

The Development of Interactive Hologram Augmented Reality Card for Wonosari Agro-Tourism

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Abstract—This article was described the development of Interactive Hologram Augmented Reality Card (IHARC) and preliminary study of users' initial readiness and acceptance to implement IHARC at Wonosari tea plantation agro-tourism. IHARC has a very high potential to apply in a variety of field such as medical, engineering, construction, education, tourism and etc. This article will describe the development of IHARC and preliminary study of users' initial readiness and acceptance to implement IHARC at Wonosari tea plantation agro-tourism. The purpose to design and develop IHARC for Wonosari tea plantation is to increase the attractiveness of tourists visiting to that place. This study also intended to determine the level of acceptance and readiness in preliminary stage among target users to use IHARC. The development of IHARC design specifications in Wonosari tea plantation based on qualitative research findings. Interview methods, analysis documents and observations were used to develop IHARC design specification. Once the IHARC design specification is developed, then the phase of development process is carried out. Through the development of the IHARC, it is hoped that it will help Wonosari tea plantation agro-tourism, Malang, Indonesia to promote and increase the number of tourists to visit here.

Keywords: *Interactive Hologram Augmented Reality Card, augmented reality, agro-tourism*

I. INTRODUCTION

The concept of agro-tourism has been introduced recently in several countries around the world. One of the famous agro-tourism in Asia is Tea Boh Plantation at Cameron Highland, Malaysia. While, at Indonesia have a lot of agro-tourism place such as Wonosari Tea plantation at Negeri Malang, Indonesia. Agro-tourism means the agriculture activity will attract the tourist to visit orchard or farm. Agro-tourism is a tourism activity that involves the use of agricultural land or related facilities that attract tourists [1]. The tourism industry is one of the industry's largest and most profitable over the past decade. The industry is able to generate hundreds of dollars compared to other industries that depend either directly or indirectly with it and create millions of jobs and income distribution [2].

Agro-tourism has a variety of variations, such as picking fruit tours, feeding livestock, to restaurants on the sea, buying a

product direct from a farm stand, navigating a corn maze, picking fruit, feeding animals, or staying at a [3,4].

Agro-tourism is one of the potentials in the development of the tourism industry throughout the world. Agro-tourism have a high potential to generating high income via various of activities conducted on a working farm or having fun for the enjoyment and education of visitors at the tourism sites [5]. Many countries doing the process of renovate and rejuvenate agro-tourism activities, by intention to attract foreigners or abroad tourist to visit their countries then it will contribute a positive development in economic aspect [2].

Planning the physical environment of the tourist area will be able to provide satisfaction to visitors if it is based on the behaviour of the environment (human behaviour) by using a hierarchy of basic human needs [6]. A proper and complete facilities such as accommodation, lodging place, transportation, food and beverages, history place, signage, and so on must be provide to the visitors [7]. A good facility provides is a vital factor to attract visitors to visit that place. The landscape of agro-tourism plantation was designed beautifully. Visitors could picking their own fresh fruit at an orchard, to trying your hand of calf roping, to pick shoots of tea leaves and enjoy a beautiful scenery around the garden. Nevertheless, with existence of some agro-tourism place, the competition to get visitors is more increase. Every agro-tourism plantations need to have their own plan and strategies to attract more visitors to visit their place. Promotions and advertisement in a right way is a good initiative to promote agro-tourism to the tourist. There are have a variety of medium could be using to promotes agro-tourism place such as media social, augmented reality, virtual reality, web site, blogs, Instagram, face book and so on. In this article, interactive hologram augmented reality card (IHARC) were proposed to be apply at Wonosari tea plantation agro-tourism as a strategy to elevates the numbers of visitors to visit this place.

Many manufacturing companies and computer scientists have been studying the Augmented Reality technology as a new human machine interface [8]. The tremendous of digital development in computer graphics and multimedia technologies have change the way of view and thinking among the human being. With an advancement of digital technology, the way of human interact, spread information, advertisement,

teaching and learning process and the almost the whole of human activities were change. The usage of AR display devices, such as smartphones and smart glasses, allow the user to receive additional information, which is in form of informative graphics based on their field of view via the devices, for example, the street's name, navigation arrow to lead the user to the destination, historical information, tourist guide, tourism information, heritage information and so on. So that in order to help Wonosari tea plantation agro-tourism to increase the numbers of tourist, IHARC was proposed as an alternative media to attract visitors to come here. IHARC also act as compliment product to the existence agro-tourism product at Wonosari tea plantation. It is expected that the IHARC will be able to attract tourists to the winosari tea plantation agro-tourism.

II. PREVIOUS STUDY

A. *Agro-Tourism*

Refereed to the finding of interview session on 10 visitors whose are first time to coming to Malang Raya (were implement on 15 December 2018 at Kota Batu). All visitors expressed their interest to visit Malang Raya because they looking the promotion of Kota Batu via TV. Television coverage greatly promotes the attractive facilities and facilities available in Kota Batu. Moreover, these tourist attractions present interesting game for children. Data obtained from the Central Statistics Agency Malang Regency 2018, the number of tourists from 2010 to 2018 continues to move. From previous research on the Concept of Wonosari Tea Plantation Agro Tourism Development in 2005 based on the level of tourist needs, the phenomena that occur include: (1) Basic or primary needs: eating, drinking, resting and shelter; (2) Secondary needs: fulfilment of self-esteem, in the form of recognition and trust of others; (3) Social desires, such as shared desires with others; (4) Play and relax: curiosity, new experiences, encouragement for are several reasons for tourists to visit a tourist attraction including (a) to identify originality and blend it's with the surrounding community, (b) to seek beauty; (c) to relieve boredom and seek or recognize and learn something that has never been known.

B. *Augmented Reality*

AR technology is fairly new in ordinary people, but for those who follow the development of technology is no stranger. Therefore, there have been several previous studies of this discovery. Research conducted by Endah Sudarmilah and Mawardi Ganda Negara in 2015 on AR Traditional Indonesian Weapons Game found that students who still had difficulty adapting to the 2013 Curriculum were slowly able to remember and learn about Indonesian traditional weapons material when they play with AR Traditional Indonesian Weapons Game.

More in-depth research was conducted at the museum by Universitas Gadjah Mada's students in 2013. The museum is an interesting place to introduce AR to visitors and to the general public as well. Data obtained that the presence of AR in general visitors appear impressed with the experience of using AR. One of the things that impressed visitors was the AR virtual object that continued to stick on the marker when

moved. The challenge of AR application is to enrich human activities, not just in reality environment. AR is more useful when the technology can reduce reality that is too complex to display [9].

Another study towards tourist whose are visit museum expressed their experience to using AR by claim AR is a very usefulness and fun are very crucial factors when using AR mobile applications. AR technology is very potential as a means to convey information effectively. Haugstvedt stated, one of the advantages that can be obtained from AR applications for educational purposes is to increase the understanding of the object being studied [10]. While, Radu states that AR is more effective as other learning media compared to other media such as books, videos, and ordinary computer use [11]. Whereas, research done by Khairul Azhar, entitled "An Exploratory Study on Mobile Augmented Reality (AR) Application for Heritage Content" concluded that AR applications on smartphones have limitations because this media is still underdeveloped [12]. Historic sites and museums are often the object of AR research but in fact there are still obstacles that hinder the results.

In a follow-up study entitled Empirical Study on Important Elements of Mobile Augmented Reality Application for Heritage Content found that the most important elements in making AR applications are colour, slight changes in text, touch screen, user interface, dynamic images and also static image [12]. Based on Azuma, the AR is a variation of virtual environment where it allows the user to see the real world, with virtual objects superimposed upon or composited with the real world [13]. Holus coined that the AR system consists of these three characteristics, which are, the combination of real and virtual, is interactive in real time and is registered in 3D [14]. This paper also highlights the reliability test of research instruments where the results show that it's stable and can be relied upon to be used in conducting surveys. These findings allow private companies, government agencies or multimedia developers to identify important elements when designing AR mobile applications appropriately and effectively.

III. RESEARCH METHODOLOGY

This study was conducted in four stages as follows; (1) Preliminary study via interview target users to obtain information on the acceptance and willingness of users to accept and use AR technology; (2) Market Survey by distribute the questionnaire to obtain information directly from users and the design that will be used in developing the AR system. The findings from this preliminary study will be summarized and form the basis for developing IHARC. Finding of this study will be used to develop AR Product Specification; (3) The design and development of IHARC. It's will be doing by follow all criteria are listed in AR Product Specification; (4) The prototype IHARC developed will test its usability through alpha testing and beta testing:

A. *Preliminary Study*

Preliminary study is an initial exploration of issues related to a proposed quality review or evaluation. To propose IHARC system, preliminary study was conducted by intention to get

initial support data from IHARC’s target users. In preliminary study, the initial data related to user needs in interface design, system capabilities and efficiencies, ease to use, attractions interface with a good graphic visual, system interactive, complete information provided and ease to understand information given, user friendly and good enough in aspects of human computer interaction. Other than that, the level of acceptance and readiness to use IHARC among target users were examined as well. In this study, the finding of preliminary study toward the using of IHARC in aspect of acceptance and readiness to use is high. Most of the respondents accept and ready to use IHARC. In fact, there are a certain visitors whose are willing to visit again Wonosari tea plantation agro-tourism just for try to use IHARC. There are a several statement to shown the users support which quoted in interviews through preliminary study. Some of their statements could be looking in part of contents analysis result and discussion in this paper.

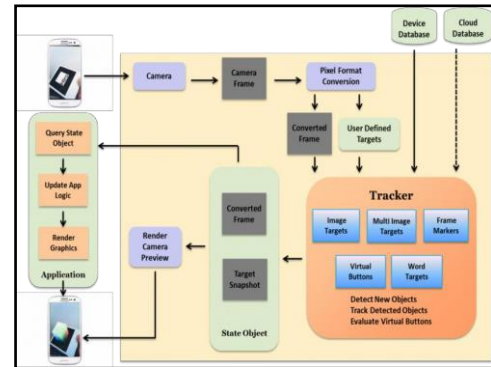
B. Market Suvey

Market survey is the survey research and analysis of the market for a particular product or service which includes the investigation into customer or target user inclinations. A study of various user capabilities such as the capabilities to use multimedia product, level of acceptance and level of readiness to use digital product like Augmented Reality is crucial. So that, market study was conducted for determine the level of acceptance and readiness to use IHARC generally.

C. The Design and the Development of IHARC

IHARC development is based on the ADDIE model. The ADDIE model is the generic process traditionally used by instructional designers and training developers. The five phases of ADDIE model are Analysis, Design, Development, Implementation, and Evaluation. It’s represent a dynamic, flexible guideline for building effective digital multimedia product. In phase of analysis, the development of IHARC were started by develop design statement also known as product specifications. Multimedia product specification was come from market survey analysis in order to identify and determine the need of target users. In this case, the target users group are all tourists in a variety of ages. Data that was been collect from market survey were analysing. The finding of analysis will be inferred to produce design statement or product specification. Based on product specification, designer could be design the layout of IHARC interface, system and card illustration in aspect of graphic design. The design and development of IHARC, designer must be followed product specifications or design statement. After designing all parts in IHARC, designer will be hand over their task to the system developer. Along the development process, designer and researcher will be monitor their job till complete. Monitoring process is a crucial part in development phase. It’s important to ensure the development of IHARC still working in track and do as plan. In development phase, among the things that need to be developed are like the development of 3D Characters, Photography, Illustrators development and interface development. Then, ultimately all data was taken and develop being edited in the darkroom process using the Template

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.



Source: <https://www.3pillarglobal.com/sites/default/files/650x432xaugmented.P20reality-2.png.pagespeed.ic.yY1miYrkQ3.webp>

Fig. 1. Data flow diagram of the vuforia SDK in application environment.

1) *Contents material:* Contents materials being develop by identify eight existence hot spot in Wonosari tea plantation. This study specifies the physical characteristics, ecosphere and facilities provided in Wonosari tea plantation. By employing IHARC and a zoom function to present the hot spot facilities, visitors observed the structure of monument, landmark or any facilities to be introduce in IHARC and learned their functions and related information.

2) *Planning and developing the system:* This study was conducted in two stages. In the first stage, the AR specification was developed from market survey result analysis. The second stage is to validate the IHARC prototype by looking comments and feedback from AR expertise. Software such as 3ds max, Maya, Photoshop, unity and android were used to implement the AR system.

3) *Developing the 3D model of interesting spot in Wonosari tea plantation:* Fig 2 at the next page shows a general flow how to develop 3D Model of interesting spot in Wonosari tea plantation. It’s obtain system development tools, model production process, model textures and upload target picture to target manager.

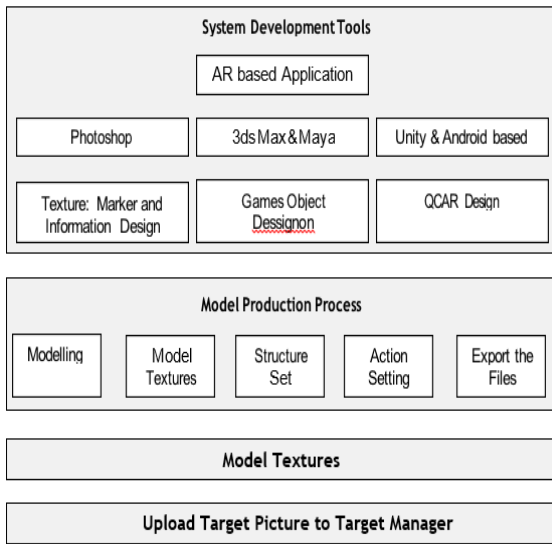


Fig. 2. The development of 3D modelling.

4) The development of IHARC by using unity software:

Figure 3 as shown below is a unity production process. The unity production process were went through began with imported the model, definition marked, interface design, programming and file released. All process must be doing carefully. Before model being import to the unity, the design must be align with the concept to be elevates.

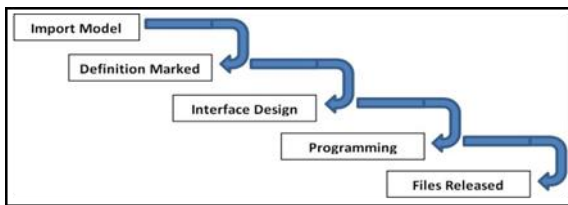


Fig. 3. Unity production process.

Before doing the unity production process, development environment must be setup first. Install the unity extension as a vuforia unity package, then setting up the android SDK, set QCAR environment variable, set up the build path, install the USB driver for windows and lastly compile and troubleshooting if necessary. All of the setup to develop environment have been illustrates on figure 4 as shown below.

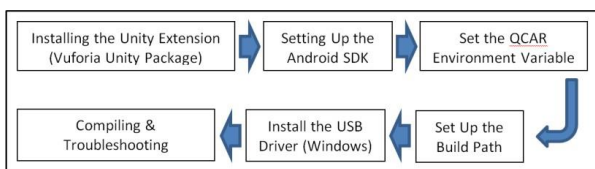


Fig. 4. Development environment setup.

In overall, figure 5 below illustrated the entire process of IHARC development generally. The development of IHARC begun by create image files, then going to manage target and ultimately integrate vuforia and publication. In phase of manage target, developer must be create target in target

manager, then upload target via target manager, target augmentable processing and lastly download targets unity packages. Then, after all target were download in unity package its will integrate that in vuforia and publication in order to built project to mobile app.

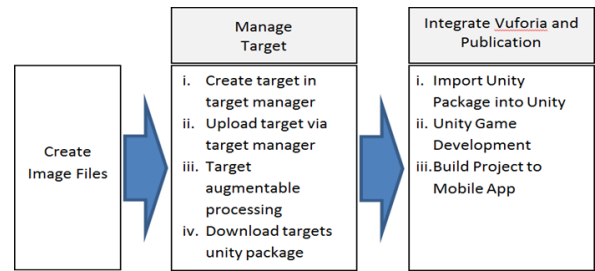


Fig. 5. Flowchart of IHARC development in general.

5) The evaluation of IHARC: IHARC was being implemented by use to the respondent as a representative of research population. For initial implement, it's known as alpha test. Alpha Testing is conducted by a team of highly skilled testers at development site whereas Beta Testing is always conducted in Real Time environment by customers or end users at their own site. So that, after getting a feedback from alpha testing, developer will doing another improvement regarding to alpha testing results. Then, developer will test IHARC again by doing Beta Testing. When the feedback and result from end user is satisfaction, IHARC will be diffuse to the real market. Figure 1 above shows the IHARC development framework.

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IV. CONTENT ANALYSIS RESULTS AND DISCUSSION

This paper proposes to develop IHARC by adapting a concept of games edutainment to tourist spot. This idea came about with the intention of solving the problem of lack of tourists in the tea gardens compared to other tourist centres around the Negeri Malang, Indonesia. The concept of Agro Tourism is a direct expansion of ecotourism, which encourages visitors to experience the limelight of agricultural life at first hand [4]. Agro-tourism activities have a big potential to increase the income of farmers or small agricultural households [15]. One of the study objective is to determine the effectiveness of using Augmented Reality technologies to attract tourist to visit a tourist spot. However, in this paper, the explanation is more concern about a general concept to create IHARC for Wonosari tea plantation as an agro-tourism spot

place at Negeri Malang, Indonesia. Technology of Readiness and Acceptance Model (TRAM) have been referred before establish interview protocol for preliminary study. The TRAM model is used to assess people's readiness for technology by measuring their behaviour. TRAM is also used to measure people's acceptance of technology in terms of ease of use and use of technology in their lives [16]. In initial or preliminary study regarding the level of readiness and the level of acceptance towards users and management of Wonosari tea plantation, the finding of the studies shown most of respondent very excited to use IHARC as one of the products that can help attract tourists to come at Wonosari tea plantation agro-tourism.

Our research methodology use mix method, qualitative and quantitative. In preliminary research, qualitative method was use by conducted interviewed session towards visitor and manager at Wonosari tea plantation. Have three selected respondent at Wonosari Tea Plantation were being interviewed. Interview was doing in semi structured method. Interview protocol have been develop and validate by two expertise, there are qualitative research expertise and augmented reality expertise. Then, the interview session were setting by making appointment with manager of Wonosari Tea Plantation, Negeri Malang, Indonesia as a first respondent. After that, next interview were involved two visitors whose are came to Wonosari Tea Plantation at the same day after interview manager of Wonosari Tea Plantation. Regarding to interview session, all the data we get its being analyse. Through the interview analyse, there were several similar themes identified from the responses of the three respondents. A similar theme were identified are acceptance, readiness, and technology. Respondent # 1 stated that he was very excited about the proposed IHARC product to be developed. He stated that he was very accepting of the IHARC technology. The following is his statement of testimony.

"... I am very excited about this project, I welcome and accept this proposal as a gift to us especially in promoting Wonosari tea plantation agro-tourism so that it will be a major tourist spot in the future ..."

Respondent # 1

While, respondent # 2 and # 3 expressed their interest toward IHARC project. Here are their statements;

"Ohh ... this is a great project. I've never seen a project like this before. Errr... its fun to use because it's just a smartphone. I feel like want to come here again to use this technology ..."

Respondent # 2

"...um...it's a really good project. I read a few article related with AR but this is my first time seeing it. If it's really used here, I'll definitely come back here to try this AR project. My son would love to play with this AR..."

Respondent # 3

Regarding to the comments from all respondents above, it's could be conclude that in initial study all selected respondent in purposively and randomly stated that they are really excited, willing to accept and ready to use IHARC. It's mean the level of acceptance and readiness among them is very high towards IHARC. All respondents' feedbacks were appropriates and related with their behaviour in aspect of optimism, innovativeness, discomfort and insecurity where four of them were form the variable of readiness [17]. Feedbacks shown, all coding and themes were emerging in interview analysis is directional to readiness factors. Other than that, finding also shown almost all the respondents tend to comments about the IHARC regarding or ease to use and usefulness. All respondents found that IHARC was easy to use and usefulness to them. Actually, the factor of ease to use and usefulness is a construct of acceptance variable. Therefore concluded the level of acceptance among respondents is very high.

V. EVALUATION RESULT

IHARC as a multimedia product has been evaluated by an AR Expertise in order to ensure the design of IHARC prototype been function, ease to use and user friendly. There have 10 aspects to be view and validate by expertise, there are login screen animation, home menu interface, layout design, photo quality, using guide line, interface button, card design, 3D model, 3D animation and facility information. Regarding to the results of IHARC evaluation based on 10 aspect as listed above, in overall expertise satisfy and conclude the designing of IHARC was meet all 10 criteria as listed. However, regarding to the comments from expertise, still have a space to improve the quality of IHARC. Regarding to the feedback from expertise, aspect of facility information is not provided completely in the system. Without a complete information, visitors or users whose will use IHARC feel confuse and unsatisfied with the lack of information in IHARC. Therefore, designer and developer must be concern and stress with the aspect of facility information in effort to improve IHARC. Another aspect is about card design, which is expertise think the design of IHARC Card is unsatisfied and must be follow a principle of compositions in graphic design. A principle of composition in graphic design is contrast, alignment, balance, hierarchy, proximity, white space and repetition. While, for the other aspect in IHARC evaluation, the results shown it's in range of satisfied and very satisfied. So, in overall it's could be conclude the designing of IHARC prototype is good and under satisfaction of AR expertise.

VI. CONCLUSION

The study was conducted to develop the IHARC system to attract foreign and local tourists to visit wonosari tea gardens, Indonesia. To develop IHARC, a preliminary study was conducted to look at the level of readiness and acceptance against respondents to Augmented Reality Technology. To examine the level of readiness and acceptance, TRAM model is an appropriate model to be referred [18]. Through the TRAM model, preliminary studies found that the level of acceptance and readiness of respondents using this IHARC was high. All four construct where form readiness variable as optimism, innovativeness, discomfort and insecurity are get a very

positive feedback from respondents. While the two main factors that shape the IHARC's, there are easy-to-use and usefulness also get a very positive feedback from all respondents.

Thus, this paper proposed an Interactive Hologram Augmented Reality Card (IHARC) by using Unity and Vuforia AR technology. The market survey in preliminary study show that the prototype of IHARC were accepted and ready to use by the respondents. Most of the visitors at Wonosari tea plantation agro-tourism appreciated the prototype of IHARC and considered the interactive functions straightforward to use. The majority of visitors agree that IHARC may increase the interest of tourists to visit in the Wonosari tea plantation agro-tourism, the IHARC design is lively and interesting, and it can be helpful for exploring and learning natural environment around Wonosari tea plantation agro-tourism. Infrastructure is a crucial component to agro tourism [19]. By provide a good infrastructure such as accommodation, shop of food and beverages, rest room, parking area, telecommunication facilities, signage and of course provide a new technology where support the elements of 4.0 Industrial Revolutions such as IHARC will stimulate agro-tourism activities and local economic growth.

Future research should focus on visitors' behaviour analysis and system improvements. A number of visitors reported that the prototype of IHARC was slow during interactive operations. The buttons should be clearly defined, the sub-pages should be highlighted, the markers should be appropriately sized, and proper instructions should be provided to ensure that the users are more focused on specific information that presented in the IHARC.

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