

Augmented Reality Application in Exploring the Malaysia Multimedia Super Corridor (Government Electronic, Smart School and Smart Card)

Azita Ali^{1*}, Mohamad Hazim Aiman Shahnam¹

¹Faculty of Technical and Vocational Education,
University Tun Hussein Onn Malaysia, 86400 Batu Pahat, Johor, MALAYSIA

*Corresponding Author Designation

DOI: <https://doi.org/10.30880/ritvet.2022.02.02.027>

Received 06 January 2022; Accepted 12 July 2020; Available online 30 September 2022

Abstract: The project aims to design and develop an Augmented Reality Application in exploring the Malaysia Multimedia Super Corridor (Government Electronic, Smart School and Smart Card). Augmented Reality technology was chosen because of its potential to improve education in the teaching and learning processes positively. Augmented Reality application development can help society particularly students gain exposure and awareness in comprehending three major fields of MSC applications provided by the government to advance the nation and people globally. The model used in the development of this product is the Hannafin and Peck which includes three main phases namely analysis need, design and development or implementation. Each phase will go through the evaluation and revision. The analysis phase was conducted by analyzing previous cases to find out the problem. In the design phase of the product, the developers creates the storyboard and get feedback from the design content and interface specialist. In the development or implementation phase, the developers creates a prototype using selected hardware and software. The evaluations carried out by five (5) specialists in a creative multimedia field from the Faculty of Technical and Vocational Education (FPTV). Three (3) specialists were chosen in evaluating design content while two (2) specialists in design interface for the development of Augmented Reality application. The instrument of study used is the expert checklist form. Data are analysed using the frequency and percentage method. The findings of the study found out that all five specialists gave a positive response to this product. The results obtained by this product can help society, especially students to gain a better understanding about MSC groups and its application that been introduced by the government.

Keywords: Augmented Reality, Multimedia Super Corridor

1. Introduction

Information and Communication Technology (ICT) is an important factor in creating the best multimedia industry and creating an information-based and knowledge-based society in Malaysia. Therefore, the government has introduced the Multimedia Super Corridor (MSC), a Special Economic Zone in Malaysia for the global information and communication technology industry (Yahya, 2018). The MSC was officially inaugurated by the former Prime Minister of Malaysia, Tun Dr Mahathir Mohamad on 12 February 1996 to make Malaysia a modern country and a knowledge society (Nusa, 2013). According to Sham (2006), MSC applications consist of two groups which are multimedia development and multimedia environment. The first group includes electronic government, smart schools, multi-purpose cards, and telemedicine. While for the second group are research and development (R&D) clusters, worldwide manufacturer network and borderless marketing centres. Therefore, the Malaysian government has supported and been responsible for developing the MSC to transform the country's economy towards a more developed one (Payne, 2017). In the era of globalization, new technologies such as augmented reality provide many benefits and advantages to raising awareness to the society about the importance of MSC in contributing to the national economic sector (Khalid, 2017). Therefore, augmented reality is seen as suitable to be applied to provide awareness and knowledge to the public on the MSC groups and its application that been introduced by the government.

1.1 Research Background

The level of understanding of the community especially students on the flagship application of the Multimedia Super Corridor is not at its best. Until now, society has not used the opportunities provided by the government to the best of its ability to assist the country in developing the economic sector. According to a study conducted by Ismail (2001), the knowledge of students of UiTM Alor Gajah Melaka on the Multimedia Super Corridor especially in Electronic Government, Smart Schools and Smart Cards are only at a satisfactory level. It is because students only understand the role or function of Multimedia Super Corridor (MSC) development to the community but do not explore overall functions. Thus, society in generation Y or as IT literate generation cannot understand well the application of Multimedia Super Corridor (MSC) introduced by the government.

The study conducted by Arie (2014) related to the third branch of the Multimedia Super Corridor (MSC) application which is the smart school branch also received a negative response from respondents. This study found that teachers under cluster schools can only use computer software at a moderate level. This matter is taken seriously because this smart school project was piloted under the implementation of the MSC. In addition, no specific modules introduced by the government to the society especially the younger generation, cause them to be unaware of the importance and existence of this supposedly borderless world. Therefore, the role of multimedia is significant for learning and exposure for public awareness. Aspects such as graphic design, audio selection, how to present animation and appropriate colour selection need to be considered in developing a product to the community (Eddy *et al.*, 2017). Augmented reality technology is the best technology to choose because it can help students understand and can focus on the learning process by using multimedia software (Baharsyah, 2019).

1.2 Problem Statement

Based on the problems stated above, knowledge and awareness of the application of the MSC especially Electronic Government, Smart Schools and Smart Cards among the community help the government achieve the objectives of the establishment set. According to Bernama (2014), lack of awareness of the Multimedia Super Corridor has caused the community not to use the government's opportunities due to several factors. Generation Y especially students who are not encouraged and exposed to the Multimedia Super Corridor due to low mastery and understanding from teachers (Arie,

2014). In addition, factors such as the lack of specific and interesting modules introduced by the government cause the public not to be aware of this Multimedia Super Corridor development in Information and Communication Technology (Nusa, 20013).

In line with technological developments, the Multimedia Super Corridor especially Electronic Government, Smart Schools and Smart Cards development needs to be introduced to the public using multimedia such as Augmented Reality application (Molla & Vincent, 2012). This study is to develop Augmented Reality applications in the Multimedia Super Corridor in Malaysia which aims to provide awareness and exposure to the community especially in understanding the three main branches of MSC applications introduced by the government to develop the country and people globally.

1.3 Objectives of this study are:

- 1) Designing Augmented Reality applications in Multimedia Super Corridor Malaysia (Electronic Government, Smart Schools and Smart Cards).
- 2) Developing Augmented Reality applications in Multimedia Super Corridor Malaysia (Electronic Government, Smart Schools and Smart Cards).
- 3) Evaluating the functionality of Augmented Reality applications in Multimedia Super Corridor Malaysia (Electronic Government, Smart Schools and Smart Cards).

2. The Multimedia Super Corridor Malaysia (MSC)

The Malaysian Government has formulated a development strategy to ensure that the Multimedia Super Corridor successfully changes Malaysians' economic and lifestyle patterns through this MSC application. The focus of the study is related to the first group, namely Electronic Government, Smart Schools and Smart Cards because they are the basics before entering the second group (Molla & Vincent, 2012). This MSC aims to open wider opportunities for Malaysians to lead efforts towards the advancement of digital content and the creative industry (Bernama, 2014). However, lacking of knowledge and only focused on the local market resulted in the objectives of the MSC not being fully achieved (Nusa, 2013). Most Malaysians only know about the MSC in radio channels and newspaper highlights but do not explore into the groups of applications introduced by the Government properly. As a result, about 90 per cent of the total 3,000 companies with Multimedia Super Corridor (MSC) status are still lagging in the start-up stage even after two decades of its existence (Asohan , 2012).

Putrajaya is a new government administrative area and its location is within the Multimedia Super Corridor development area. Electronic government administration using technologies such as computers and multimedia. Any business will be done digitally and no longer using paper forms (Mohmad.k, 2005). Sekolah Bestari is a school that practices culture, knowledge and thinking (Bernama, 2015) of technology. According to Mohmad.K (2005), technology is widely used to improve the effectiveness of learning and teaching and also school management systems. Furthermore, MSC will educate students globally and compete internationally by focusing on building information technology competencies.

The world's first smart card combines four government apps and two optional apps with high-security features. The card produced will replace the identity card and driving license. Furthermore, cashless applications and public key infrastructure (PKI) are also included. For example, MyKad has a chip that can read all the information stored in it.

2.1 Use of Augmented Reality (AR) Applications for Information Communicators

According to Khalid (2017), AR can increase the user's perception of the real world such as virtual objects that the senses cannot feel. However, virtual information can help users perform tasks in the real world. The development of AR has been widely used and among others in the fields of medicine and health. The development of AR technology helps a lot through pictures, videos, or computer-generated models to the structure in the virtual or real-world to facilitate the learning process to the clinical environment (Salim & Idris, 2019). Meanwhile, in education, AR is seen to save time in mastering knowledge and provide an alternative for teachers to use a more interactive, exciting and effective teaching media (Alias et al., 2018). Meanwhile, Khalid (2017) supports that people can apply AR to various fields because AR has a feature where users can move virtual objects and see from various angles such as seeing and holding a real object. As such, AR is chosen in this study to help people understand better about the application of MSC.

3.0 Methodology

The Hanaffin and Peck models were selected as design models for Augmented Reality (AR) application development. The developers chose this model because it is suitable for multimedia software development. This model is also simple, clear and easy to implement (Jamalludin, 2012). In addition, the model conducts an ongoing evaluation and review process can ensure that the information presented in the product is accurate and can meet the objectives that have been set. The developers did not have to wait until the development phase to perform an evaluation and review process on the developed software. This model has three main phases, namely the Needs Analysis Phase, the Design Phase, and the Development and Implementation Phase.

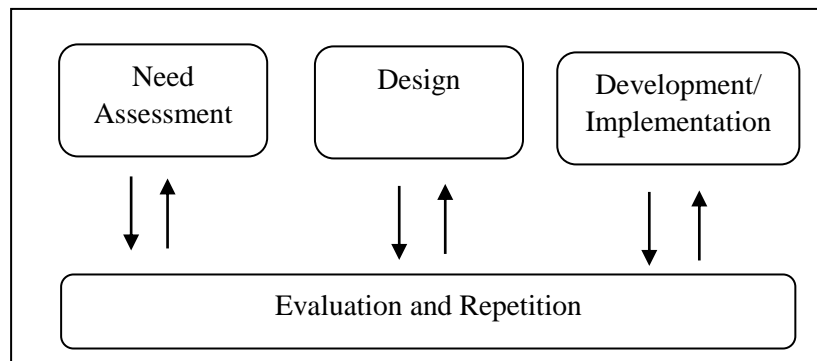


Figure 1: Workflow Based on the Hannafin and Peck Model (1988)

3.1 The Needs Analysis Phase

The needs analysis phase is the first phase in the Hannafin and Peck Model. In this phase, the developers have made an analysis especially on the characteristics of the target group to ensure that the design process performed guide and direct to meet the needs of users (Plutora, 2020). Among them, the developers have conducted an analysis of the research problems and the methods used to solve the problems. In addition, the developers have determined the study's objectives, including choosing the target users and the appropriate software and hardware used in conducting this study. This phase requires the developers to obtain important information by reading past studies, articles, newspapers and scholarly sources to increase understanding. The developers have also determined the target group for this study consists of students, teachers, parents and the community. In addition, the developers have looked at the level of mastery and knowledge by the target group of these three

branches of the Multimedia Super Corridor (MSC) and their willingness to operate this application for learning purposes. According to Atmaja (2018), Augmented Reality in learning is an effective effort to increase an individual's understanding of something.

a. Analysis of Software and Hardware

Analysis has been done in this section to identify software and hardware used to develop Augmented Reality in Multimedia Super Corridor Malaysia. Appropriate software and hardware used in this study to ensure the quality of the product to be produced successfully and attract the interest of consumers and have a good interaction between users and products. The software used in this study are Unity 3D, Android SDK Adobe Photoshop CS6, Autodesk 3D Max 2018, Wondershare Filmora and Vuforia SDK. Meanwhile, the hardware used is Laptops, Android Devices and Pendrive Thumb Drives.

b. Evaluation and Repetition Phase (Needs Analysis)

The process evaluation and repetition phase happened once the developers have completed the user's analysis and analyses of the required software and hardware. The evaluation and repetition for this need analysis consist of discussion and approval by the supervisor. Developers have analyzed references on past cases to identify problems that occurred.

3.2 The Design Phase

The design phase is the second phase involved in the Hannafin and Peck Model which requires the developers to plan, compile and provide an overview of the developed product (Jamalludin, 2012). Therefore, the developers have produced a storyboard related to Augmented Reality in Multimedia Super Corridor Malaysia (Electronic Government, Smart Schools and Smart Cards) and a flow chart for the development of the application. The production of storyboards and flow charts for this application has been approved by the supervisor first before obtaining feedback from the experts involved.

a. Interaction Design

Interaction design is an important element as it allows developers to see how this product can be produced. The interaction design also enables users to interact and communicate with products that have been developed based on the interactive multimedia elements used. The developers have provided navigation buttons to allow the users to control the product and there will be an interaction between the users and the product.

b. Interface Design

Interface design is the overall arrangement of all the content contained in a product. Among the content found in the interface design are the product content, multimedia elements and interaction design that the developers have provided. Developers have used the storyboard sketch method to determine the type of display produced and accompanied by appropriate navigation buttons. The storyboard gives an overview of the Augmented Reality application for MSC such as menus, submenus and navigation buttons that the developers provided.

c. Evaluation and Repetition Phase (Design)

Developers had got feedback from experts related to design- that are suitable for use in developing this Augmented Reality app. Developers have also getting feedback on content design storyboards, interaction design and interface design at this phase. The evaluation conducted by the experts have also gave feedback and suggestions of ideas that can be used and adapted by the developers for the improvement of Augmented Reality applications.

3.3 The Development and Implementation Phase

The third phase in the Hannafin and Peck Model involves the development and implementation phase that ensures the developers completes all aspects designed to be adapted in the media. This phase will display the developed product to consumers. Therefore, the developed Augmented Reality application containing multimedia elements designed along with the navigation buttons displayed in this product. In addition, the developers have also obtained feedback from the experts involved to identify faults or problems throughout the design and development process done for evaluation purposes.

Evaluations and repetition in the development and implementation phases were conducted to obtain feedback from experts to improve the application. The evaluation of the development of Augmented Reality applications for interface and content design has involved experts consisting of Creative Multimedia Lecturers from the Faculty of Technical and Vocational Education (FPTV) at Universiti Tun Hussein Onn Malaysia (UTHM).

3.4 The Development of the Augmented Reality Application in Malaysia Multimedia Super Corridor (Government Electronic, Smart School and Smart Card)

In every product that needs to be developed, there should be a key point for the users to begin. In this AR application for MSC have developed a great look for users who are ready to start using this app. Then, the 'exit' button is placed on the top right side of the application screen and 'sound' button on the bottom right side. Figure 2.0 shows the home screen interface.



Figure 2.0: Home Screen Interface

The main menu screen is the next screen where the users can click the 'start' button. On this menu screen, users can select the option to select the topic they want to see. On the navigation buttons, there are five selection buttons namely 'Introduction of MSC', 'Objective', 'Function of MSC', 'MSC in AR', and 'User Manual'. In addition, the developers placed the 'exit' button on the top right side, 'back' button on the top left side and 'sound' button on the bottom right side of the application. All these buttons were placed in the same place for every interface. Figure 3.0 shows the main menu screen.



Figure 3.0: Main Menu Screen

On the introduction screen, the developers enter text for the description about MSC to give knowledge for the users in order to understand MSC. The introduction interface was shown in figure 4.0.



Figure 4.0: Introduction Interface

Meanwhile on the objective screen, the developers enter text for the description about three objectives. It is to give the users an understanding of the purpose of the application being developed as shown in figure 5.0.

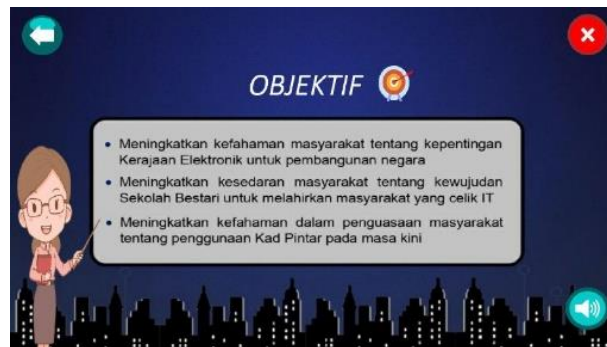


Figure 5.0: Objective Screen

On the function of MSC screen, the developers enter text for the description about three functions of MSC. It is to give the users better understanding about MSC introduced by government. Figure 6.0 shows the function of MSC interface.



Figure 6.0: Function of MSC Screen

On the MSC in AR screen, it divided into three main branches which are Government Electronic, Smart School and Smart Card. It gives the options to the users to choose which one they likely to appear on the screen as shown in figure 7.0.



Figure 7.0: MSC in AR Screen

On the government electronic screen, the developers provided two screens which are Introduction and E-Kerajaan. Both interfaces give different explanation and 3D model will appear when users target the camera to image provided. When model appears, the description of the model will start. Otherwise, an infographic screen for the model also allowed the users to read the explanation given. Figure 8.0 shows the government electronic interface.

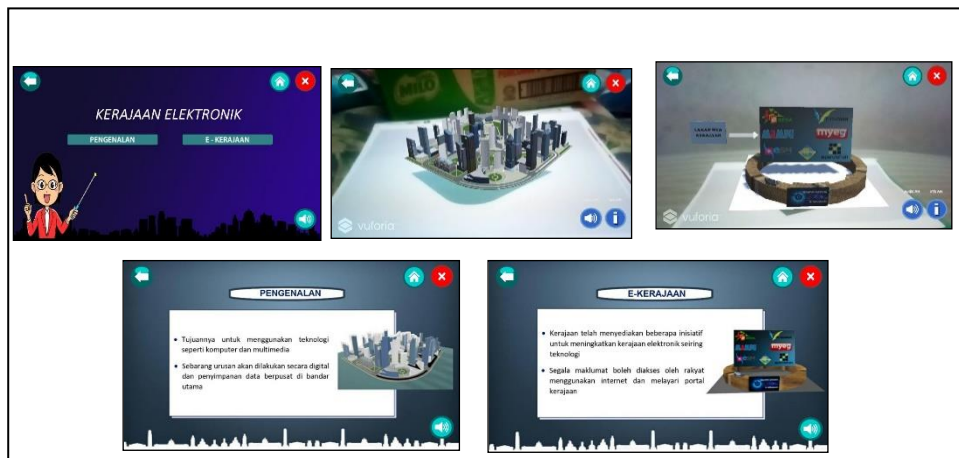


Figure 8.0: Government Electronic Interface

On the smart school screen, the developers provided two screens which are Introduction and Educational Reform. Both interfaces give different explanation and 3D model will appear when users target the camera to image provided. When model appears, the description of the model will start. Otherwise, an infographic screen for the model also allowed the users to read the explanation given. Figure 9.0 shows smart school interface.

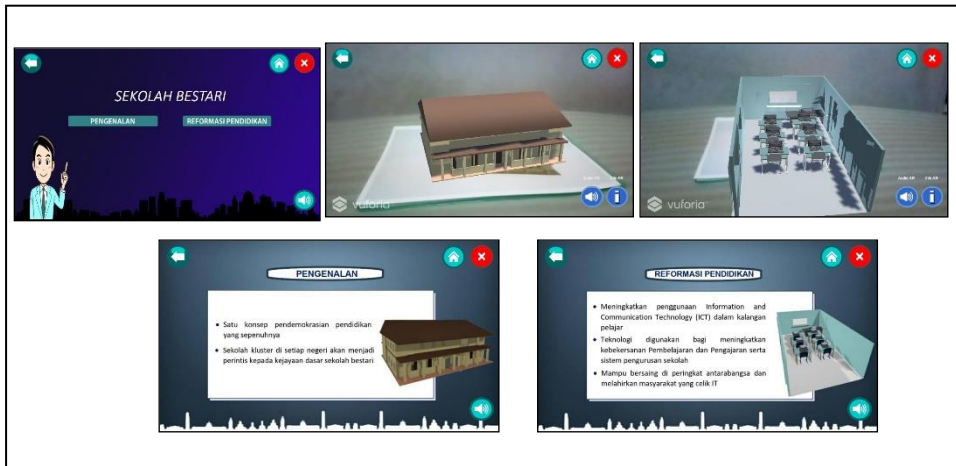


Figure 9.0: Smart School Interface

On the smart card screen, the developers provided three screens which are Identity Card, ATM Card and Touch N' Go Card. All interfaces give different explanation and 3D model will appear when users target the camera to image provided. When model appears, the description of the model will start. Otherwise, an infographic screen for the model also allowed the users to read the explanation given. Figure 10.0 shows the smart card interface.

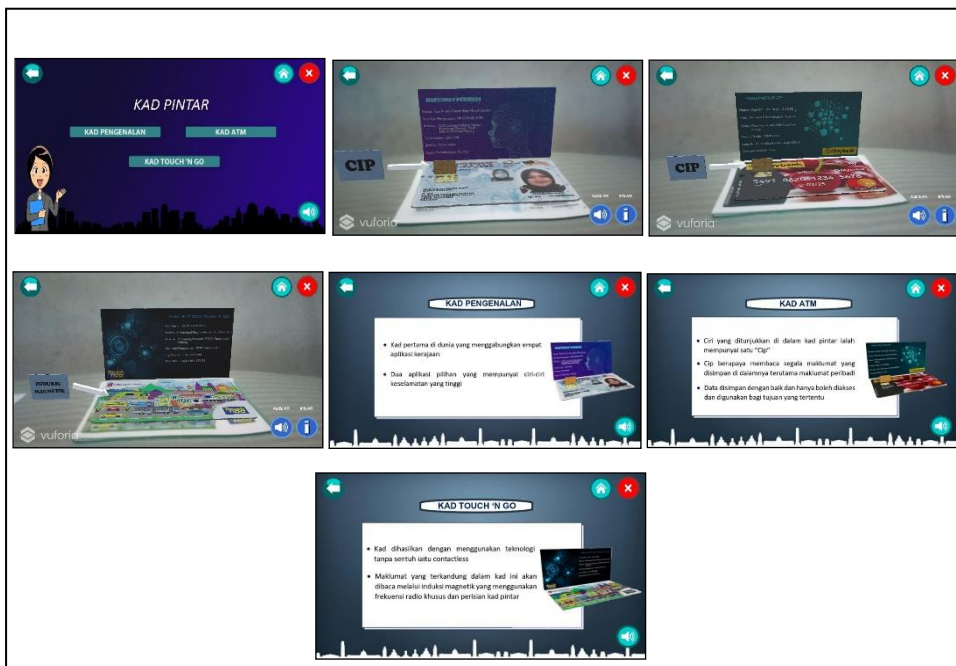


Figure 10.0: Smart Card Interface

The user manual screen was developed by the developers to explain to the users the function of each control button used in this AR application. The buttons used in this application are intended to make it easy for users to quickly and easily reach the information they want. Figure 11 shows user manual screen interface.

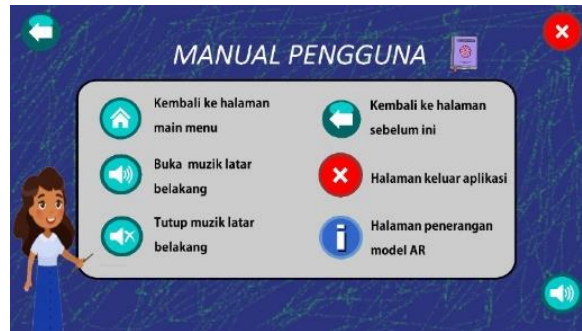


Figure 11.0: User Manual Interface

An exit screen is developed to tell users whether or not they want to leave this application when they press the 'exit' button on each screen. This view is the text in question. If the users want to sign out of this app, they will need to hit the 'Yes' icon button and press the 'No' icon to remain on the app. Figure 12 show exit screen interface.



Figure 12: Exit Interface

Thank You Screen is developed when the users choose 'yes' at exit screen. This is one of appreciation from developers for users because of their willingness to use this Augmented Reality application for MSC. Figure 13 shows the thank you interface.



Figure 13: Thank You Interface

4.0 Result

Through expert evaluation, it is divided into two (2) sections, namely, content and interface design. For the content design, three (3) experts were selected and for two (2) experts were selected for interface design. All experts are lecturers in the field of Creative Multimedia from the Faculty of Technical and Vocational Education, University of Tun Hussein Onn Malaysia. Table 1 shows the demographics of those five experts.

Table 1: The Demographics of These Five Experts

Details	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
Gender	Man	Man	Woman	Woman	Woman
Educational Status	Doctor of Philosophy	Degree	Doctor of Philosophy	Master	Doctor of Philosophy
Working Experience	11-15 Years	>15 Years	11-15 Years	>15 Years	5-10 Years
Specialty Field	Information Technology	Multimedia	Information Technology	Software Engineering	Information Technology

4.1 Content Design Evaluation

Evaluation for the development of this application focuses on content to ensure target users can understand the content and the information presented. Seven (7) questions provided and divided into 3 sub item which are Electronic Government, Smart School and Smart Card. The data answered by experts in this section have been developed and analyses using frequency and percentage acceptance levels to ensure that the content contained in this application is appropriate for the target users. Table 2.0 shows the results of expert evaluation on the content design section.

Table 2.0: The Results of Expert Evaluation on The Content Design Section

Bil	Items	Frequency		Percentage of Acceptance (%)
		Yes	No	
1.	Augmented Reality (AR) on the application arm of the Malaysian Multimedia Super Corridor provides a clear picture of the MSC			
	a) Government Electronic	3	0	100%
	b) Smart School	3	0	100%
	c) Smart Card	3	0	100%
2.	Augmented Reality (AR) content on the application branch of the Malaysian Multimedia Super Corridor (MSC) is suitable for use			
	a) Government Electronic	3	0	100%
	b) Smart School	3	0	100%
	c) Smart Card	3	0	100%
3.	Augmented Reality (AR) on the application arm of the Malaysian Multimedia Super Corridor (MSC) is easy to understand			
	a) Government Electronic	3	0	100%
	b) Smart School	3	0	100%
	c) Smart Card	3	0	100%
	The content on the application branch of the Malaysian Multimedia Super Corridor (MSC)			

describes the information correctly			
a) Government Electronic	3	0	100%
b) Smart School	3	0	100%
c) Smart Card	3	0	100%
Augmented Reality (AR) on the application branch of the Malaysian Multimedia Super Corridor (MSC) can be understood by users			
a) Government Electronic	3	0	100%
b) Smart School	3	0	100%
c) Smart Card	3	0	100%
Augmented Reality (AR) on the application branch of the Malaysian Multimedia Super Corridor (MSC) is clear			
a) Government Electronic	3	0	100%
b) Smart School	3	0	100%
c) Smart Card	3	0	100%
Augmented Reality (AR) on the application arm of the Malaysian Multimedia Super Corridor (MSC) is timely and appropriate			
a) Government Electronic	3	0	100%
b) Smart School	3	0	100%
c) Smart Card	3	0	100%

Table 2.0 shows the results of the percentage frequency of expert score of the content design section. The findings through the analysis of the questionnaire showed that the experts agreed that AR application gives a clear picture of the MSC. In addition, experts agreed the content of AR on the application branch of the MSC for the three sub-items, namely Electronic Government, Smart Schools and Smart Cards, suitable for use. Experts also agree that AR on the application branch of the MSC for the three sub-items are easily understood by users. Next, the experts chose to agree on the fourth item which the content on the application branch of the MSC for Electronic Government, Smart Schools and Smart Cards to describe the information correctly.

Then, experts agreed that AR on the application branch of the MSC for Electronic Government, Smart Schools and Smart Cards could be well understood by users. In addition, the sixth item was also agreed by experts where AR on the application branch of the MSC is clearly explained to consumers. Finally, experts also agree that the AR on the application branch of the MSC for the three sub-items, is appropriate. Overall, all three experts answered "Yes" which agrees to all items on the content design of the product developed. Experts also provide comments and suggestions for improvement in content design.

4.2 Design Analysis

The interface design analysis of the application focuses on the content of multimedia elements so that the application is developed to provide clear and interesting information by incorporating a variety of multimedia components. Twenty-Seven (27) questions were asked to the experts in this section that were developed and analyse using frequency and percentage. Table 3.0 shows the results of expert evaluation on interface design.

Table 3.0: The Results of Expert Evaluation on Interface Design

Bil	Items	Frequency		Percentage of Acceptance (%)
		Yes	No	
Text				
1.	The type of text used is appropriate	1	1	50%
2.	The type of text used is easy to read	2	0	100%
3.	The type of text used is readable	2	0	100%
4.	The text size used is appropriate	1	1	50%
5.	The text font used is appropriate	1	1	50%
6.	The text font used is consistent	2	0	100%
7.	The type of text used is consistent	2	0	100%
8.	The position of the text is consistent	2	0	100%
Graphic				
9.	The 3D graphics used are interesting	2	0	100%
10.	The 3D graphics used are clear	2	0	100%
11.	3D graphics is easy to understand	2	0	100%
12.	The graphic colours used are appropriate	2	0	100%
13.	The arrangement of the graphics used is appropriate	2	0	100%
14.	The 3D graphics used are easy to understand	2	0	100%
15.	Graphic colours used is appropriate	2	0	100%
16.	Graphics used have a clear resolution	2	0	100%
Audio				
17.	Use of audio appropriate to the content	2	0	100%
18.	Audio can be heard clearly	2	0	100%
19.	Audio matches the content	2	0	100%
20.	The audio used does not disturb the users	2	0	100%
21.	The background music used is appropriate	2	0	100%
22.	The background sound used is appropriate	2	0	100%
Interaction Design				
23.	The interaction buttons used work well	2	0	100%
24.	The position of the interaction buttons used is consistent	2	0	100%
25.	Interaction buttons use the appropriate icons	2	0	100%
26.	The interaction buttons on each display can be identified by their function	2	0	100%
27.	The design of the interaction buttons used is users-friendly	2	0	100%

Table 3.0 shows the results of the analysis of the interface design. In the first aspect, which is the text, has eight questions that have been answered by experts. Expert 1 has agreed with all items that the type of text used is appropriate, easy and readable. In addition, the text size and text font used are also appropriate. Lastly, the font, type and position of the text used are consistent. Meanwhile, Expert 2 has agreed that the type of text used is simple and readable. Moreover, expert 2 also agreed that the font, type and position of the text used were consistent. However, three items are not agreed by expert 2 which are the type, size, font of the text used is appropriate. Next, Experts 1 and 2 agreed that the 3D graphics used are attractive and clear, the use of 3D graphics is easy to understand, the color and arrangement of the graphics used is appropriate, the 3D graphics used are easy to understand and the use of color graphics used is appropriate graphics that have a clear resolution.

Then, Experts 1 and 2 also agreed on the use of audio appropriate to the content, audio can be heard clearly, audio appropriate to the content, audio used does not disturb the users, and the music and background sound used is appropriate. The last item in the questionnaire is interface design contains 5 questions. Experts 1 and 2 also agreed that the interaction buttons used could work well, the position of the interaction buttons used is consistent, the interaction buttons used appropriate icons, the interaction buttons on each display can be identified and the design of the interaction buttons used suit the users. Overall, experts 1 and 2 have chosen "yes" which is agree in most of the items in the interface design analysis.

4.0 Conclusion

In conclusion, the development of this app has successfully provided an interactive and suitable learning medium that allows users to interact with applications by society especially students. Augmented Reality Application in Malaysia Multimedia Super Corridor (Government Electronic, Smart School and Smart Card) can be accessed via an android mobile device. The process of developing this application is not an easy one, but careful planning must be planned before it can be successfully developed. The use of a variety of multimedia elements in applications has successfully delivered content to users in a more structured and engaging way. Therefore, the development of MSC application is expected to give awareness and knowledge about three main branches introduced by the government. Overall, as a result of the findings of this study, the application was developed based on the objectives and research questions. Comments and suggestions for improvement have also been taken into consideration in the development of this application to ensure it meets the needs and requirements of users. In addition, all experts give positive feedbacks and agree that the development of Augmented Reality Application in Malaysia Multimedia Super Corridor (Government Electronic, Smart School and Smart Card) is attractive and appropriate for public especially students.

Acknowledgement

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

References

- Alias, A., Abdullah, F., Khalid, A. (2018). Aplikasi Interaktif *Augmented Reality* (AR) dalam Pengurusan Halal. *1st International Conference on Religion, Social Sciences and Technological Education*. Nilai, Malaysia: Universiti Sains Islam Malaysia.
- Arie, A. (2014). Teknologi Dalam Pengajaran Dan Pembelajaran. Scribd. Dicapai pada 12 November 2020 dari <https://www.scribd.com/doc/214235776/Teknologi-Dalam-Pengajaran-Dan-Pembelajaran-Amatlah-Penting-Pada-Hari-Ini>
- Asohan, A. (2012). *Digital Malaysia Economy*. Dicapai pada 23 Oktober 2020 dari https://www.digitalnewsasia.com/digital_economy/digital-malaysia-details-out-finally
- Atmaja, N. J. D (2018). Pengembangan Aplikasi Media Pembelajaran Interaktif 3D Tata Surya Menggunakan Teknologi Augmented Reality Dengan Android. *Seminar Nasional Sains dan Teknologi*. Jakarta, Indonesia: Universitas Majalengka. 2018. pp 1- 11.

- Basri, M. (2012). Bab 4: Kaedah Kajian. Kolej Universiti Islam Antarabangsa: Tesis Ph.D.
- Baharsyah, A. N. (2019). Teknologi Augmented Reality: Definisi, Cara Kerja, Pelajari Semua di Sini. Dicapai pada 25 November 2020 dari <https://www.jagoanhosting.com/blog/teknologi-augmented-reality/>
- Bernama Awani (2016). *90 peratus syarikat berstatus MSC masih di peringkat permulaan – Mdec*. Dicapai pada 20 Oktober 2020 dari <https://www.astroawani.com/berita-bisnes/90-peratus-syarikat-berstatus-msc-masih-di-peringkat-permulaan-mdec-90443>
- Eddy T., Imtiyaz A., & Zibeon L. (2017). Strategi Pembangunan dan Kesan Terhadap Ekonomi dan Kawasan di Malaysia. Dicapai dari <https://www.slideshare.net/EddyTerinisip1/hgm239-msc-malaysia>
- Hishamuddin, F (2012). Keberkesanan Penggunaan Elemen Multimedia Dalam Pengajaran dan Pembelajaran. Universiti Teknologi Malaysia: Tesis Sarjana
- Ismail, M., & Liharsizad (2001). Satu Kajian Mengenai Pengetahuan Para Pelajar Universiti Teknologi MARA Kampus Alor Gajah Melaka Terhadap Koridor Raya Multimedia (MSC). Universiti Teknologi Mara: Tesis Sarjana Muda
- Jamaluddin, M (2012). *Multimedia Interaktif Dan Pembangunan Aplikasi*. Dicapai pada 26 November 2020 dari http://studentsrepo.um.edu.my/MultimediaInteraktifDanPembangunanAplika____si.pdf
- Khalid, F. (2017). Kesan Teknologi Augmented Reality Dalam Pendidikan Terhadap Peningkatan Motivasi Pelajar. International Conference on Global Education V. Bangi, Malaysia: Universiti Kebangsaan Malaysia. 2017. pp. 1200-1205.
- Molla, E., Vincent, L. (2010). Augmented Reality for Board Games. *Mixed and Augmented Reality (ISMAR), 2010 9th IEEE International Symposium*. EPFL, CV Lab. 2010. pp 1-2.
- Mohmad, K. (2005). *Koridor raya multimedia (MSC): Kajian tentang keprihatinan pelajar IPTA terhadap perlaksanaannya*. Universiti Malaya. Univeraiti Malaya: Jabatan Pengajian Media, Fakulti Sastera dan Sains Sosial <http://madzani.blogspot.com/2013/05/multimedia-super-corridor.html>
- Mahmud, R., Ismail, A., Ibrahim, J. (2011). Jurnal Teknologi Pendidikan Malaysia. Tahap Kemahiran dan Pengintegrasian ICT di Kalangan Guru Sekolah Bestari. Vol 1 (1). pp 5-12
- Nusa, M. S. (2013). *Multimedia Super Corridor*. Dicapai pada 24 November 2020 dari <http://madzani.blogspot.com/2013/05/multimedia-super-corridor.html>
- Khalid, F. (2017). Kesan Teknologi Augmented Reality Dalam Pendidikan Terhadap Peningkatan Motivasi Pelajar. International Conference on Global Education V. Bangi, Malaysia: Universiti Kebangsaan Malaysia. 2017. pp. 1200-1205

- Payne M. (2017). Multimedia Super Corridor (MSC). Dicapai pada Oktober 24, 2020 dari <https://docplayer.net/41480012-Multimedia-super-corridor-msc.html>
- Plutora. (2020). *Software Development Life Cycle (SDLC): Making Sense of the Different Methodologies*. Dicapai pada 21 Desember 2020 dari <https://www.plutora.com/blog/software-development-life-cycle-making-sense-of-the-different-methodologies>
- Rahman, K., Mohid, S., Ramli, R. Kesiediaan Guru Menggunakan Teknologi Multimedia dalam Pengajaran dan Pembelajaran di Sekolah Rendah Agama di Selangor. 4th International Conference on Information Technology & Society. Selangor: Kolej Universiti Islam Antarabangsa. 2018. pp. 1- 6
- Salim, S., Idris, I., Idris., H. (2019). Journal on Technical and Vocational Education (JTVE). *Penerapan Teknologi Augmented Reality Untuk Memahami Fungsi Kamera DSLR*. Vol 4 (3): pp 106-113
- Sham, A. (2006). ICT: Peranan dan Potensi dalam Pembangunan Pelajar. Universiti Tunku Abdul Rahman (UTAR): Tesis Sarjana Muda. Abdullah, W. (2005). Agenda Untuk Mewujudkan Malaysia Sebagai Negara Yang Berteraskan ICT. Universiti Malaya: Tesis Sarjana.
- Salleh, S. Z. (2012). Multimedia Dalam Pendidikan. Dicapai pada 22 November 2020 dari <https://www.slideshare.net/SitiZulaikhaSalleh/bab9-multimedia-dalam-pendidikan>
- Technopedia (2020). Apa itu carta aliran?. Dicapai pada 19 Desember 2020 dari <https://ms.icyscience.com/flowchart>
- Yahya N. (2018). Perkembangan MSC dalam Pendidikan di Malaysia. Universiti Malaya: Tesis Sarjana Muda.