Research and Innovation in Technical and Vocational Education and Training Vol. 3 No. 2 (2023) 018-026

RITVET

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/ritvet
e-ISSN : 2785-8138

Development of 3D Simulation Video in the Field of Computer Component Manufacturing

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DOI: https://doi.org/10.30880/ritvet.2023.03.02.003
Received 16 June 2023; Accepted 12 December 2023; Available online 30 December 2023

Abstract: This research was conducted to develop a manufacturing simulation video application to convey information related to computer component manufacturing using the Android application platform. In this field, namely computer manufacturing, there is still a shortage of technological resources that can be used as interesting and more interactive teaching aids. The development of this android application is very interesting and in line with current information delivery methods which can be translated into a more dynamic form than the use of statistically presented information delivery using the right distance to the smartphone screen. The ADDIE model serves as a guide during the development process of this application. The platforms used to develop this application are Unity, Blender, Adobe Illustrator CS6, Adobe Photoshop CS6, and Wonder Share Filmora. Testing and evaluation of this application is carried out through the expert survey method conducted on five experts. In this study, three interface experts were selected, and the lecturers involved had broad skills in creative multimedia. The results of the study indicate that all experts have provided positive comments, suggestions, and input on this developed application. In conclusion, with this product, the developers believe they can provide a better understanding of a process that occurs in the computer manufacturing sector. The success of this application development is expected to be an interactive manufacturing knowledge platform and able to achieve every goal that has been set by the developer.

Keywords: Simulation Videos, Attractive, Computer Component Manufacturing

1. Introduction

Multimedia software is a new alternative for diversifying teaching media and providing exposure to students to the sophistication of today's multimedia systems (Blair-Early & Zender, 2008). According to Norah et al., (2013), the application of multimedia technology is effective and efficient in the teaching and learning process, especially in producing interactive learning materials and exposure to 3D simulation videos that can provide exposure to the public and students about the sophistication of today's multimedia systems. in terms of Manufacturing. Through current technology, the use of simulation methods allows teachers to achieve learning goals, especially in the field of manufacturing

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in terms of content, concepts, skills, and attitudes and this simulation method can also arouse one's creativity (Ang, 2001). This simulation is also a learning situation in a controlled state and deliberately made like the real situation. The goal is to do exercises to solve problems. According to Naismith et al., (2004), simulation is an activity in which a problem has been discussed and carried out in the provided place. According to him, the simulation has important elements such as the existence of activities, discussions, and implementation in the space provided.

Making 3-dimensional simulation videos can help especially those who are new to the manufacturing field to gain experience in the procedures of a product development process more realistically as if the experts in the field were carrying out the procedures. to actual developments. The use of multimedia is one of the best educational techniques because it can provide more than one taste at the same time. It also identifies the senses of sight and hearing (Sharples, 2000). The use of creative and popular technologies such as this video application will reduce the overall cost of a procedure in manufacturing.

1.1 Research Background

According to Che Lah in an excerpt from My Metro Portal (2019) in the manufacturing sector, there is still a lack of application of technology such as video simulations, especially during teaching and learning activities. This is due to the lack of learning resources that are in line with technology as practiced in developed countries such as Japan, the United States, and even Ireland. Most developed countries are currently adopting more interactive learning and focusing on using gadgets such as laptops, smartphones, and even tablets as their learning media. The rapid and widespread development of information and communication technology affects all aspects of life without exception in the manufacturing sector. In line with this development, it has changed the way humans learn information, obtain information, and learn something. Naismith et al., (2004).

According to Norah et al., (2012), in the past the use of multimedia in various fields required high production costs, but now they can produce their multimedia presentations based on their ideology and creativity. The use of multimedia in manufacturing is still less popular and still practice "chalk and talk" learning where this method focuses more on the role of the instructor as a source of information (Yunos, 2015). However, this technology also makes it easier for users to obtain certain health information, especially for students in manufacturing. The use of simulation videos combined with other multimedia elements such as graphics, sound, text, and animation can stimulate students to master the learning process and the necessary skills (Brecht, 2012).

1.2 Problem Statement

Based on the background of the problem, in the specified field, namely manufacturing, there is still a shortage of technological resources that can be used as interesting and more interactive teaching aids. This is because, in today's modern world, a product has become more interactive and able to attract the interest of various generations to use it. In line with this development, it has changed the way humans learn information, obtain information, and learn something. Naismith et al., (2004). The use of video simulation in manufacturing combined with other multimedia elements such as graphics, sound, text, and animation can stimulate a person to master the learning process and the necessary skills (Brecht, 2012). Through technological developments, the use of multimedia learning is very important in helping the quality learning process because it can stimulate thinking and attract users to continue learning (Tajularipin, 2014). The use of these videos can explain something complex into easy. According to Jamalludin (2003), simulation helps explain a process systematically by following it step by step.

1.3 Project Objectives

i. Designing 3D simulation videos in the field of manufacturing
ii. Develop 3D simulation videos in manufacturing
iii. Test the functionality of conceptual video simulation of three-dimensional techniques among experts

2. Methodology

In this chapter, the research methodology is determined and used in analyzing the research. It is also a guide and reference for developers when conducting the research process. To develop a 3D simulation video in this manufacturing field, the Addie model was chosen as the study design model. The Addie model includes several stages, namely analysis, design, development, implementation, and evaluation. The purpose of using this model is to produce effective multimedia products for the target user so that the delivery of information will be more effective and efficient.

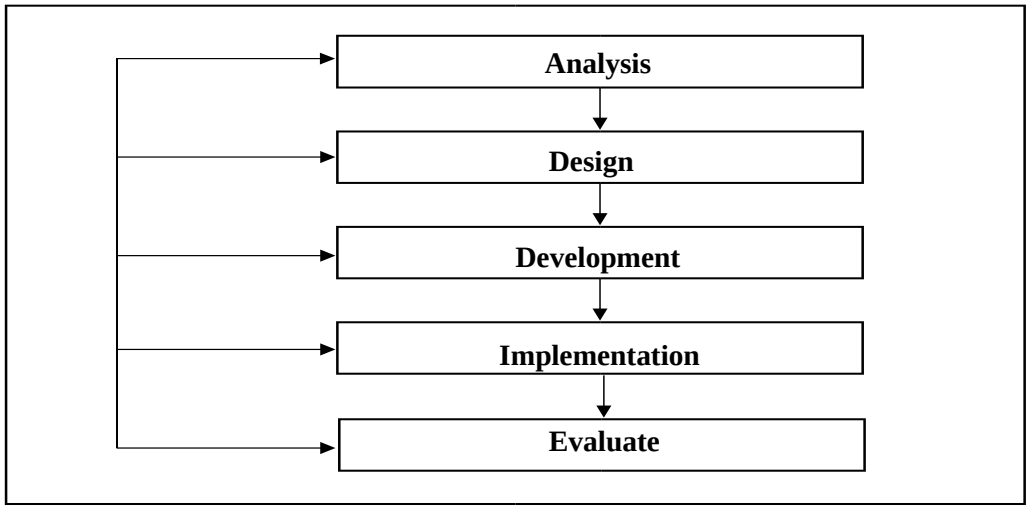


Figure 1: ADDIE Model

2.1 Phase 1: Analysis

The analysis stage is the first stage in the ADDIE model, and developers need to get the requirements needed for the development of the simulation video to be developed. The analysis of each aspect must receive attention so that the project to be developed follows the concept and actual goals of the developer. Explain what the activities were here under Phase 1.

2.2 Phase 2: Design

The design stage is the second phase in the ADDIE model. This stage aims to determine and design methods that will be used by developers in designing the development of 3D simulation videos. In this study, the developer made a flowchart and storyboard from the development of this simulation video. Developers will also get expert support from simulation video design storyboards and content storyboards in simulation videos. Explain what were the activities here under Phase 2 what have you designed?

2.3 Phase 3: Development

The development stage is the phase of translating the written storyboard sketch into actual development using the software. The design sketch on the storyboard is used as a guide for developers

to develop views in the software. The developer will explain the use of information and communication technology in manufacturing to provide exposure to the public about the importance of using multimedia. Explain what were the activities here under Phase 3, what was the software?

2.4 Phase 4: Implementation

This phase refers to the development and design of simulation videos that have been prepared and will be implemented according to user needs.

2.5 Phase 5: Evaluation

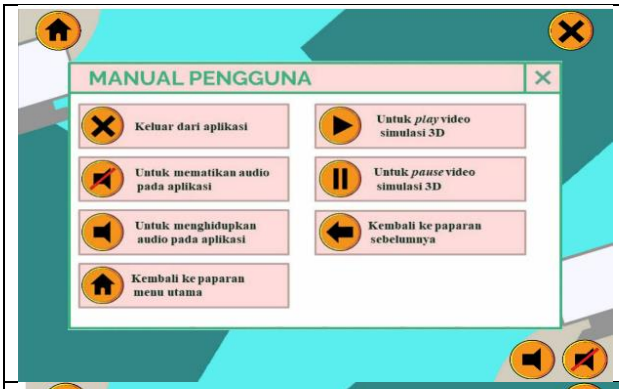
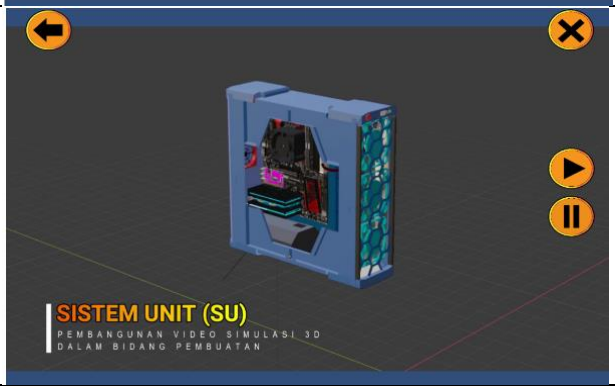
In this phase, the developer will evaluate the overall development of the simulation video in terms of content, interface design, and use of multimedia elements such as text, graphics, audio, and animation in the simulation video. Explain what the activities were here under Phase 5, and how did you evaluate them. Using questionnaire? Explain.

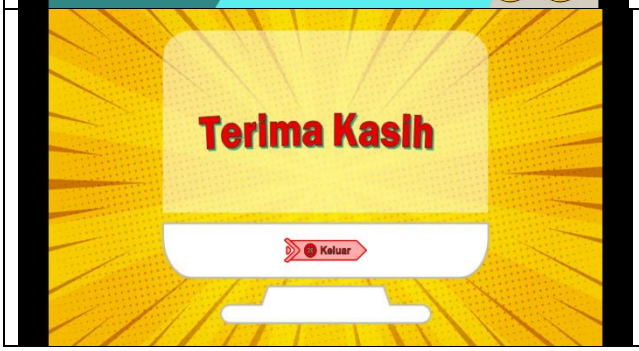
2.6 Develop the 3D simulation video in the field of computer component manufacturing

Interface design is a combination of a whole set of content, multimedia elements, and several interactive elements. Table 1 shows the interfaces that had been developed.

Table 1: Application Interface

Application Interface	Description
	Main product display. In the graphic, is the text related to the title of 3D simulation video development in the field of manufacturing. Then, the 'START' control button is placed under the title
	On the main menu screen of this animated video development, the developer has designed this section by providing four main menus namely introduction, objectives, user manual and computer manufacturing

	On this display, the developer has designed a section of the page using a light-colored background and dark-colored text. The text is information about the guide to the user to use this product
	In this view, the developer has designed the page section by providing submenu control buttons namely Mouse, System Unit (SU), Monitor and Keyboard
	In this view, the developer displays a video of a 3D model of the mouse. The video is placed to play in a new scene. In the video, the developer has included the background voice that is the narrator and the sound of music.
	In this display, the developer displays a video of a 3D model of the System Unit (SU). The video is placed to play in a new scene. In the video, the developer has included the background voice that is the narrator and the sound of music.

	In this display, the developer displays a video of the 3D Monitor model. In the video, the developer has included the background voice that is the narrator and the sound of music. The developer also provides control buttons on the right side so that users can easily control the video. There are several characteristics of learning based on constructivism, namely doing learning based on experience by relating individual knowledge, providing learning that involves interaction, using media in learning to be more effective, and involving emotional elements in learning. by exploring the content of the video
	3D model video display of the keyboard. The font used in the video in the subtitle section is IM FELL DW Pica Roman size 24 pt. The developer also provides control buttons on the right side so that users can easily control the video.
	The developer has designed the page section by placing two control buttons namely the 'Yes' button if the user wants to exit the page and the 'No' button if the command to exit is canceled.
	The developer has designed the page section by placing a control button which is the 'exit' button if the user wants to exit the application.

3. Findings and Discussions

The developer has confirmed with three experts for the evaluation of the 3D simulation video. The results of the evaluation were analyzed using the method of frequency and percentage of acceptance. Table 2 shows the validation findings of content design experts. From these findings, (10) items were

sent and there were (9) items that answered 'yes' but (1) other items received 'no'. There are suggestions and views from experts regarding content design at point 8. Experts advise developers to be more detailed by adding some other components such as printers and speakers. Saim, Ali, and Ibrahim (2003), state that software with user-friendly elements can be seen when the instructions and sequences are clear and orderly on each screen. Overall, all experts gave a positive response to the design of 3D simulation videos in manufacturing as a medium that can convey information and understanding to those in the field.

Table 2: Findings of expert confirmation of content design

No	Items	Frequency		Percentage of Acceptance (%)
		Yes	No	
1	This 3D simulation video gives a clear picture of the manufacturing field	2	0	100%
2	3D Simulation Videos related to easy-to-understand work on the manufacturing field	2	0	100%
3	The use of this Information Technology is very suitable for use in the manufacturing sector	2	0	100%
4	The 3D Simulation video in this manufacturing field is very clear	2	0	100%
5	The objective in the development of 3D Video Simulation in the field of manufacturing is very appropriate	2	0	100%
6	The Malay language used in the simulation video easy to understand	2	0	100%
7	The simulation video gives a good explanation of the manufacturing field	2	0	100%
8	This 3D Simulation Video is easy to understand by many ages.	0	2	0%
9	Simulation video developed to coincide with the manufacturing field	2	0	100%
10	The simulation video is developed according to the manufacturing field	2	0	100%

The evaluation of the interface design expert is an evaluation of the content of the multimedia elements contained in the development of the 3D simulation video that has been developed. This evaluation is carried out so that the developed video can provide interesting and clear information to users. Each item in the interface design expert review form has been divided into several sections, namely text, graphics, animation, audio, video, and interaction design. A total of 28 question items were given by the developer to the experts. Findings from expert reviews were analyzed and described in terms of frequency and percentage. Table 3 shows the results of the evaluation study of interface design experts.

Table 3: Findings of expert confirmation of interface design

No	Items	Frequency		Percentage Of Acceptance (%)
		Yes	No	
	Text			
1.	Appropriate use of color in text	3	0	100%
2.	Use appropriate text size	3	0	100%
3.	The type of text used is consistent	2	1	66.6%
4.	The type of text used is appropriate	3	0	100%
	Graphics			

5.	Attractive use of 3D graphics	3	0	100%
6.	Clear use of 3D graphics	3	0	100%
7.	Easy-to-understand use of 3D graphics	3	0	100%
8.	Correct use of colors in graphics	3	0	100%
9.	Use of graphics that have a clear resolution	3	0	100%
	Audio			
10.	Use of content-appropriate audio	3	0	100%
11.	Audio can be heard clearly	1	2	33.3%
12.	The audio used is appropriate	3	0	100%
13.	The audio used does not disturb the user	3	0	100%
14.	Background music used is appropriate	3	0	100%
	Video			
15.	Users can control video	3	0	100%
16.	The quality of this 3D simulation video is satisfactory	1	2	33.3%
17.	This simulation video is easy to understand	2	1	66.6%
18.	3D simulation video is generated	2	1	66.6%
19.	Appropriate video duration	3	0	100%
	Animation			
20.	The animation in the 3D simulation video is interesting	3	0	100%
21.	Animations in 3D simulation videos are generated	3	0	100%
22.	Animations in 3D simulation videos are generated according to the content	3	0	100%
	Interaction Design			
23.	The interaction button uses the appropriate icon	3	0	100%
24.	The interaction button works fine	3	0	100%
25.	The position of the interaction field used is consistent	2	1	66.6%
26.	Interaction buttons use appropriate text	3	0	100%
27.	User-friendly interaction button design	2	1	66.6%
28.	The interaction button on each display can identify its function	3	0	100%

4. Conclusion

In conclusion, this research was conducted with the aim that according to Blair-Early and Zender (2008) and Norah et al., (2013), the application of multimedia technology is effective and efficient in the teaching and learning process, especially in producing interactive learning materials and exposure to 3D simulation videos that can provide exposure to the public and students about the sophistication of multimedia systems in terms of Manufacturing. Comments and suggestions from experts were included in the development of this product to meet the needs and requirements of users. For the most part, all specialists agree on content design, interface design, and interaction design for this product.

Acknowledgement

The author would like to express appreciation to the Faculty of Technical and Vocational Education, University Tun Hussein Onn Malaysia.

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