

Augmented Reality Mobile Application of 3D House Models for Fiesta Communities Inc., Zambales

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Abstract— Augmented Reality (AR) provides better experience to the users and satisfaction by providing a more comprehensive exposure into a multimodal learning environment. It takes advantages over Virtual Reality (VR) in providing interactive consumer experience and becomes one of the many marketing strategies that businesses have. Through the use of mobile devices, augmented reality now becomes possible to makes advertising interactive that allows marketers and advertisers to reach out their consumers in totally new ways. This paper presents an augmented reality mobile application that allows users to view 3D house model in a more realistic perspective view. Data gathered shows to the respondents that the application Functionality is excellent (4.71), Usability is excellent (4.75), Efficiency is in comparable with other criteria with excellent rating (4.64), Portability is also excellent (4.74) and Users Acceptance is excellent (4.70). Data presented are based on the statistical results out of the data gathered through a series of tests and surveys conducted among the 51 respondents, composed of clients, agent/marketing representative, area marketing supervisor, associated marketing executive and experts; the researcher concluded that the proposed mobile application will improve the beneficiaries marketing strategy in terms of innovation by using AR as advanced technology.

Keywords – Augmented; Augmented Reality; 3D; 2D; Multimedia; Animation.

I. INTRODUCTION

Augmented Reality (AR) and Learning Analytics (LA) both provides a way of making the user's experience and satisfied them through an enriched multimodal leaving experience (Mota, et al., 2017). Augmented Reality takes advantage over Virtual Reality in providing interactive consumer experience and becomes one of the many marketing strategies that businesses have. AR now is considered as one of the newer forms of strategies adopted by many companies who use to combine print and online advertisement. AR has already been used in advertising and it is going to change the way the digital advertising market functions. AR makes advertising interactive; it allows marketers and advertisers to reach out to consumers in totally new ways.

The proposed software has the ability to execute a 3D model house of Fiesta Communities, Inc., Zambales through the use of mobile device. With AR implemented through a mobile device, it can give an authentic and realistic experience to the users who uses it. The advantages of AR are: it highly entertains customers in comparison to a traditional video or audio; business marketing can significantly improve the business revenue in the long run; and customers can now visualize advertisements in 3D graphics, rather than in 2D which significantly one of its benefits.

Technology now a days are becoming widely used in terms of its usefulness in presenting different ways on how to present projects in new and more comprehensive way. To change the way on how to make traditional representation of the physical environment, Augmented Reality and Virtual Reality as a tool to make this as possible. Typically, in some other projects in which AR and VR are now being used, smartphones and tables becomes the primary devices that this technology may be implemented. Using its device cameras to help the user's view the virtual world and other information, including graphics, images and text to help them understand the presentation. For this feature of AR and VR becomes the mobile application interesting to the users.

A. Project Context

With the growing traction towards Augmented Reality technology business are exploring innovative ways to harness its potential. AR effectively engage users in a virtual world that creates illusion of the real-world objects. To make the physical environments or objects becomes more interesting to the users', Augmented Reality introduced a more realistic way to visualize virtual scenarios. Augmentation techniques area unit usually offers real time visualization of the images available in its context of the environment components. The development of AR application for business must consider the interface of the application and other aspects of the technology platforms. The design of the application must be organized so that the information presented are clear to avoid confusing the user. Augmented Reality offers opportunities to enhance many applications. AR can aid in visualizing building projects. AR can also be employed within an architectural firm which can render 3D visualizations of the 2D designs. For example, a sales or marketing associate will present a 3D house model using AR application in a mobile device, allowing customers to view the exterior and interior designs and layout. Customers will visualize the model houses interactively in a 3D perspective with basic information and specification.

B. Purpose and Description

The traditional marketing methods includes print advertisements, such as newsletters, billboards, flyers and newspaper print advertisements which still being used by many companies now a day. Technology adaptation is now being implemented by many companies that will improve the delivery of those stated marketing methods. The researcher came up with an idea of transforming the way traditional marketing methods to improve its delivery using augmented

reality applications in mobile device that would allow customers to view 3D house models.

Delivered through a mobile device, augmented reality application will provide impact on costumers' buying decision, an interactive experience is done through the use of mobile application that allows users view the real-world environment and provides components of the virtual environment to make the user's experience of the physical environment.

The purpose of the proposed study of the Augmented Reality Mobile Application is to provide an augmented reality application of the 3D house models of Fiesta Communities Inc. (Zambales) that will serve as additional marketing strategies in delivering advertisements to the costumers. The application will augment the existing 2D house models presented in the flyers of the Fiesta Communities Inc. The augmented reality environment uses interactive designs that focuses on user's experience to the model houses to make it more interesting to the user's and provides realistic experience.

C. Statement of Objectives

The researcher's objective is to create an application which uses Augmented Reality Application in mobile devices. Specifically, the researcher would like:

1. To develop an Augmented Reality Mobile Application of 3D House Model of Fiesta Communities, Inc., Zambales.
2. To reduce the cost of printing flyers which is used for advertisement of houses.
3. To introduce an innovative way of the existing marketing strategy of the fiesta communities.

D. Scope and Limitation

The researcher aimed to create an Augmented Reality Mobile Application, which allowed the customer to view a 3D visualization of the model houses. The software also allowed users to visualize the 360 degrees' realistic view of the internal designs of the model houses. The software required target object. The proposed mobile application utilized target images or brochures that detected and tracked to enable the application to show the 3D model houses in a mobile device. Once the image target was detected by the mobile phone camera, it would display the 3D visualization of the house. Vuforia Cloud Recognition services enabled the developer to manage image target online which was used in image recognition. In terms of graphics, the researcher used 3D rendering software like V-Ray and Lumion for rendering models and objects to make it realistic in view.

In some other software they use data matrix and QR codes, but in Augmented Reality image target, it did not require any special black and white regions to function. AR uses the real-world attributes that needs device camera for the image target to be recognized. Image registration is the process that is similar to other forms of presenting graphics like video recognition but is different from other computer vision methods. AR are based on computer vision methods which uses visual odometry that have 2 parts: (1) it uses interest points for detection, fiducial markers or optical flow through camera images that uses feature detection method for corner

detection, blob detection and other image processing method; and (2) the real world coordinate system restores data which was obtained in the first part.

The main scope of the study is to cover the 3D House Models of Fiesta Communities, Inc., Zambales, which is in the form of an Augmented Reality Mobile Application.

II. LITERATURE REVIEW

Rankohi and Waugh (2013) presented a review of different augmented reality literatures in the field of engineering specifically in construction industry. The study focuses on the use of augmented reality in architecture and engineering focusing on enhancement of planning or training and scheduling opportunities in presenting projects in similar fields. The researchers gathered data among 133 articles (1999-2012) found using the keyword "augmented reality" in searching articles. Data on their research found that the increase in the use of augmented reality in construction industry is continuously increasing. Wang (2005) explored the benefit of AR applications for Architecture, Engineering and Construction industry to help in the construction facility projects. Augmented Reality also been used as web-based application using "panoramic environment" to file construction development (Waugh et al., 2012).

According to Dacko (2016) stated that shopping application improved consumers shopping experience through the use of augmented reality in mobile device and increased the customer's satisfaction. Their findings clearly present the six different contributions of MAR in terms of value to retailers, user expectations, experimental shopping, purchase satisfaction, changing consumer behaviors and finally, user's most important issues using the mobile application. The study sought to present the benefit of augmented reality shopping application in improving consumers shopping experience.

Farshid et al., (2018) discussed in their study the six different kinds of reality and virtual reality advantages that new technology brings to business. The two IT-based concepts relatively contribute to the development of other forms of virtual environment. The study explained the difference of reality to augmented reality. The authors define "Reality as the actual world that we experience with all our senses while Augmented Reality is the information and data overlaid on top of the actual world" (p. 2).

AR uses 3-dimensional images to present the physical world's enhancement of the digital environment in real time. Ibáñez and Kloos (2018) in their study STEM learning reviewed the application using the three pillars using tools to track informations, hardware and software usage and mobile device for viewing of information and was integrated into the physical environment. This technology can be described into two predominant models of locating information from the physical environment.

Augmented reality as one of the advanced technologies might solve problems in computer visions and object recognition that will help users gain information about the real world interactively. There are review of research and application that proves augmented reality potential to make the user's experience interactive experiences possible and

other suggestions may be introduced to the future researchers. Business Insider (2017) emphasized the advantages of augmented reality in terms of allowing users to experience the real-world environment which AR applications are connected wirelessly. AR also lets users to use computers even without using their hands. Researchers found that “77% of millennial and 47% of baby boomers” are already engaged in the benefit of AR in their work. As formally defined by Milgram and Kishino (1994), mixed reality (MR) is the combination of Virtual Reality (VR) and other technologies for presenting virtual environment of the virtual world objects combining it together to form a single display. Augmented Reality (AR) and Augmented Virtuality (AV) are the components that makes Mixed Reality range of the Reality Virtuality (RV) continuum. To support the literature in connection to Virtual Reality (VR), Augmented Reality (AR) uses computer to generated information of the virtual environment. AR technology aims to improve the traditional way of architectural firms in presenting blueprints of the designed houses into a 3D models that may be used to visualize building designs before the construction (Milgram & Kishino, 2017).

In the study of Peña-Rios et al., (2018) the researchers presented new innovative tool for emerging virtual environment of occupied buildings using desktop imitation to simulations. The implementation of the three collaborative learning situations of the application to allow users create a combination of the MR objects to form dual reality were used.

Lifton (2009) explained the term “Dual-Reality as an environment resulting from the interplay between the physical world and the virtual world”. While each of the worlds have their own characteristics, there are also possibilities that each world has also the capability to combine one another. In their definition, each environment is complete by itself and the lack of the other does not pose a problem for it to work, however when both environments exist, any element within the physical world is directly linked to another in the virtual world, reflecting any change in either of them in real-time.

Augmented reality is now widely used not only in building designs but also in other field like engineering, health, architecture and even in the field of education. A ten (10) year comprehensive study were conducted from 2004 to 2014 relative to the implementation of augmented reality with a total of “291 papers with 369 individual user studies” that sought to help AR researchers who are learning the top practices of scheming their own application (Dey et al., 2018). This is based on the first comprehensive study conducted from 1992 and 2004 with a total of 1,104 papers about augmented reality application (Swan & Gabbard, 2019).

Augmented Reality may also be used in construction and architecture projects that may enhance their projects proposals into a more realistic 3D model of the proposed designs using mobile phones augmenting 3d models. AR can also be used in video gaming and media entertainment to show a real image interacting using computer graphics.

Nithin et al., (2015) proposed methods to improve the viewing of painting or artistic works by incorporating additional level of perception that includes sounds, music and

animations. It contains two-layer perception, the physical appearance of the paintings perceived by naked eye and an augmented layer containing animations and sounds which can be perceived by a mobile device augmented reality application. In health, a marker less application was developed for the trajectory kidney surface using video footages and join 3 dimensional models of the kidney, stone (tumor) and collecting system on surgery (Su et al., 2009). A framework was proposed by Mota et al. (2017) for the development of augmented reality learning applications indicating the techniques on how teacher can create their own mobile application using AR authoring tools.

The dual-reality principle has been implemented in different projects, although is commonly classified as augmented reality. In his work, Lifton (2007a; 2008b; 2009c) used a bespoke sensor/actuator node as embedded in a power strip (called PLUG) to link virtual and physical worlds. This, sent the data collected to the virtual world, creating different metaphors that showed the data in real-time (fig. 1). Finally, multiple PLUGs were distributed within a physical building, creating a ubiquitous networked sensor/actuator infrastructure of interconnected nodes that reflected their current status on a virtual map of the building (fig. 1).

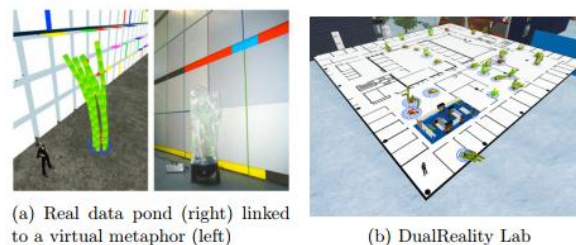


Figure 1. Cross-Reality implementations, image courtesy Lifton (2007)

Zheng and Waller (2017) stated that the use of 3-dimensional structures creates computational science widespread and impactful in chemistry course. The same study was presented by Su et al. (2014) on group learning situation that allows junior high school students make investigations “composition of substances” in chemistry classes even without their teacher instructing them as shown in Figure 2. Thus, the authors concluded that (a) the AR tool has a significant supplemental learning effect as a computer-assisted learning tool; (b) the AR tool is more effective for low-achieving students; (c) students shows positive attitudes toward this software; and (d) students; learning attitudes are positively correlated with their evaluation of the software.

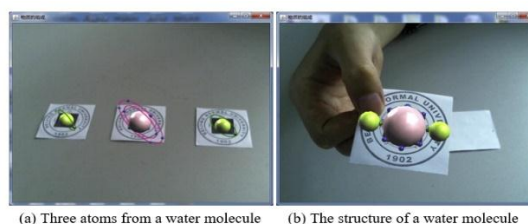


Figure 2. A case study of Augmented Reality simulation system application in a chemistry course, image courtesy of Cai, Wang and Chiang (2014)

The computer-based application using augmented reality in simulating chemistry course, students were able to master the different topics presented in the application using 3D models. Although there are group of students who commits mistakes during the simulation due to carelessness, still the learning tool presented significantly provides additional learning effects on the students. Cai (2018) presented the effect of “AR-based authentic learning environment” to the students learning performance which is comparable with the usual interactive method were students enjoy the same experience of the real setting.

Augmented reality applications can also be part of the instructional materials that may be used by teachers to make their discussion more interactive. Augmented reality applications may support the teaching and learning processes of the students in understanding easily the presented topics by the teacher.

Ibañez and Kloos (2018) stated that it is worth noting that AR-SiS application was used differently in solar system sub-topic and provided factual knowledge or helped students to become immersed in the educational context by superimposing digital elements related to the narrative of the lesson and also helped students to visualize 3D concrete or to increase students' visual perception. In addition, by using audio in AR-SiS application for instance, can achieve a higher immersion in the learning context. This AR-SiS application is suitable to use as teaching aids in the classroom.

Sirakaya, M. and Sirakaya, D. (2018) presented a study on the development of education augmented reality from year 2001 and 2016 through several literature reviews on the same topic. The study strictly examined the included articles for evaluation which only focuses on the approach of AR in educational purposes. The researchers based on their data concluded that there was an increase in the number of publications or studies pertaining to education AR most likely in 2016. It is noticeable that the development in AR is continuous wide spreading through the year and can even produce more studies in the future.

A. Synthesis of the Study

This study focuses on the use of advanced technologies as an innovation particularly in architectural models' visualization. The difference of this study to other innovation researches is it focused on visualizing Augmented Reality of 3D model designs wherein it will contribute to the advancement of the existing marketing strategies and it might lessen the cost of printing of marketing materials such as flyers, brochures, leaflets, etc. that will encourage the customers by viewing an authentic and realistic experience of the model houses.

B. Conceptual Framework

The Input, Process and Output model or pattern is commonly used approach in system analysis and software engineering for the purpose of describing the structure of an information processing program or other process (Wikipedia.org, 2017). The IPO diagram serves as a visual representation of the processes of the system. The first step was the gathering of information from sales/marketing

associates of Fiesta Communities Inc. The researcher received data of the business processes from the personnel directly involved in the said area of delivering products. The data gathered of the researcher from the respondents served as springboard to support ideas in developing the proposed system. This conduct led to the discovery of new approach and an innovation in the marketing strategies of the beneficiary. The business specified that there was no existing augmented reality software being used by the sales/marketing department in delivering their products to the customers; thus, it was the desire of the researcher to propose for an augmented reality mobile application for the 3D model houses. See Figure 3 for the Paradigm of the study.

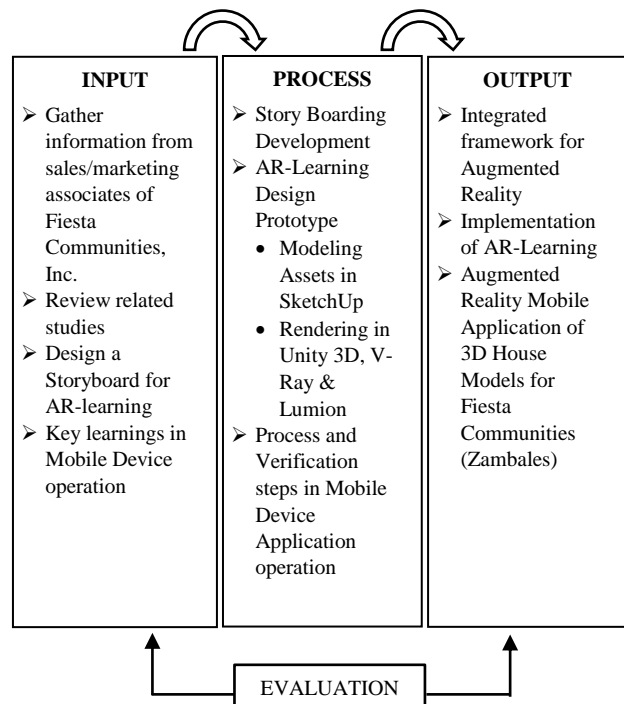


Figure 3. Paradigm of the Study

III. MATERIALS AND METHODS

A. Research Design

The research followed the guidelines of a qualitative descriptive research since it allowed the researcher to observe the samples more carefully and gave deep analysis of data provided by Fiesta Communities Inc., Zambales. Descriptive research is a design method that utilizes the characteristics of a given topic. It helped him answered the identified problems since the project consisted of a particular topic. Moreover, the researcher easily calculated the results of the answered question in a numerical format.

B. Software Development Methodology

The researcher chose incremental prototype for the system development. Incremental Prototyping model was used by the researcher since it had an iterative process that started with a simple implementation of a subset of the software requirements and iteratively enhanced the existing versions until the full system was achieved. In the

development of the prototype, users were actively engaged to quickly gather feedback that may lead to better solutions of the software. In this methodology, a working model of the system was provided so that the users could get a better understanding of the system being developed. Prototyping provided an excellent way for designing good human computer interface systems. In other words, the incremental prototyping methods lived up to their promised benefits.

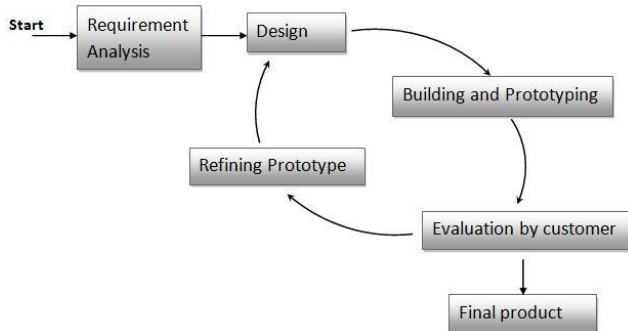


Figure 4. Incremental Prototyping Method

Requirement Analysis - In requirement analysis, the researcher and Fiesta Communities, Zambales had a strong collaboration to establish the requirements of the software. The researcher gathered data and conducted an interview and sought for advice. In requirement analysis, the researcher made it clear to himself what was his responsibility and taking into account the scope of the project.

Design – In this phase, the researcher started the prototyping of the application and evaluated the design model. The researcher started to model the architectural designs of the model houses based on the brochure/flyers through the given specifications and description gathered during the first phase.

Building and Prototyping – In this phase, the researcher started to build and design the model houses. House models were based on the brochure given by the Fiesta Communities Inc. marketing department. Testing the prototype enabled the researcher to gather immediately feedback to be incorporated into the architectural designs and detailed user interface.

Evaluation by the Customer – In this phase, the clients evaluated the prototype and provided their recommendations and suggestion to the researcher through survey questionnaire. Evaluating the prototype software helped improve the prototype met its specified function. The researcher used evaluation questionnaire as its evaluation instrument.

Refining Prototype – Prototyping accommodates problem of changing requirements. To refine the developed prototype, an interactive manner was done to ensure that user requirements were met. The researcher continuously asked the locale for comments and suggestions to further improve the prototype application.

Final Product – The final product of the design was produced throughout the collaborative effort of the researcher and the user. Series of testing were done to make sure that user’s requirements and acceptance were meet by the system. The final product design was a prototype.

C. Research Instruments

To measure the data obtained on the topic, research instruments were used by the researcher. These were the fact findings strategies. They were tools for data collections. The researcher utilized Data Gathering Instruments for the conceptualization of the topic which included Interview and Observation and for the evaluation of the mobile application, the researcher used Evaluation Questionnaire. Basically, the researcher must ensure that the instrument chosen was valid and reliable. Research projects validity and reliability depended on the appropriateness of the instrument. Collected data must be carefully checked to ensure that all the data collected would help the researcher to gain the expected results.

Data Gathering

Interview

An interview is one way of gathering data from the people who are directly involved in the realization of a certain research topic. A face-to-face conversation through giving questions to the interviewee is necessary on this stage of data gathering. Questions must generate ideas relative to the research topic and must be beyond the person’s personal interest.

Observation

Observation is one way of observing the actual scenario inside the research topic’s locale. It is a very important method to gain comprehensive data in this type of research. An audio-visual recorder for a complete collection of such comprehensive record was needed by the researcher.

Evaluation Instrument

The following are the instruments used by the researchers to evaluate the quality of the system and test the required components of the system.

Evaluation Questionnaire

Questionnaire is one way of measuring the efficiency and effectiveness of the developed application. It is designed to answer evaluation questions which is not the same as questions being asked in an interview. To gather data from the evaluation questionnaire, the researcher used a five (5) point rating scale for the respondents to select among different criteria in the questionnaire.

D. Sample Screen Shots



Scene 0 – Welcome Screen to Start



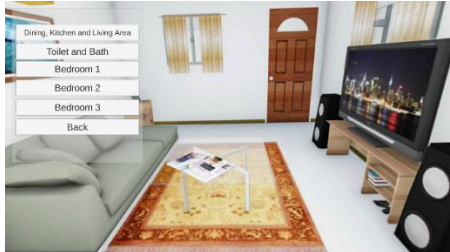
Scene 1 – Menu Selection



Scene 2 – Augmenting House Model



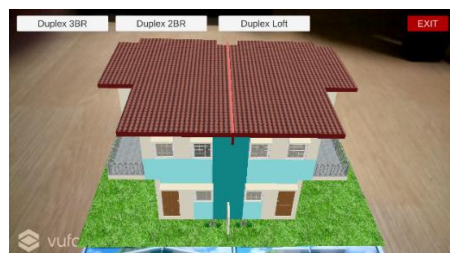
Augmenting Dining, Kitchen and Living Area



360° View of Living Area



360° View of Bedroom 3



Augmenting House Model without selection panel

IV. RESULTS

The researcher of the study performed simple purposive sampling to allow him gather the data necessary for his research. The researcher chose the clients and marketing personnel of Fiesta Communities Inc., Zambales since they were the primary beneficiaries of his research. The respondents were exposed with output system before answering the questionnaires, which were then distributed right after the demonstration. Before the proper demonstration of the said platforms, the researcher discussed some key points in answering the survey. There was a total of 51 respondents. 20 from clients, 20 from Sales Agent/Marketing Representatives, 1 from Area Marketing Supervisor, 5 from Associate Marketing Executive and 5 from IT Experts.

Table 1. Data Interpretation of Functionality

Criteria	5	4	3	2	1	Total	Interpretation
A1	3.92	0.71	0.12	0	0	4.75	Excellent
A2	3.82	0.86	0	0.04	0	4.72	Excellent
A3	3.53	0.94	0.18	0	0	4.65	Excellent
A4	3.82	0.78	0.06	0.04	0	4.70	Excellent
Total Weighted Mean						4.71	Excellent

Where:

- A1. The software performs its desired operation
- A2. The system provides necessary information
- A3. Intractability to the device
- A4. Desired operation can be done easily (viewing models)

Client responses to the developed application were largely in agreement with each other but there were notable deviations based on the responses. With regards to Functionality, it was noted that three-fourth of the clients’ samples answered that it was excellent in all of the criteria inquired about. While the other client respondents answered that Functionality of the system was very good or simply good. Marketing Agent responses to the developed application were also in agreement with each other. In the same criteria, majority of the agents answered excellent and the other was very good or simply good. The Area Marketing Supervisor rating with regards to Functionality was very good or simply good. While the Associate Marketing Executives answered to the same criterion as very good or good, while one answered fair. Experts’ ratings regarding the same criterion were convergent with clients and agent’s responses, with four experts rated it as excellent, and one as very good. This suggested that the overall Functionality with a total weighted mean of 4.71 (Excellent) for the application with regards to performing its desired operation and providing necessary information, in general, excellent and the desired operation were done easily by the users.

Table 2. Data Interpretation of Usability

Criteria	5	4	3	2	1	Total	Interpretation
B1	3.92	0.71	0.12	0	0	4.75	Excellent
B2	3.92	0.71	0.12	0	0	4.75	Excellent
B3	3.92	0.78	0	0.04	0	4.74	Excellent
Total Weighted Mean						4.75	Excellent

Where:

- B1. Ease of Use
- B2. Labels on each part of the program are clear and understandable
- B.3 Provides menus and buttons that can be easily navigate

With regards to Usability, clients’ responses showed that the mobile application was excellent in terms of Ease of Use with few deviations but responses to the Menus and Buttons for easy navigation was more varied, with the Area Marketing Supervisor suggested that buttons must be improved. Responses of the Agents and Associate Marketing Executives showed excellent result that they recommended the use of the application since it was easy to use, with one Marketing Executive answered fair. Experts’ ratings, however, showed that the Usability of the mobile application in terms of usefulness and the presentation of menus and buttons were excellent. Table 2 shows that the Usability of the application was excellent with a total weighted mean of 4.75 (Excellent) in terms of its use, labelling, menus and buttons used for easy navigation of the users.

Table 3. Data Interpretation of Efficiency

Criteria	5	4	3	2	1	Total	Interpretation
C1	3.53	0.86	0.24	0	0	4.63	Excellent
C2	3.63	0.86	0.12	0.04	0	4.65	Excellent
Total Weighted Mean						4.64	Excellent

Where:

- C1. Efficiently utilized the resources
- C2. Realistic view of the models (house models)

Responses to the Efficiency of the application were largely varied and would be tackled per criterion. The first criterion, efficiently utilized the resources, was rated as excellent by more than half of the clients and agents and as very good by the remaining clients and agent. One client rated Realistic viewing of models as needing improvement. Rating by the Associate Marketing Executives was good also with one answered fair. Area Marketing Supervisor rating suggested that the application was recommended for use since it provided realistic models. Experts’ ratings supported the high ratings given by majority of the clients and agents, suggesting that the application was efficient and provided realistic model houses. In overall rating, Efficiency of the mobile application supported the efficiency of utilizing the resources and the realistic viewing of house models with a total weighted mean of 4.64 (Excellent) and that it was recommended to use.

Table 4. Data Interpretation of Portability

Criteria	5	4	3	2	1	Total	Interpretation
D1	4.02	0.55	0.12	0.04	0	4.73	Excellent
D2	4.22	0.63	0	0	0	4.85	Excellent
D3	3.43	1.10	0.12	0	0	4.65	Excellent
Total Weighted Mean						4.74	Excellent

Where:

- D1. Software application can be installed in all devices (android)
- D2. Easy to install
- D.3 Provides updates for new software

With regards to Portability, clients and agents’ responses suggested that software application met its desired use and could be installed in an android mobile device. Clients and Agents responses were excellent with few deviations but responses to the Easy to install was more varied, with one agent suggested that providing updates for new software

needed improvement. Area Marketing Executive rating showed that the mobile application could be easily installed and a good rating for providing updates. Ratings of Associate Marketing Executives showed very good rating with one answered fair. Experts’ ratings, however, suggested that the mobile application was excellent but the criterion for Software application can be installed in all devices (Android) had a rating mean lower than the Easy to install. This suggested that while Usability, in general, was rated highly, Portability of the mobile application needed to have improvement in terms of updates.

Table 5. Data Interpretation of User Acceptance

Criteria	5	4	3	2	1	Total	Interpretation
1	3.82	0.78	0.12	0	0	4.72	Excellent
2	3.33	1.25	0.06	0	0	4.64	Excellent
3	3.33	1.18	0.12	0	0	4.63	Excellent
4	4.02	0.71	0.06	0	0	4.79	Excellent
5	3.92	0.86	0	0	0	4.78	Excellent
6	3.63	0.86	0.18	0	0	4.67	Excellent
7	4.02	0.63	0.12	0	0	4.77	Excellent
8	3.82	0.94	0	0	0	4.76	Excellent
9	3.04	1.25	0.24	0	0	4.53	Excellent
10	3.63	1.02	0.06	0	0	4.71	Excellent
Total Weighted Mean						4.70	Excellent

Where:

Criteria	Description
1	The user interface is intuitive to use.
2	The user interface contains all the necessary functions at first glance.
3	The user interface is pleasing to look at.
4	The user interface allows easy navigation.
5	The graphics is pleasing to look at.
6	The graphics present a clear distinction between the different elements of the program.
7	The graphics is intuitive and represents their function / basis.
8	The graphics does not cause confusion.
9	The program matches your expectations.
10	The program is able to provide what it is meant to do.

Table 5 shows the User Acceptance result of the respondents on the given criteria of the mobile application. Results from the client showed that majority were satisfied to the performance of the application. Respondents’ responses to the developed application were largely in agreement with each other but there were notable deviations based on the responses. Clients’ responses were Strongly Agree, which was in congruent with each other with one client answered undecided. Result of rating on agent responses were varied, with majority of the agent responses were Strongly Agree or Agree that the mobile application performed its specified function as indicated on the hypothesis. Area Marketing Supervisor response was in agreement to the result of the agent but it was recommended that the user interface must be improved for easy navigation. While Associate Marketing Executives responses were mostly undecided and recommended that the system must improve its graphics of the model houses to avoid confusion to the users. Experts’ ratings were Strongly Agree and were comparable with other respondents, suggested that the proposed mobile application could perform its function and provide better representation of the model houses. In general, in table 8, the User Acceptance

on the application was 4.70 (Strongly agree) that the mobile application was intuitive to use, graphics were intuitive and represented the function of the system, user interface was recommended and the mobile application could provide its desired function.

V. CONCLUSION

With this, it can be said that the mobile application developed entitled *Augmented Reality Mobile Application of 3D House Model* as a whole was able to respond to the existing marketing strategy of fiesta communities and was able to, based on survey results of clients, agents, area marketing supervisor, associate marketing executive and experts, demonstrated its capabilities as an innovative tool by being able to effectively present model houses to the costumers in a more realistic way. A more realistic way of visualizing 3D house model helps the marketing representative/agent in their job. Though it was not a flawless application and it could be improved, even in its prototypal stage, the application was able to demonstrate that, in the future, technology could be used augmented reality through the use of mobile devices.

VI. RECOMMENDATIONS

Upon analysis of the recommendations of the respondents, it was noted that many of the recommendations focused on the presentation of the objects within the system. While many find that user interface was easy to use, some find the actions done within the system to be shaky and unstable. As the project objective was to provide a 3D house model of fiesta communities, a shaky action within the system may result in a dissonance between what the user sees and what he does and thus, it may, throttle the efficiency of the presentation process. As such, all these recommendations will be noted and be recommended for future researchers who wish to study and improve the existing proposed mobile application.

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