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AUGMENTED REALITY ON MOBILE FOR INTERACTIVE CATALOGUE

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Abstract : The prevalence of augmented reality and the rapid evolution of related technologies, such as the widespread use of smartphones, have led to its widespread recognition. Users get an insight with excess information in the form of reality through this type of human-computer interaction. As such, the application of augmented reality has become a key idea in marketing sales. One way to promote things is using a print catalogue. The little information, images, and brief lines found in print catalogues do not engage readers in any way. Regarding specifications and inadequate information, many customers have difficulties while attempting to purchase things. With the help of augmented reality, this article attempts to create an interactive catalogue that gives customers detailed product descriptions. A broad design process has been used.

Index Terms **– Human computer interaction , Prototype , Augmented reality , Catalogue , Mobile Application**

I. INTRODUCTION

A particular type of Human-Computer Interaction (HCI) is used to depict the computer science discipline known as Augmented Reality (AR). Adding more information to a user's experience of reality is the fundamental idea behind augmented reality. This data may be computer-generated or it may just be data that is not directly perceptible to people [6]. Numerous businesses have utilized augmented reality (AR) as interactive media to promote their goods. Combining electronic text, graphics, music, and moving images into a structured digital computerized environment that enables users to engage with the data for relevant purposes is known as interactive media. The Internet, telecommunications, and interactive digital television are examples of the digital environment [6]. Print catalogues are used to promote products because they are non-interactive for users and consist of few text , images, and restricted information. When attempting to purchase electrical items, many customers have difficulties due to inadequate information and specs [17].

The increasing advancement of mobile phones and portable devices allows for the introduction of new and more sophisticated technology for finding and displaying additional information on electrical products. Thus, augmented reality has been integrated into mobile devices. Mobile Augmented Reality (MAR) is an application that operates in a mobile setting [12], interfaces with a mobile device , and makes specialized applications available to deliver services and functions based on reality [12]. In this study, we have created an augmented reality-based Android application that functions as an interactive catalogue to assist businesses in providing clients with adequate product information, as well as the opportunity to view online content like product interviews and videos. The created application has removed the limitations of paper catalogues, improved the use of mobile devices, and enhanced catalogues with a wealth of video, interview, and narrative content.

A preliminary investigation has been carried out to determine the problems associated with the use of print catalogues. Fifty people were given questionnaires, and the findings show that the majority of respondents—93%—used printed catalogues; however, 53% of them expressed dissatisfaction with the information contained in the catalogues due to a lack of details regarding the products' specifications. Seventy percent of respondents agreed that they would utilize augmented reality (AR) to learn more about the products.

II. RELATED WORKS

A. Associated Augmented Reality Applications

MAR represents one of the AR's rapid growth systems. According to Papagiannakis et al , mobile augmented reality system is a real-time interactive system that links virtual and physical objects, with the virtual augmentation primarily reliant on dynamic 3D [16,1]. According to Speech et al. [1], augmented reality (AR) is a system that creates and supports the three primary senses—vision, touch, and audio—in order to digitally visualize natural or virtual observed information [11]. Therefore, mobile augmented reality is run by mobile media devices that combine a compass, GPS, accelerometer, screen, navigation location, and picture recognition. Access to the internet has evolved into a means of communication between users and systems [14]. As a result, the AR idea may be used in a mobile environment. In addition, a mobile augmented reality (AR) is expected to change the way that information is presented by integrating the entire system directly with the real environment [9]. By employing it to provide pertinent

information, clear up doubts, and collaborate with others, MAR can aid humankind in fostering engagement. Many technologies, including as global tracking technologies, wireless communication, interaction technology, and technology presentation, must be implemented collectively in order to make MAR expertise possible [9].

Previous augmented reality research has taken use of the variety of application domains, including aviation cockpit rheostat, surgical support, invisible building substructure inspection, maintenance and overhaul, and components assembly [7]. A touring machine is one of the associated systems; the 3D MAR system prototyped it for use in sightseeing the urban area [22]. They named a prototype system that combined the unconnected freedom of mobile computing with the overlapping 3D images of augmented reality , .Investigating how these two technologies could work together to enable wearable computer systems that can assist users in their daily interactions with the outside world has been the aim. Furthermore, they showcased an application that utilizes a head-tracked, see-through, head-worn 3D display to provide information about their school, in addition to an untracked, dense, handheld 2D display with a track pad [22].

B. Technology

Mobile technology became widely used in 2002 [20]. The growth of mobile phone networks was substantial, with a significant increase in numbers surpassing those of fixed lines. Due to this, the number of mobile phones doubled and reached 2.6 billion in January 2007; as a result, 80% of people are either exposed to or live near a mobile signal [5]. That said, this is contingent upon the nature of the nation—that is, developed or developing [19]. The next generation can accomplish countless jobs with the use of smart phones, including as email, remote access, and CRM [19]. All gadgets that are easily operated by individuals are referred to as mobile devices, including cell phones, PDAs, pagers, laptops, and Personal Navigation gadgets [10]. Some of these gadgets have access to websites, while others do not have network providers [8], but they can obtain data from a variety of sources. These come with either a touch display panel or a keyboard [4,12]. Cell phones, for example, are little computing units that may be easily handled; nonetheless, the most popular gadgets are, in particular, mobile phones due to their high capacity and small size [15], smart phones, pagers, PDAs, and personal navigation systems [10]. Some mobile devices are built to perform specialized activities, such as EDAs or enterprise digital assistants, which are especially useful for business customers. Nonetheless, several mobile devices are eliminated from this study since they are unsuitable for use due to their large size and weight.

C. Android

Since Google introduced Android, application development has been a hot issue. On a regular basis, thousands of requests are advanced in the Android marketplace. Android podium is the first software podium and operating system designed for an open and complete mobile device. It includes the operating system, middleware, user interfaces, and application software [15]. Android is a Linux-based operating system designed primarily for smart and tablet phones due to its widespread popularity. The project began with a small business called Android Inc. and was later purchased by Google in 2005 as a method to enter the phone industry [21]. Android supports a wide range of input/output devices, sensors, and communication media. Google has demonstrated the potential of open source and has significantly improved the web with its search engine and mobile computing technologies with its open source Android platform.

III. RESEARCH METHODOLOGY

This study adapts Vaishnavi and Kuechler's [21] General Research Design Methodology. It is divided into five phases: a) Problem Identification, b) Research Suggestions, c) Prototype Development, d) Prototype Evaluation, and e) Research Conclusion.

A. Problem Identification

This phase is the finding of an issue in a specific field of research via a preliminary study. A preliminary study was conducted on a sample of 50 people to determine the challenges associated with the use of a traditional print catalogue. The study's findings show that while the majority of respondents (93%) used a printed catalogue, 53% were dissatisfied with the information included inside its pages. In addition, responders must have access to adequate information regarding the specifications of electrical products. The majority of respondents (70%) agreed to use the AR to gain additional information about products.

B. Research suggestions

In this phase, mobile technology has been identified as the technology to be employed in addressing the problem because it is extensively used nowadays and the application can be made available anywhere and at any time. For this goal, MAR was designed as a mobile application. The Interactive Catalogue was designed using UML. The UML is an object-oriented modelling language. UML allows for easy testing of the system model and architecture in terms of artifact accessibility. Because the system model or architecture must be executed using the component specification, it is necessary to ensure that the system can be developed using this artifact.

C. Prototype Development

This is the period during which the prototype is developed. In this study, the Interactive Catalogue application was created using Unity 3D. The Android SDK, JDK, and Unity Extension 3.0.9 were installed on a PC in order to create an APK file. When the Interactive Catalogue begins and passes over the targeted part, if the image marker exists on the mobile screen, it displays the target video from the target resources. Corel Photo Impact and Video Studio 12 were used to generate and modify the necessary films, photos, and icons.

D. Prototype Evaluation

At this point, the usability heuristics of the interactive catalogue application are assessed .This phase included both expert and normal user evaluations.

1. Expert Evaluation

Two usability experts from the School of Computing and the School of Multimedia Technology and Communication at the University of Utara Malaysia were contacted to assess the perceived usefulness, ease of use, understanding, and satisfaction with work outcomes when using the interactive catalogue. The experts assessed the system and remarked that the interactive catalogue is considered as informative, simple to use, improves knowledge of job outputs, and they are satisfied with the results.

2. Normal User Evaluation

An evaluation of the Interactive Catalogue application was conducted with 50 people. The user evaluation was conducted out using a collection of questionnaires, which mostly included measurements such as usefulness, ease of use, outcome/future use, and satisfaction with the interactive catalogue prototype. The questionnaires were derived from [21,3,23], and the measures were based on a 5-point Likert scale anchored by "Strongly Disagree" (1) to "Strongly Agree" (5), as shown in Table I.

TABLE I
FIVE POINT LIKERT SCALE FORMAT

	Strong	Disagree	Neutral	Agree	Strong
Score	1	2	3	4	5
Category	Disagree		Neutral	Agree	

Usefulness measures a person's belief that utilizing a given program will improve the user's performance. Easy to use can be defined as the degree of ease with which a specific application can be completed without exerting significant effort. Effectiveness and satisfaction measure the user's contentment with the entire program and its contents. Finally, outcome and future work indicate the extent to which a user is likely to employ this application.

E. Conclusion

During this phase, various research constraints, findings, and recommendations were addressed. The result of the research conclusion phase is the research report. Additional future works have also been proposed. This study used descriptive statistics, reliability analysis, and the t-test. All of the analyses were conducted using SPSS version 21.0 for Windows 7. The findings are discussed in the following sections.

IV. THE DEMOGRAPHIC CHARACTERISTICS

In this study, the respondents' gender and age serve as descriptive variables. As shown in Table II, the descriptive analysis reveals that 26 respondents (52%) are male and the remaining 24 (48%) are female. In terms of age, 23 (46%) of the 50 respondents are between the ages of 20 and 29, 18 (36%) are between the ages of 30 and 39, and the remaining 9 (18%) are between the ages of 40 and 49.

TABLE II
DESCRIPTIVE CHARACTERISTICS OF THE RESPONDENTS

Construct	Items	Frequency	Percentage
Gender	Male	26	52
	Female	24	48
Age	20-29	23	46
	30-39	18	36
	40-49	9	18

The user evaluation is based on respondents' perceived usefulness, perceived ease of use, comprehension of the outcome/future use of the interactive catalogues, and satisfaction with the outcome/future use of the interactive catalogue. The results indicate that all constructs have a minimum value of 2, except for "satisfied with the outcome/future work," which has a minimum of 2. Perceived usefulness and satisfaction with outcome/future work have a maximum value of 5, whereas ease of use and understanding has a maximum value of 4. However, the mean value of all constructs on a 5-point scale varies between 3.10 and 3.21, indicating that the interactive catalogue prototype is usable. Table III shows the results of the user evaluation of the system.

TABLE III

USER EVALUATION OF THE INTERACTIVE CATALOGUE

	Minimum	Maximum	Mean	Std. Deviation
Perceived	2	5	3.16	0.822
Ease of Use	2	4	3.10	0.804
Understanding of Outcome/Future Work	2	4	3.21	0.754
Satisfied of Outcome/Future Work	1	5	3.12	0.835

V. DISCUSSION

This paper discusses the evaluation of an interactive catalogue, as well as a prototype of an AR-based mobile application operating on an Android smartphone. This prototype allows consumers to access more extensive product information in the form of interactive displays by pointing the smartphone camera at barcodes in print catalogues. The application begins to display a movie that informs the user about product details. Each product has its own video, so when you touch the scan button, the application begins playing an interactive video with extensive information and instructions on how to use the product.

The interactive catalogue application is meant to enhance the traditional approach of browsing products through the print catalogue. Because most people nowadays use smartphones, the concept of creating an interactive catalogue aligns with users' desire to learn more about the desired goods. The application can give users with detailed information about products that would otherwise be difficult to locate. All measurements were compared between males and females to indicate statistically significant differences. The results show that there is no significant difference in all metrics between the male and female groups, as all significant values are bigger than 0.05.

This study also reported the results of user evaluations about the application's acceptance and usage. The findings revealed that consumers agreed on all of the measures, including usefulness, convenience of use, functionality/effectiveness, satisfaction, and outcome/future use. The findings indicate that the majority of users are pleased with the use of the interactive catalogue application. Furthermore, the user consented to utilize the application because they believed the information offered by the application was useful, learnable, and intelligible.

VI. CONCLUSION

This paper outlines a suggested mobile application for the Android platform that combines MAR technology to create an interactive catalogue. The program gives product information and allows clients to access online material such as videos and interviews. The mobile AR was built and developed to meet the requirements indicated in the user's suggestions. Users consider the developed prototype as useful and easy to use. The users can understand and are satisfied with the outcome of the interactive catalogue. The program was able to meet the requirements of AR while also assisting businesses in providing adequate information about their items. The study's significant achievements include overcoming the limitations of print catalogues and increasing the use of mobile phones. Furthermore, the study added a wealth of video, interview, and narration content to the database.The primary drawback of the developed application is that it only works on Android phones. We advised that the application be made compatible with other mobile phone operating systems, such as iOS. The program could be enhanced with more features, such as other languages and greater flexibility. It is possible to increase the application's interactivity by including a 3D module and an interactive button that works in steps. Researchers who are interested in continuing their work on this topic should provide users with the option to compare different brands of products and download the catalogue for future reference .Simplifying the text to show and so minimizing the quantity of vertical scrolling by users would necessitate further effort.

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