Research Article

Vaccinoted Augmented Reality (VNAR): Vaccine Knowledge for Raising Awareness of Immunisation Among School Children

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Abstract: People may now instantly obtain any information they desire thanks to the advancements in technology. Unfortunately, technological development can also result in grave issues, such as irresponsible anti-vaccine advocates who disseminate incorrect information gleaned from unreliable sources. Since a result of the panic that their actions have sparked, many individuals have been misled into developing vaccination hesitance as they are constantly bombarded with false information regarding vaccines. In order to raise awareness and give consumers accurate fundamental understanding about vaccinations using entertaining multimedia technology, this research sought to develop an interactive way of learning utilizing Augmented Reality (AR) mobile application (i.e., Vaccinoted AR (VNAR) mobile application). The focus of this study was to analyse the level of understanding about vaccines and how it works to help control contagious diseases. The next priority was to develop a modern learning system using AR technology and interactive mobile application to convey correct information and awareness about vaccines. The effectiveness of the new interactive learning tool using AR technology and interactive mobile application to educate the user about vaccines was also evaluated. The model used for this project production was the Waterfall model. This project has successfully done an evaluation, positive feedback from the respondents were obtained, where they are satisfied and rated as excellent and good for this application. The respondent agrees that this VNAR Application gives them awareness and better understanding about immunisation.

Keywords: vaccine, immunisation, augmented reality, mobile Application, AR.

1.   INTRODUCTION

Augmented Reality is a method of observing the real world (either directly or through a device such as a camera that creates a visual representation of the real world) and 'enriching' that visual with computer-generated information such as still graphics, music, or videos. AR differs from VR because it enhances (adds to) an existing or real-world environment rather than generating something new from scratch. According to (T.Azuma, 2014), AR is a system that consists of three characteristics: First, it combines the real and the virtual; secondly, it is interactive in real-time; and lastly, it must register in three-dimensions (3D).

Living with the pandemic for a good two years has been an eye-opener for the researcher. Seeing how easily information could spread through gadgets has given the researcher a strong idea and desire to create a mobile application with an additional feature of AR technology to increase the

interactivity of the application. As a result, the researcher has developed the 'Vaccinoted' AR (VNAR) Mobile Application to spread awareness and provide correct fundamental knowledge about vaccines through a simple, easy-to-understand, and entertaining method. Every Malaysian citizen received mandated vaccination shots since infancy without any exclusion. It started in 1961 when all newborns were vaccinated with the BCG vaccine (Arnold Loh, 2019). According to (Special et al., 2021), vaccines contain antigens that stimulate the immune system and help the body develop immunity to specific infectious illnesses. The vaccination programme is one of the most critical health programmes in Malaysia which has greatly improved childhood morbidity and death rates. In developing the Vaccinoted AR Mobile Application project, the researcher prepared a storybook that users can interact physically with an additional advanced 3D animation that will pop out upon scanning with the device's camera through the specific application. Thus, the user can read information and learn about the vaccine from both the physical VNAR storybook and the Vaccinoted AR (VNAR) Mobile Application. In addition, the researcher included a fun game using an AR Core Foundation, where the users can kill viruses that appear on the screen. Unity was used by the researcher to build this AR Mobile Application, with the usage of Blender 2.93 to create the 3D effect.

2. METHOD & MATERIAL

2.1 Research Methodology Structure

In developing VNAR, the researcher has chosen the Waterfall Model development method. The Waterfall Model is known as a systematic approach in which the model resembles the flow of a waterfall. This model consists of six different phases: analysis phase, requirement specification phase, design phase, development phase, testing and integration phase, and lastly, the implementation or deployment phase.

As stated by Kulas et al. (2004), when developing the user interfaces for Augmented Reality, several issues must be considered. These issues can be seen well with the use of the chosen model method. Not only that, apart from the fact that this model is a clear and straightforward framework, the researcher found when comparing this model to other models, the Waterfall Model is more effective in terms of time factor (Mohamad Rofie & Khambari, 2017). This model's advantages also supported this statement and gave the researcher a solid reason to use the model in the production of VNAR. Furthermore, the Waterfall Model provided that all the system requirements can be defined as whole and explicit from the start of the project, to ensure that the project can work smoothly without any problems (Buchori et al., 2017).

Therefore, even though the system's needs cannot be clearly defined, the early problems that arise on the system requirements are more cost-effective, effort-saving, and time-saving than those that arise later in the development process.
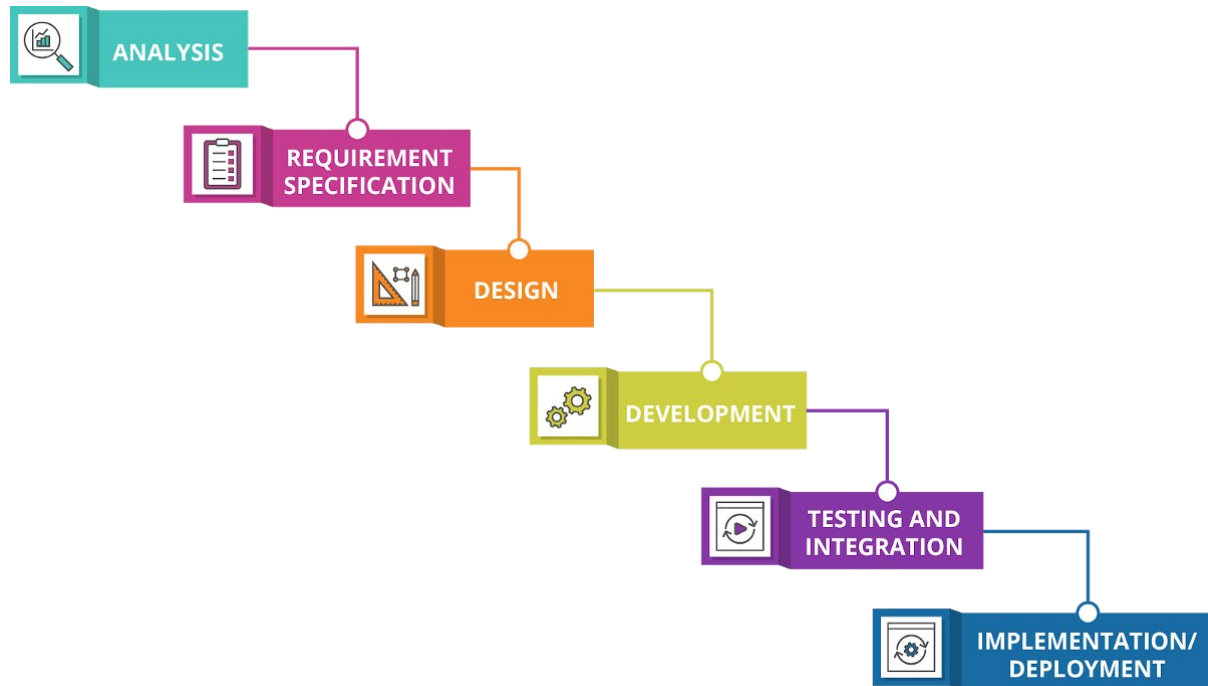
Figure 1- The Waterfall Model

2.1.1 Analysis Phase

During the development, the analysis phase plays a significant role throughout the whole process. The researcher began with brainstorming ideas for the project by listing out the possible title and requirements before discussing them with the supervisor. Brainstorming is the process that involves two main stages: idea exchange at the social level and idea expansion at the cognitive level (Wang et al., 2010). After the discussion, the researcher confirmed the project's title with the supervisor in order to proceed with the idea proposal. Finally, in the pre-planning phase, the researcher analysed and studied any topics related to the project title to complete the proposal. The data required for the proposal are the background of the project, problem statement, project objectives, and the methodology used for the project development.

2.1.2 Requirement Specification Phase

The requirement specification phase is unique to the Waterfall Model, compared to other famous development models. In the Batik AR Application (Sobandi et al., 2021), the requirement specification phase identifies any software, hardware, and other requirements needed to build the project successfully. The researcher used this requirement specification phase to complete the first two chapters of thesis writing. Next, the Gannt Chart was prepared to set the deadline for each specific task in every phase.

The phase is then continued with the studies and an informal online meeting with Miss Affifah Saadah Binti Ahmad Kassim, a Clinical Laboratory Scientists, to finalise the content of the VNAR Storybook. After that, the researcher continued to prepare the contents of the VNAR application, set the pieces of information appropriately, and finalise the content arrangements for both VNAR Storybook and VNAR application.

2.1.3   Design Phase

Apart from the first two phases in the Waterfall Model, the design phase is crucial. This statement is supported by (Hamid et al., 2018) that students who live in this digital age expect to see interactive and appealing things in order to attract their attention. The researcher spent most of the time thinking of new creative ideas in creating and designing the VNAR Storybook and VNAR application. Therefore, if the researcher failed to create an application that is up to expectations, it could cause the target audience to be demotivated and lose interest.

The researcher started with deciding the best theme and concept that suits VNAR Storybook and Application. The process then continued to the sketching of the VNAR storybook storyboard and VNAR application storyboard. Not only that, to ensure that the application is smooth and user friendly, the researcher prepared a suitable VNAR application flowchart that showed the flow of the application precisely. Finally, after getting approval from the supervisor with the storyboard, the researcher continued to design the VNAR Storybook, VNAR Storybook cover, and user interface for the VNAR application. The designing phase ended after the design of buttons for the VNAR application was done.

2.1.4   Development Phase

The development phase falls into the production category when all the ideas are brought into reality. In other words, the development process includes selecting and determining methods, media, and learning strategies appropriate for developing the project (Buchori et al., 2020). Commonly, all multimedia elements such as text, animation, video and graphics are included to create the project. All the designs prepared in the previous phase were assembled by the developer.

Hardware and software are needed to develop the desired project. Before getting started, all of the markers prepared from the VNAR storybook are uploaded into Vuforia. This process is essential for any AR projects using Vuforia to ensure the image target rate and activate the licence. For this project, Unity version 2020.3.20f1 were used as software to develop the whole VNAR application before applying a C# language for coding by using Visual Studio. The 3D objects development was done using the Blender 2.93 software before exporting back into Unity for the animation.

2.1.5   Testing and Integration Phase

After the VNAR Storybook and VNAR application have been developed, both products must be tested. This part is compulsory to check for any errors or issues that could arise. (Dünser et al., 2007) showed that slow tracking performance is a potential issue with existing AR systems. This is primarily technological and it is hoped that it will be reduced and improved in the future. Until this issue is resolved, designers and developers must consider it when striving to build the system, so that poor tracking performance does not interfere too much with task performance.

The testing phase should be taken seriously and thoroughly to identify even the tiniest problems and ensure that the VNAR application could run as smooth as planned. The testing was done internally first before conducting the test with the target audience. If any errors were found, the developer will investigate and try to identify the bugs to obtain a proper solution until everything was done accordingly. Once everything is in order, when VNAR Storybook and VNAR application run as they should, the project proceeded to the final phase.

2.1.6   Implementation/Deployment Phase

The implementation phase is the last phase in the Waterfall Model. Thus, it is the final step in the process of assessment. Once the developer has developed and optimised the application, the application is now ready for launch. Users will be given questionnaires to complete in order to provide feedback. The input will be analysed to see whether the project achieves the primary research objectives as well as the expectations of the users.

3.   FINDINGS

A total of sixty questionnaires are checked one by one before all the data is then submitted into the Google Form for an easy data compilation. Finally, the result of each question is shown in a graph with a percentage
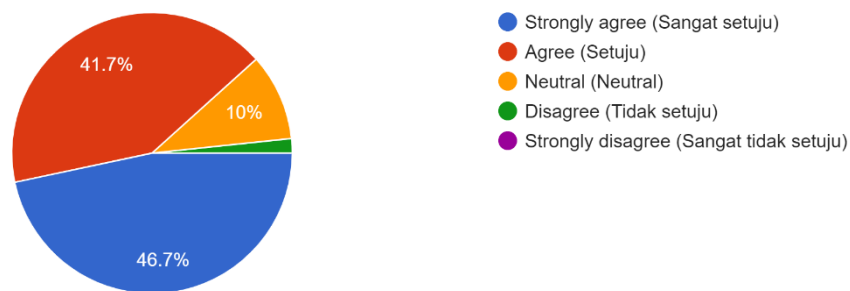
3.1 Important Result and Graph

Figure 2 - The pie chart is shown for question 13

Besides developing an AR technology application to convey information, the objective of this project is to spread awareness about the vaccine. As a result, 46.7% of the respondents strongly agreed, and 41.7% agreed that VNAR could help them with vaccine awareness. Only 10% are neutral, and a small percentage of only 1.7% did not agree with this question.

Vaccinoted Augmented Reality (VNAR) make it easier to understand the importance of immunisation
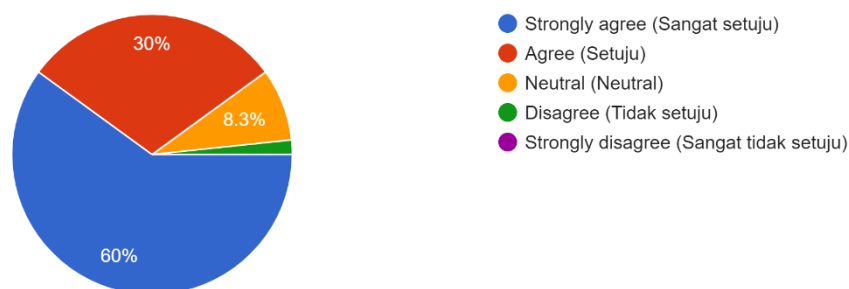
60 responses

Figure 3 - The pie chart is shown for question 14

Just like the previous questions, the Figure shows the variation of answers from respondents regarding whether VNAR could make it easier for them to understand the importance of immunisation or not. Therefore, even though most of the respondents agreed, the answer selection of neutral and not agree from the respondent should be taken seriously by the researcher. This is to ensure that the information gained by the user through the application could help them understand the importance of immunisation in the easiest way possible.

3.2.2 Effectiveness of the Research

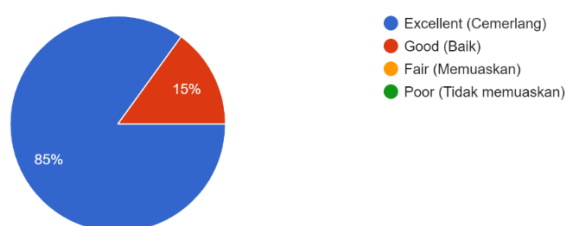How would you rate the whole application?

60 responses

Figure 4 - The graph showing the effectiveness of the research

All of the respondents have given the whole application a good rating, with 85% rated excellent and a balance of 15% rated good for the VNAR application. This shows that all respondents enjoy using the application, and the different preferences of each respondent have shown a variety of answers to the question. The questionnaire result has met the research's expectations.

4.   CONCLUSION

According to this study, the impact of the individuals who spread false information online results in unnecessary public alarm. As a result, the concept of developing "vaccinated augmented reality" has emerged in order to deliver data and knowledge on vaccinations collected from trustworthy sources. The researcher has successfully completed all of the goals of creating Vaccinoted Augmented Reality (VNAR): Vaccine Knowledge for Raising Immunization Awareness Among School Children after completing the research utilising the Waterfall Model approach. Therefore, it demonstrates that multimedia technology, such as AR, may be a useful tool for disseminating information and imparting knowledge. Additionally, this VNAR Storybook and Program will give the user the knowledge and expertise they need to use the application, which may be beneficial to them. . However, some limitations faced by the researcher in developing this project could be improved with the betterment of the product in future. As a result, the researcher and developers are working very hard to think more creatively, and more new and fresh ideas will to be added to this product soon.

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