

Advantages and Challenges of Using Augmented Reality for Library Orientations in an Academic/Research Library Setting

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ADVANTAGES AND CHALLENGES OF USING AUGMENTED REALITY FOR LIBRARY ORIENTATIONS IN AN ACADEMIC/RESEARCH LIBRARY SETTING

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Abstract

This study aims to make an inquiry regarding the advantages and challenges of integrating augmented reality (AR) into the library orientation programs of academic/research libraries. With the vast number of emerging technologies that are currently being introduced to the library world, it is essential for academic librarians to fully utilize these technologies to their advantage. However, it is also of equal importance for them to first make careful analysis and research before deciding whether to adopt a certain technology or not. AR offers a strategic medium through which librarians can attach digital information to real-world objects and simply let patrons interact with them. It is a channel that librarians can utilize in order to disseminate information and guide patrons in their studies or researches. And while it is expected for AR to grow tremendously in the next few years, it becomes more inevitable for academic librarians to acquire related IT skills in order to further improve the services they offer in their respective colleges and universities.

The study shall employ the pragmatic approach to research, conducting an extensive review of available literature on AR as used in academic libraries, designing a prototype to illustrate how AR can be integrated to an existing library orientation program, and performing surveys and interviews on patrons and librarians who used it. This study can serve as a guide in order for academic librarians to assess whether implementing AR in their respective libraries will be beneficial to them or not.

Keywords: Augmented reality, emerging technologies, library orientation program, academic/research libraries

Introduction

Given that librarianship is considered as one of the oldest professions proves that librarians have successfully survived numerous wars, plagues, economic depressions, and varying social values and conditions [Lahiri, 1999]. Librarians have always been known for their resourcefulness and adaptability. When the Internet became available to the general public, even though many believed that libraries will eventually vanish, librarians were able to learn how to incorporate it to the services they offer and turn the situation to their advantage. Currently, technology has transformed libraries in terms of collection makeup, services, operations, and functions [Rendon, 2014]. In this age where a vast number of emerging technologies are being introduced to the library world, it is essential for librarians to learn how to wield these tools effectively and use this opportunity to further improve their service.

Rotolo, Hicks and Martin [2015, p.4] defined an emerging technology as “a radically novel and relatively fast growing technology characterized by a certain degree of coherence persisting over time and with the potential to exert a considerable impact on the socio-economic domain(s)”. The New Media Consortium (NMC) annually publishes the NMC Horizon Report which charts the five-year horizon for the impact of emerging technologies in colleges and universities worldwide [Johnson, Adams Becker, Cummins, Estrada & Hall, 2016]. The NMC Horizon Report: 2016 Higher Education Edition included augmented reality (together with virtual reality) in the mid-term classification with time-to-adoption of 2 to 3 years.

The concept of augmenting reality has been around even as early as mid-1900s. However, the term augmented reality (AR) was first used in 1990 by Tom Caudell, a Boeing researcher who devised a head-mounted digital display to guide electricians through assembling electrical cables in aircrafts using blended virtual graphics onto a physical reality. He coined the term augmented reality

to refer to this system and it was used since then to refer to the intersection between virtual and physical reality [Chen, 2009] [Cassella, 2009]. AR is defined as “a medium in which digital information is overlaid in the physical world that is in both spatial and temporal registration with the physical world and that is interactive in real time” [Craig, 2013, p. 20]. It is worth noting that according to Craig and Azuma [1994], AR should not be considered as a technology per se but more as a medium.

The recent boost of popularity in using AR is tied to the developments that took place in mobile technology. When smartphones and tablets went mainstream in 2010, AR also became more publicly available. Akçayır and Akçayır [2017] also discovered that AR research has increased dramatically since 2011 and has intensified from 2012 onwards. However, most of the available research literature about AR in libraries either evaluate the current state of technology or propose newly developed AR applications for libraries. There exists few studies that offer detailed, practical information in integrating AR into library services that will help other librarians in deciding whether to adopt the technology in their own libraries or not.

This study aims to make an inquiry regarding the advantages and challenges of integrating AR into the library orientation programs of academic/research libraries. With the variety of emerging technologies that are currently available in the market, it is very important for librarians to make careful analysis and research before deciding which of these will be helpful in reaching the goals of their respective institutions. AR offers a strategic medium through which librarians can attach additional digital information to real-world objects and simply let patrons interact with them. In relation to librarianship, AR is not simply a technology but a channel librarians can use to disseminate information and guide patrons in their studies or researches. If properly implemented, AR can be a powerful tool to provide better access to information for library patrons.

The University of the Philippines (UP) is the premier state university in the country. The College of Engineering (COE), being the biggest degree-granting unit in the whole UP System, aims to become a global leader in engineering education, research, technology innovation and service. With this guiding principle, the UP COE Library, likewise, envisions itself to be a world-class intellectual haven of learning in engineering education, research and service by providing ubiquitous access to information resources and services by using appropriate advance technologies. The Library's intends to enhance traditional library services by using in-house developed systems, open source applications, and innovative technologies. This study shall inquire whether it is feasible to apply AR in the Library's current orientation materials by checking the perception of users on the advantages and challenges of using AR.

Literature Review

Rotolo, Hicks and Martin identified that emerging technologies lack key foundational elements since there is no consensus on what classifies a technology as 'emergent'. Another issue is the problem of evidence – the perceived lack of available research material regarding the impact of such technologies since they are new and still developing. Hence, Hayman and Smith [2015] suggested about acknowledging both formal and informal evidence in studies involving emerging technologies. The current study was conducted in such way – using formal evidence that resulted from research studies and published in reputable journals, as well as informal evidence gathered from the experiences of library professionals as narrated in blogs and other websites.

Since the term augmented reality was coined, AR researches and project implementations also grew in number. Research studies published in the 1990s laid the foundation for AR research. Paul Milgram introduced the concept of Reality-Virtuality (RV) continuum (Figure 1). This illustrates that AR lies between the extrema of the completely real environment and the completely virtual environment, but with more proximity to the real environment [Milgram, Takemura, Utsumi & Kishino, 1994]. Ronald Azuma also conducted an important research in 1997 which surveyed the state of AR at that time, identified potential AR applications, discussed issues in AR systems, and suggested areas for further research. He also identified the characteristics of AR systems, namely (1) combines real and virtual, (2) interactive in real time, and (3) registered in 3D.

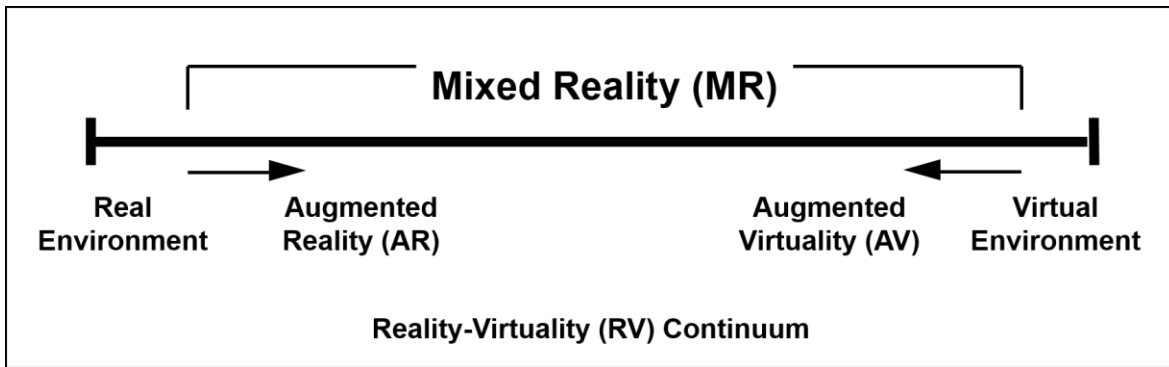


Figure 1. Paul Milgram's Reality-Virtuality Continuum

The recent public interest in AR mobile games is unprecedented in the history of the field. However, based on Gartner's 2016 Hype Cycle for Emerging Technologies (Figure 2), AR has already arrived in the phase called "Trough of Disillusionment". This is the phase in a technology's life cycle when general interest starts to wane as experiments and implementations fail to deliver, with many producers of the technology either shaking out or failing [Gartner, 2017].

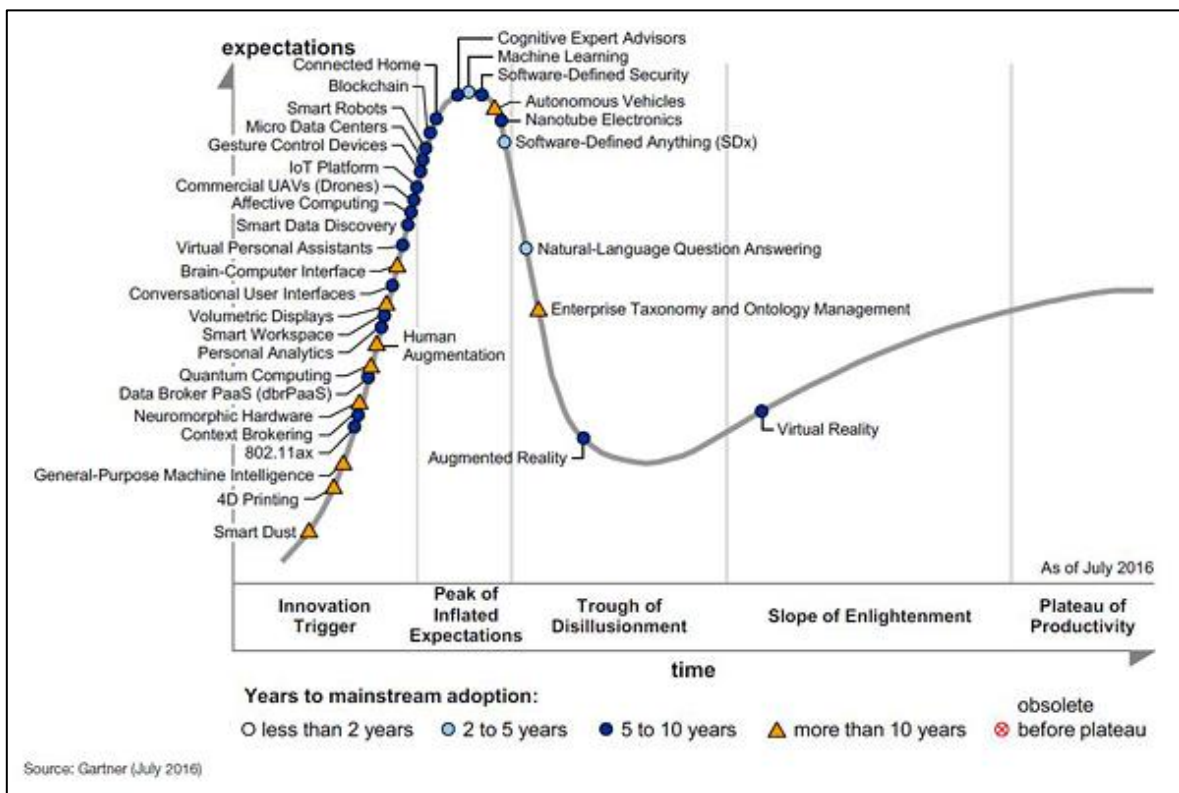


Figure 2. Gartner's 2016 Hype Cycle for Emerging Technologies

Meanwhile, librarians have also noticed the potential advantages AR can possibly bring to the profession and have also conducted researches to examine current state of AR, evaluate library-related AR applications, and analyze how AR may affect librarianship [Massis, 2015] [Oyelude, 2017] [Zak, 2014]. A closer look on recent publications and online articles reveal how AR was being applied to library work:

- Bookshelf reading and browsing (e.g., ShelvAR mobile application) [Spina, n.d.] [Hahn, 2012]
- Library instruction / orientation [Spina] [Chen & Tsai, 2012]

- Library tours [Boyadijan, 2014]
- Instructional guides [Humphries, 2012]
- Augmenting photo collections [Hawkins, 2013]
- Promotional games (e.g., The Mythical Maze app, Stiktu app) [McGettigan, 2014] [Barnes & Brammer, 2013]
- Awareness campaign [Cameron, 2015]
- Library navigation [Hahn] [Huang, Shu, Yeh& Zeng, 2014]
- Reader's Advisory [Hahn] [Meredith, 2014]

Methodology

The study employed the pragmatic approach to research, also called as mixed methods, in order to gather appropriate information about the subject, demonstrate what AR can do, and gather both quantitative and qualitative data. First, an extensive review of available literature on AR was conducted, focusing on the foundations of AR and how it is currently being used in academic/research libraries. As previously mentioned, articles that provide both formal and informal evidence were considered since information from published research studies may still be limited. Then, a prototype implementation was designed and demonstrated to library staff and users of the UP COE Library in order to illustrate how AR can be integrated to existing library orientation materials. And lastly, survey forms were distributed and short, on the spot interviews were conducted with those who participated in the demonstration.

Library orientation is generally the most basic form of information literacy program being offered by libraries. As librarians, it is our mandate to transform people into wise information consumers by guiding them how to retrieve and assess information. Especially for the Philippines, having an informed society is vital in developing our national identity. This is probably one area of the Filipino culture where librarians have the most contribution. By integrating emerging technologies such as AR into library orientation programs, librarians become agents of change and develop more interactive activities that shall pique the interest of more users to discover more from their respective libraries.

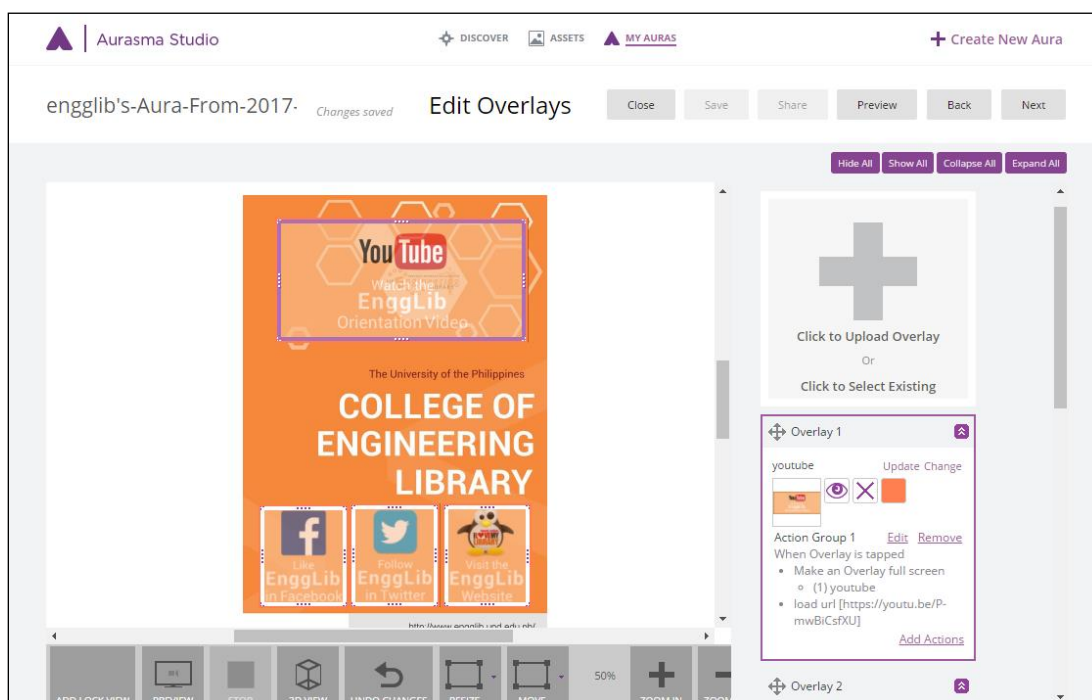


Figure 3. The Aurasma Studio

For the prototype implementation of the AR library service, the Aurasma mobile application was selected and used. Aurasma is an augmented reality platform developed by HP Autonomy that

uses a mobile device's camera to recognize real world images and, by using Aurasma Studio, add various forms of media as overlay [Wikipedia, 2016], as shown in Figures 3 and 4. Since this paper aims to serve as a sample and guide for academic librarians in assessing the value of AR, Aurasma was selected because it is free to download in any Apple and Android device, most of its services are also free, it is easy to use and has a user-friendly interface, and many tutorials are available online.

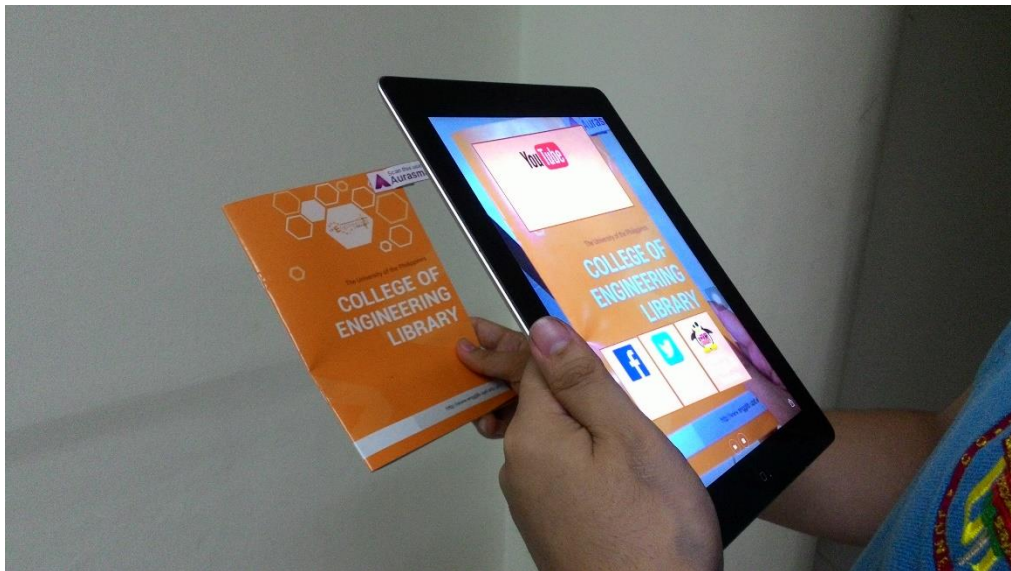


Figure 4. Using the Aurasma mobile application

The short survey form was designed for this specific study in order to measure the perception of library staff and users regarding the integration of AR into the Library's orientation materials. It consists of five statements that require respondents to express whether they agree or disagree using Likert scale, and two open ended questions that ask for comments and suggestions.

Results and Discussion

A total of 71 respondents filled out the survey forms. These respondents are composed of 49 students, 21 library staff, and 1 faculty member. The study was conducted in the UP COE Library during the mid-year term – the term between regular semesters when only few students enroll to either catch up with their curriculum or take subjects in advance. Hence, there are only few students who enter the library and were able to participate in the study. Figures 5 and 6 show more details on the profiles of respondents:

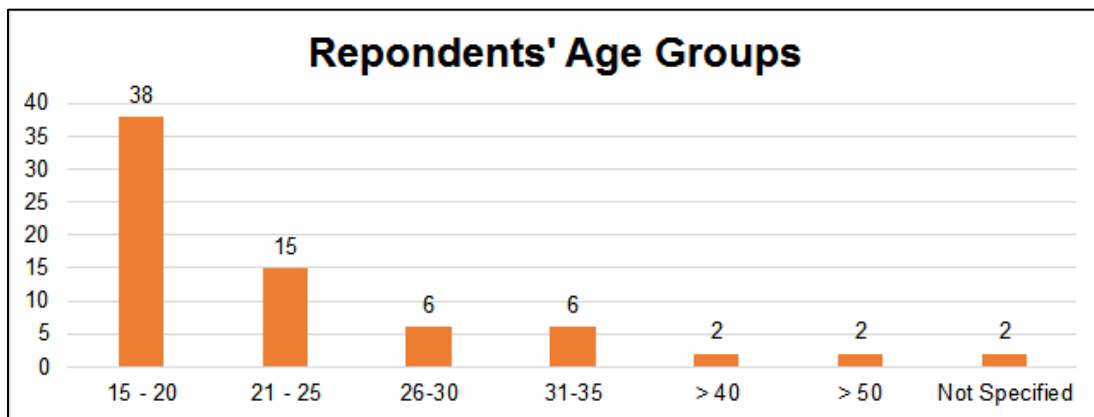


Figure 5. Age Group of Respondents

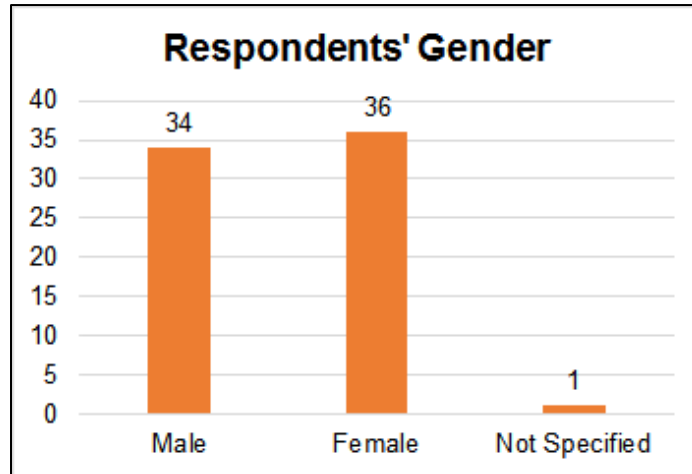


Figure 6. Gender of Respondents

More than half of the respondents (53%) are within the range of 15-20 years old, the generation that is often described as 'digital natives'. Only a total of 4 respondents were aged more than 40. When the demonstration was being conducted, the feeling of astonishment is clearly visible in most of the respondents' faces whenever they see the digital overlays come out, no matter what their age is. This shows that AR can be appreciated by everyone of any generation. Regarding gender, the number of male and female respondents is almost equal, which means that results are also equally represented.

For the first statement "AR service will allow me to know more about the Library's services and resources", responses are shown in Figure 7. 62% strongly agreed and 35% agreed on this statement which means that AR can be an effective channel to disseminate information, as perceived by the respondents.

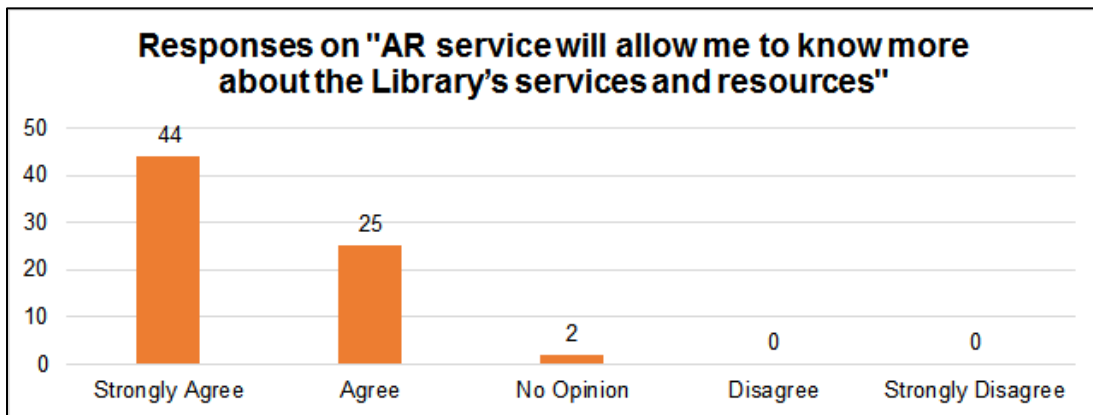


Figure 7. Responses on Statement 1 "AR service will allow me to know more about the Library's services and resources"

For the second statement "AR service will enable me faster access to the information I need", Figure 8 shows the responses. With almost similar results with the first, this means that respondents also believe that it is easier and faster to get information using AR than traditional means.

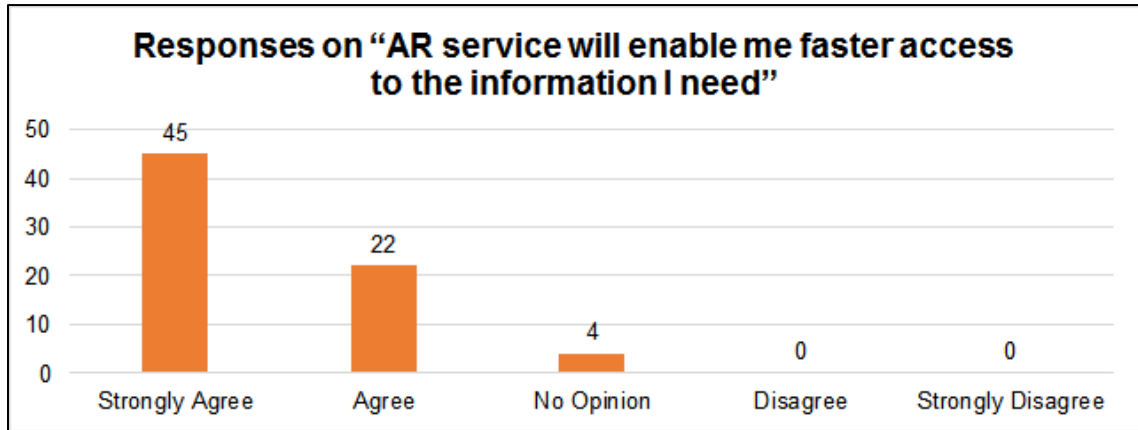


Figure 8. Responses on Statement 2 “AR service will enable me faster access to the information I need”

The third statement says “The AR app is hard to operate and requires technical knowledge”. This is the only statement that is not expressed in the affirmative so there is a possibility that some respondents might have been confused. Still, 48% disagreed and 27% strongly disagreed on this statement which means they found it relatively easy to use the Aurasma mobile application. The figure below shows the responses.

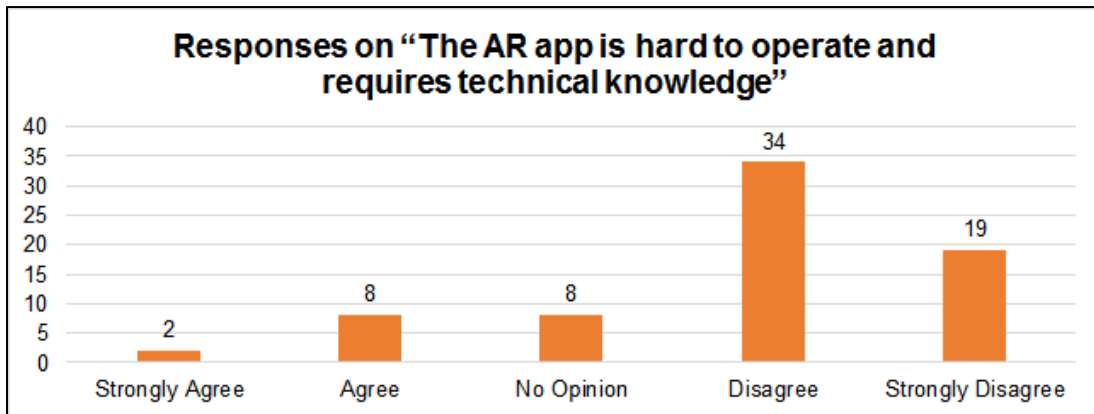


Figure 9. Responses on Statement 3 “The AR app is hard to operate and requires technical knowledge”

For the fourth statement “AR service will be effective in reaching out to more students”, the responses show slight difference in opinions like in the third, with 1 respondent who strongly disagreed, 2 who disagreed, and 8 who expressed no opinion. Nevertheless, 48% agreed and 37% strongly agreed which still proves that respondents believe that an AR service will connect more students to the library. Figure 10 shows the responses.

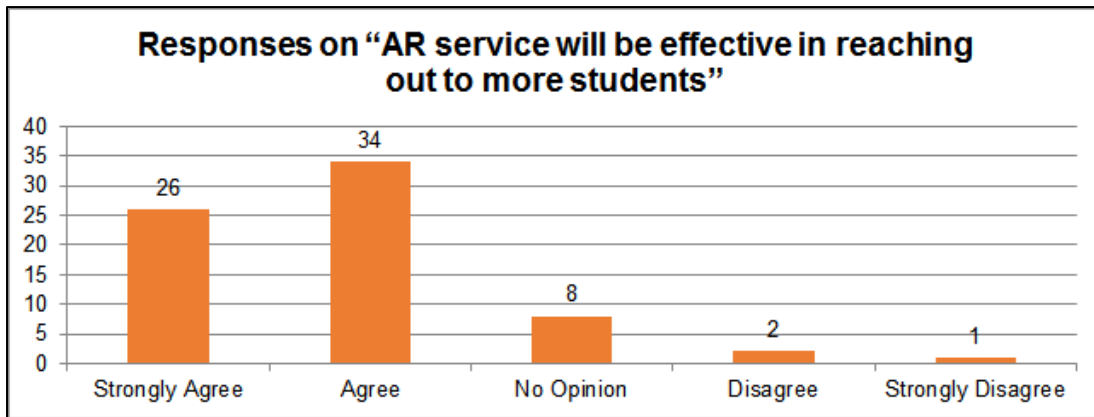


Figure 10. Responses on Statement 4 "AR service will be effective in reaching out to more students"

For the fifth statement "The Library should pursue this service and implement this in a bigger scale", responses are shown in the Figure 11. Almost similar with the first 2 statements, this is a strong evidence that, at least for those who answered the survey, full implementation of the AR service is a worthy endeavor for the library.

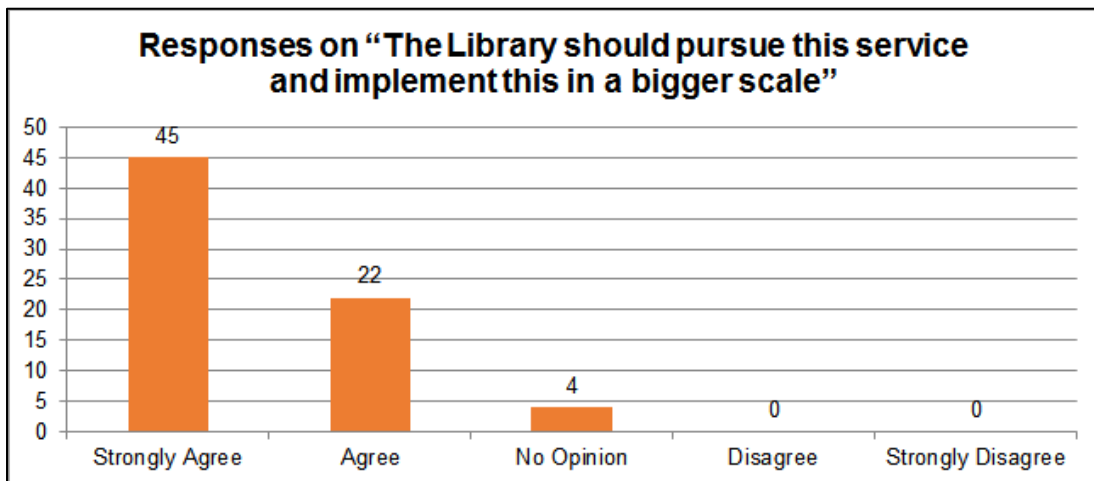


Figure 11. Responses on Statement No. 5 "The Library should pursue this service and implement this in a bigger scale"

Item no. 6 in the survey form asks "Anything you want to say about this service?" The responses were listed, tallied and analyzed. Responses that have resemblance were grouped together, as shown in Table 1. Some of the written comments are actually suggestions so they were included in the Table 2 instead. Most of the comments are positive in nature, with some expressing their perceived limitations of an AR library service.

Impression on AR Experience
Cool stuff/idea (8)
Awesome; Amazing; Very Nice (4)
Good; Great idea (3)
Innovative (3)
Interesting (2)
Highly advanced; Looks like a luxury tech (2)
Enjoyable (1)

Something new (1)
Functionality
Helpful; Useful (5) Ease of access to links/services (3) Interactive (3) Great opportunity to promote resources/library use (2) Informative (2) Will change perception on libraries (2) Practical (1) Will enhance library service (1)
Perceived Limitations
Hard to implement (1) Dependent on internet speed (1) Might be for young users only (1) Can't be accessed without device (1)

Table 1. Comments of Respondents about the Augmented Reality Service

Lastly, item no. 7 asks respondents for further suggestions. Like in item no. 6, answers that resemble others were grouped together as shown in Table 2. Some suggested different ways on how the service can be better implemented but some suggestions are beyond the objectives of the AR service and of this study.

Suggestions about the AR Service
More options for scanning/documents/videos/relevant content (4) Promote more; Introduce to more students; Inform users (3) Integrate with books/books with e-book counterpart (2) Better design (1) Use for orientation (1) Use for games (1) Let AR service be updated regularly (1)
Suggestions for the Library
Play room with AR and VR (1) Faster internet (1)
Things to Consider
Consider device specs of target users (1) Alternative for offline use (1) App needs to be optimized (1)
Future Direction
Add notes/annotations from professors and students as overlay (1) Coordinate with teachers to use in their lessons (1) AR app developed by UP students (1)

Table 2. Suggestions of Respondents about the Augmented Reality Service

Conclusion

The findings of the study clearly show that using augmented reality is advantageous to academic/research libraries. It is true that the hype an emerging technology brings is volatile and should never be the basis for any decision-making, especially for academic/research libraries that can spend their resources in many other endeavors. However, when the effectiveness of using augmented reality in certain library activities, such as orientation programs, is supported by hard evidence, it means that its implementation will be worthwhile. For librarians, AR should not be viewed as a technology only but as a medium to relay information. Librarians should use various methods or technologies in order to help users find the information they need. Based on the literature reviewed and the results of the survey conducted, the following are the advantages of using augmented reality in academic/research libraries, especially for library orientation programs:

1. AR can be implemented at virtually no cost, at least for the software. It will be useful especially for libraries that lend mobile devices as additional library service. Since many students nowadays are mobile device users, the library can also take advantage of it by letting them download the mobile application on their own devices.
2. Implementing an AR service is easy to learn, depending on the platform to be used. Various instructional videos are also available online. On the part of the user, using an AR mobile application is also easy. By giving simple instructions, it is expected that library users will already be able to view digital overlays.
3. Librarians can overlay additional information to physical objects through AR. By using it in various library brochures, manuals, posters, etc., users can look further to things that interest them by viewing additional digital content. Librarians can use it in many other programs also.
4. AR can make the library more interactive – a characteristic that is highly valued in today's concept of library spaces and commons.
5. Augmented reality is fun to both implement and use.

However, as with any other technology, implementing an AR service also comes with certain challenges on the part of the librarian. The following are some of the limitations of an AR library service:

1. Most AR platforms are owned by proprietary companies which means that subscription rules can change anytime. Many companies also offer free accounts but with certain limitations. Acquiring a paid account to develop a customized AR application may be costly.
2. Unlike QR codes, there is no single AR application that can read all AR digital overlays. Since the features of an AR service will be dependent on what is being offered by the platform, it is very important to choose the platform that shall be used.
3. Aside from the platform, AR implementation minimally requires a mobile device with good camera and internet connection since it is being run in the cloud. These two requirements are as equally important as the platform.
4. As an emerging technology, many things may still happen in the field of AR. Although its current direction is highly favorable, there is still a slight possibility for it to fail.

This paper aims to provide enough information to help academic/research librarians decide whether to implement an AR service in their respective libraries or not. Since published literature regarding the topic is still lacking, many aspects of AR are yet to be studied. However, since every library has its own vision and mission, every decision must still be based mainly on these. AR can offer a number of things but its implementation must still be in accordance with what goals the library is pursuing to achieve.

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