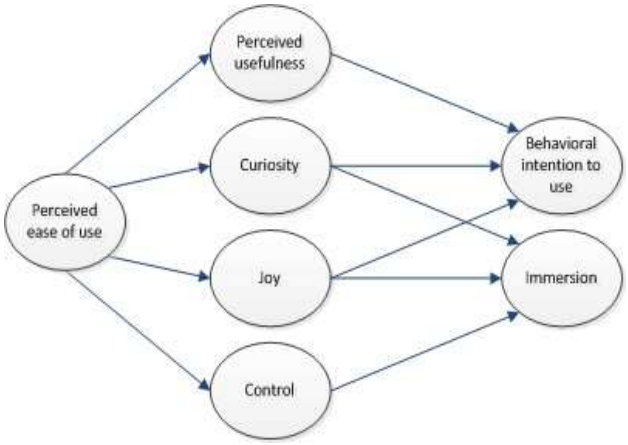

Figure 11. Hedonic Motivation System Adoption Model (HMSAM)[19]

Table 1. HMSAM Questionnaire Result based on respondent groups

Aspect	Likert's score		
	Highschool Student	Freshmen	Sophomore
Perceived ease of use	0.8033	0.8014	0.8017
Perceived usefulness	0.8042	0.8034	0.8037
Curiosity	0.8061	0.8053	0.8052
Control	0.8060	0.8055	0.8051
Joy	0.8021	0.7965	0.7961

Table 2. HMSAM Questionnaire Result

Aspect	Likert's Score	Interpretation
Perceived ease of use	0,8021	Strongly Agree
Perceived usefulness	0,8038	Strongly Agree
Curiosity	0,8055	Strongly Agree
Control	0,8055	Strongly Agree
Joy	0,7982	Agree

Table 2 displays the overall results of the questionnaire calculations with interpretations based on the 5-point Likert's scale category, namely strongly disagree, disagree, neutral, agree, and strongly agree with a range of 0.2 in each category. Based on the calculation results of five aspects, namely Perceived ease of use, Perceived usefulness, Curiosity, Control, and Joy which are approved by the user in table 1, then these five aspects will be used to calculate the value of the two main aspects, namely Behavioral Intention to Use and Immersion based on the model in Figure 10. The average value of Perceived usefulness, Curiosity and Joy is the value of Behavioral Intention to Use with a value of 0.8025. Immersion gets a value of 0.8031 which is obtained from the average value of Curiosity, Joy and Control.

CONCLUSION

Based on the research and evaluation that has been done, it can be concluded that UMN Sims as a medium for introducing onsite campus activities has been successfully designed and developed. Through evaluation using HMSAM, the Behavioral Intention to Use value was 80.25% and the user Immersion value was 80.31%. It can be concluded that users strongly agree to use UMN Sims as a medium for introducing onsite campus activities, and strongly agree that users feel involved in the game in UMN Sims. We also found that the behavior intention to use and immersion based on HMSAM will be higher for high school students and will decrease when they become university student, it is assumed that they already know and are involved in campus activities. UMN Sims could be a good medium not only to introduce campus activities, but also introduce high school student to life as university student.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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