Digitization planning for museum exhibition the learning museum of Universitas Negeri Malang

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Abstract: The digitization design of the Learning Museum of Universitas Negeri Malang aims to realize the achievement of the Learning Museum's vision so that it becomes a reference in terms of learning development. The Learning Museum as a source of learning is expected to provide a concrete picture of the development of learning from the past and present. This museum is present as a place for conservation, education, and recreation. For this reason, the museum is equipped with several story lines that illustrate the long journey of Universitas Negeri Malang from 1954-present. As part of educational and recreational tourism, the museum management team also designed the digitization of museum collections following the needs of the industrial revolution 4.0 era, the goal is that visitors feel comfortable and enjoy learning through the museum. This study uses qualitative research and data collection techniques through observation, comparative studies and literature studies. This research resulted in digitizing the UM Learning Museum design with Augmented Reality technology, Virtual Reality, Touchscreen, Flash, Green screen, Video Animation, Games and also resulted in a visitor flow plan of the Learning Museum of Universitas Negeri Malang.

1. Introduction

Throughout human history, technology has continued to evolve from generation to generation. Knowledge passed down through generations accumulates to form human civilization through a complex and long process. Three important revolutions are shaping the course of history: the cognitive revolution began history about 70,000 years ago. The Agricultural Revolution accelerated it around 12,000 years ago [1]. The scientific revolution, which only started 500 years ago, is likely to end history and start something completely different. Until finally sparked an industrial revolution that affects all aspects of the current generation of humans.

The development of science and technology which is marked by progress in the field of information and technology media at this time has been going so fast [2]. Technological developments also make the role of museums increasingly complex. The museum is a means to develop human culture and civilization that is not only engaged in the cultural sector, but also in the economic, political, social, and others. So it is necessary to adjust the current condition of the museum with technological developments [3].

Museum is one of the facilities that can be used by the public in accessing various information and means to get entertainment. The concept of the museum is always showing off its collection objects to visitors. In many "developing" countries, museums are seen as places where unwanted objects or materials are stored; besides, they are considered as a place where objects related to idolatry and religions are stored [4]. Negative interpretations of the meaning of this museum continue to hamper its development in most countries. A negative interpretation of the meaning of the museum makes the enthusiasm of people visiting the museum not too great. People tend to underestimate the value and importance of the presence of a museum. Especially in museums that lack adequate facilities.
This ancient impression is a scourge for every manager of any museum. This happened because of several reasons. The early (traditional) museums were elitist, unattractive, and aloof because they only encouraged educated people to visit them [4]. Such a focus today becomes too narrow and unacceptable in the world. More than that, the view of ordinary people towards the museum is also limited to the outer skin. Therefore we need a new paradigm regarding museums.

One thing that can be done is to arrange the display system following the times. But the reality of the field is not entirely available museums that offer an interesting and interactive spectacle. Many museums still use passive methods and do not directly involve visitors in their exhibition activities [5]. To enjoy the presentation of the museum requires intellectual participation in the audience, for example the ability to imagine [6]. From here a good museum presentation will encourage a good understanding of the public towards the museum. One possibility that can be done is to be interactive between visitors and museum objects is to use digitization. This can also support the preservation of museum collection objects by utilizing information technology [7]. Issues that will be examined further in this article include: 1) challenges and Opportunities for the Development of a Digital-based the Learning Museum Exhibition System; 2) Concrete digitizing design of the learning museum of Universitas Negeri Malang with various digital media.

2. Methods

This study aims to construct a Digital Interactive Media of The Learning Museum Universitas Negeri Malang. This study uses the design research methodology in a series of work processes, namely the analysis process, the synthesis process, and the evaluation of results. This Study also emphasizes the elaborations of Digital Interactive Media to support adequate visitors interactivity for empowering the engagement. Design research is a work plan by making a construction so that each question can be found the answer [8]. In this case, the researcher must have a research paradigm that explains how the researcher's perspective understands a problem, as well as the testing criteria as a basis for answering the research problem. In making a research design it must include the following processes:

![Figure 1. Chart Design Process with Research and Design Methodology](image)

The research methodology begins by including the manuscript material collection of the Learning Museum of Universitas Negeri Malang for further review and analysis of its needs. This is important to
provide an overview of the next stage that will be carried out. So there is no imbalance in the planning process.

The process continues at the analysis stage. In this process there are several criteria, the first is to identify the problem. Problem identification is one of the important stages to be considered by researchers because this activity formulates questions about a phenomenon that occurs, both in its position as an independent phenomenon, and its position as an interrelated phenomenon [8]. The next thing that is analyzed is the storyboard and the factors of determination. The storyboard analysis process is important because it determines the initial objectives of the digitization activity. In addition, it is also important to conduct surgery on the determinants so that the digitization design becomes more effective and efficient. After analyzing the next step is to carry out the synthesis process. Beginning with sketching and drawing illustrations of digitizing designs, then proceed with the process of making sketches and drawing animations. Later the results of both will be in the form of interactive programs and collected into a database compilation that will later be tested aired and evaluated. After fulfilling the criteria, it will proceed to the refinement stage and find the final results.

Data collection methods used in this study were observation, interviews. Observations were made from August 26 to September 1, 2019, at the museums in Jakarta, Bandung, and Yogyakarta. The museums include the Museum Anatomi Universitas Atmajaya, Museum Grha Literasi, Museum Perumusan Teks Proklamasi, Museum Gedung Sate, Museum Pendidikan Nasional, Bandung Planning Gallery, Museum Konferensi Asia Afrika, Museum Pendidikan Indonesia UNY, Museum Benteng Vredeburg, Museum of BPK-RI, and Museum Gunung Merapi. Researchers also conducted interviews related to digitization at the museums. It aims to make the data collected more complete and can be used as a reference in developing the digitization of the Learning Museum of Universitas Negeri Malang.

3. Result and Discussion
3.1 Challenges and Opportunities for the Development of a Digital-based UM Learning Museum Exhibition System

The digitization of the UM learning museum was carried out as an effort to develop the museum by following technological developments in the era of the industrial revolution 4.0. In addition, digitization is done because the museum space is limited, so that the artifacts that can be displayed are limited. This is in line with what Britannica within museums and archival institutions there was also very limited knowledge of what constituted meta data, as well as lack of space for digital records and files on hard drives manufactured during the 1960s [9].

The design of exhibiting digitization was made as one of the solutions by utilizing computers and the internet in the UM learning museum. This is in line with what was said by Horan "The process of digitization also provides a means for meta data and images to be distributed globally with the help of computer technology and the Internet" [9]. This method can create digital inheritance that can transfer meaning in a shorter and faster time. Digitization in the exhibition system in the learning museum can be used to transfer "values" to the meaning of the development of learning carried out by the Universitas Negeri Malang.

In the planning of digitizing the museum is done regularly. This process begins with a comparative study at several museums in Indonesia. including: Museum Anatomi Universitas Atmajaya, Museum Grha Literasi, Museum Perumusan Teks Proklamasi, Museum Gedung Sate, Museum Pendidikan Nasional, Bandung Planning Gallery, Museum Konferensi Asia Afrika, Museum Pendidikan Indonesia UNY, Museum Benteng Vredeburg, Museum of BPK-RI, and Museum Gunung Merapi. From the process of comparative studies conducted by most museums, they have digitized their collections using a variety of technologies including: Augmented Reality, Virtual Reality, Animated Video, QR Code, and Android.

The opportunity to develop museums in digital form is supported by the readiness of the community as visitors to utilize mobile phones and internet connections. This makes it easy to adjust, flexible in applying technology at the UM Learning Museum. Digitization can accelerate access to information about learning at UM. History records the journey of Universitas Negeri Malang from IKIP Malang to become icons and references in terms of learning, this can be proven by community college
memories about IKIP Malang. This must be able to be accommodated in the efforts of digital inheritance through digitizing the learning museum collections.

Challenges that have arisen in developing digital museums include: 1) the high cost of maintaining equipment used to support the digitization of museum collections; 2) the high cost of developing digital media; 3) building community awareness as visitors in maintaining museum collections in digital form; 4) digital transfer of value for museum visitors. The challenges can be anticipated by: 1) maintaining and maintaining equipment used regularly; 2) need to collaborate with other Departments of DKV, Engineering, and TEP to develop digital media in the future development of the museum; 3) use written and oral appeals to maintain museum collections. 4) educators are still needed in addition to visitors learning from the material content in the Museum.

Based on the opportunities and challenges of developing the museum, the museum team concretely seeks to develop the digitization of the UM museum. Concretely, the division of museum space for collection layout can be seen in Figure 2 below.

Figure 2. Design of Digitizing for Collection of UM Learning Museum Collection

3.2 Digital Design of Exhibition Room in the UM History Room

This first exhibition space relates to the historical narratives of the leadership of the Universitas Negeri Malang from PTPG Malang in 1954 to becoming the IKIP NEGERI MALANG in 1963. By presenting various information about his achievements and life history, an interesting media is needed to be used as a show-off object. This of course will also make it easier for visitors to understand and choose information according to their wants and needs. The design of this space digitization is by using Adobe Flash, which is the main program for a complete design in making games, learning media, mobile content applications, and desktop applications [10].

The purpose of choosing Adobe Flash media is to display and provide information about a number of chancellors who have led Universitas Negeri Malang along with the outstanding achievements achieved during its leadership. Using Adobe Flash will change information media to be more interactive, so visitors can directly be involved in the operation of Flash media by selecting the desired information. Based on observations at the Museum Gedung Sate and the Museum BPK- RI, an interactive media for visitors will be made in the form of Macromedia Flash-based touchscreen media which will combined with audio, containing explanations about the history and achievements of the rectors of Universitas Negeri Malang. The form of the design can be seen as follows.
3.3 Digitization in the Exhibition Room Performance Profile UM

The Achievement Profile Room contains narratives about all forms of achievement related to the work of Universitas Negeri Malang in the national and international levels. In addition, there are also logos and various attributes used for the graduation process. The logo of Universitas Negeri Malang is also attached along with the vision and mission of the university. The digitization design in the exhibition room UM Achievement Profile uses Virtual Reality technology. Virtual reality is a technology that allows users to interact with an environment that is simulated by a computer, an actual environment that is emulated or an environment that only exists in the imagination [11]. Collaborated with 360° camera technology, this VR will contain the environment of Universitas Negeri Malang. It is intended that visitors feel the sensation of going around Universitas Negeri Malang only from the Learning Museum and it also could introduce Universitas Negeri Malang to visitors.

Figure 3. Display of the Rector History of Digitization Design in the Form of Flash Media

Figure 4. Display of Virtual Reality Material in the 1st Museum Collection Room

In the design of virtual reality will be made so that visitors can explore the scenery around the museum. The planned virtual reality trip will provide an overview for visitors through the entrance of JL.
Semarang with views of 8 faculties at UM from above, followed by entering per room from the main entrance, the rector's room, exemplary crew, UM profile, UM inspirational figures, media, and learning resources, and future of UM.

This room will also be equipped with VR glasses and also a replica of a hot air balloon that is useful to be a place for visitors to enjoy the sensation of a tour around Universitas Negeri Malang using Virtual Reality. It is intended that visitors can maintain their body balance when wearing the VR glasses. This technology was chosen because it can provide virtual reality and the sensation of being in another dimension. The placement of VR technology in this room serves as an introduction to the environment of Universitas Negeri Malang to visitors.

3.4 Digitizing the Museum Building with Virtual Reality Applications

At the entrance of the showroom of the Learning Museum of Universitas Negeri Malang, there is a Museum maps that is on the wall in 2D. This maps is considered not seen and utilized by visitors. Even though the maps is useful as a navigation for traveling at the UM Learning Museum. Based on observations to the BPK-RI Museum on August 30, 2019, there was an Augmented Reality technology that was used to support the explanation of historic buildings in Magelang, a 3D floor plan based on Augmented Reality that could be utilized directly by visitors.

Augmented Reality is defined as a technology that combines two-dimensional and or three-dimensional virtual objects into a three-dimensional real environment and then projects these objects in a real environment [12]. The Augmented Reality design that will be developed can be seen in the following image.

![Figure 5. Display Examples of Augmented Reality Designs at UM Museum](image)

The development of Augmented Reality technology provides an opportunity for visitors to know the description of the Learning Museum of Universitas Negeri Malang so that the process of getting information becomes easier. Placement of the maps with Augmented Reality technology will be installed at the front of the museum before the entrance. This allows visitors to get to know the entire contents and flow that is presented at the Learning Museum of Universitas Negeri Malang. Augmented Reality technology is very good if it is used on a learning media or catalog because it can combine the virtual world with the real environment [13].

Augmented Reality will be made so that visitors can have a more concrete picture of important buildings in the UM environment. There are 5 Augmented Reality developed, namely: 1) Gedung Utama, the old rector building in A2; 2) The new main rector building; 3) UM mosque; 4) Splendid UM; 5) Museum Building. In addition, there is an Augmented Reality frame that can be used as a photo spot with an overview of the learning process at UM by highlighting the work of UM figures namely Bu Supartinah Pakasi with the IIN AAN reading method. The selection of this design is done so that visitors get a concrete picture of learning to read before the method "INI IBU BUDI".

3.5 Making a Museum Profile Video

As a place for education, conservation and recreation, the Learning Museum of Universitas Negeri Malang needs to introduce a variety of exhibiting objects, goals, and various activities in it to give a general picture
to the public so they are interested in getting to know more about the Learning Museum of Universitas Negeri Malang. In addition to going through brochures, another way to do it is to create a museum profile. Making a museum profile video is intended for promotional media and business media in the form of a "company profile video". A company profile video is an effective media to promote the program companies, products and the potential needs of an area [14]. The application in the learning museum is used as a media to increase the community visits the museum. In line with this Munir asserts that this type of video is linear multimedia or called interactive media which is needed to explain content to be more detailed and more accurate [15]. It is hoped that visitors will get a concrete picture of the museum section per room and the history of the formation of the UM learning museum.

In the current era of technological development, the world of companies and organizations began to use information technology as a tool to introduce and advance their companies [16]. Through the making of the museum profile video is one form of public relations that represents an organization. Audiovisual media is used to convey directly the information available to visitors. Making a museum profile video is done to introduce the museum to the younger generation through digital pages. The video profile also explained the contents of the museum from the beginning of the development, inauguration, as well as a detailed part of the UM learning museum, the form of activities and vision and mission as well as the purpose of establishing the UM Museum. Through the profile video, the public will get a complete picture of the contents of the UM Learning Museum. The video content developed will later be uploaded to YouTube and other social media. For example, the design of a video museum can be seen as follows.

In this case, the Learning Museum Profile of Universitas Negeri Malang Video will be made, which will later display various activities and progress of the learning museum. Video Design Museum profile is divided into several scenes including: 1) Background of the establishment of the museum; 2) details of the division of the museum room; 3) an important part of the most prominent the Learning Museum of Universitas Negeri Malang; 4) the Learning Museum of Universitas Negeri Malang in the future, is intended to provide an overview of the development of the museum; 5) closing invitation to the importance of visiting the Museum is taken from the testimony of museum visitors.

3.6 P4 Simulation Design in the Audiovisual Exhibition Room

Audiovisual Room, Universitas Negeri Malang in the form of interactive audiovisual based on interactive learning processes. This room displays various types of items related to audio and visual media. A variety of cameras, mixers, filters and various other multimedia tools. By emphasizing the P4 simulation, this room will later become one of the spaces with P4 simulation that will be collaborated with existing technology (audiovisual). It is intended that the public can feel the sensation of teaching based on P4 Simulation.
P4 game simulation method is a method which is a combination of role-playing with discussion activities that are always linked and colored with P4. This game method is a P4 correctional effort which is a process of activities by including the message elements discussed, a set of equipment, as well as the method or rules of simulation that are planned through deliberation. The purpose of this P4 Simulation game is to instill understanding and raise awareness of the participants of the production process to participate in practicing Pancasila. The plans for the digital development of some of the Pancasila in the museum can be seen in the following figure.

![Figure 7. Simulated Design of Pancasila at the Learning Museum](image)

The function of the P4 Simulation game is to convey information, train participants to dare to express opinions and listen to the opinions of others, as well as thinking skills. It also serves to arouse the participants' awareness of themselves and the surrounding situation. This game also aims to produce outcomes that have a mental attitude of courage to argue, argue, dare to answer and dare to accept new ideas in the form of development policies and so forth.

3.7 Making Games in the Future UM Exhibition Room

In the last room of the UM Learning Museum, the narration was presented based on an artificial data design that symbolizes the atmosphere of Universitas Negeri Malang towards the future. This space will also be given a digital touch through Flash media that will feature simple games that can stimulate interaction between visitors and the museum's layout. The game created is simple in the form of guessing the words of some questions related to the museum.

Based on observations carried out on August 28, 2019, at the Bandung Planning Gallery and the Museum BPK-RI, there is an interactive game that involves visitors directly. The types of games on display are personality games that tend to be easily played by the visitors. So that the personality game can be one of inspiration in developing the Learning Museum of Universitas Negeri Malang. Concretely the planning of animation game design in the future of Universitas Negeri Malang room can be seen as follows. Games are very useful in a class because they “provide an opportunity for students to use their language in a less formal situation” [17], without the pressure of doing it absolutely rightly or not, but with the enthusiasm for winning the game, as well as practicing the critical thinking and the excitement.
Figure 8. Display Design of UM Learning Museum Animation Game

The personality game that will be developed at the UM museum can give an idea of the identity of visitors in filling the game adapted to the scientific field at the Universitas Negeri Malang which is divided into 8 faculties. Visitors will be invited to play the role of being students of one of the majors at UM. Digitizing games is created using the Animation Game application. The game provides a template about the attributes of clothes and tools that became the study program's inventor at UM. If they succeed in answering the question given, there will be a reward in the form of a photo with a frame that they can adjust and the results are sent via visitor's email and can be printed on the spot.

4. Conclusions

Through this paper can provide a concrete picture of the planning of the learning museum of Universitas Negeri Malang digitization. The digitization of museum collection is the most popular technology to introduce the museum so that it is more widely used as a means of education, conservation, and recreation. This is intended to periodically erase the impression that the museum is only a place to store ancient objects. The museum should move to adjust the development of information technology so as not to lose visitors. Museums and technology can be a bridge of cultural heritage and learning for the next generation to see the development of learning in Indonesia. For the learning museum to provide a transfer of value to visitors, it should be continued that the study of the museum involves not only historians but also academics from representatives of each faculty. The aim is that the digitization of the museum can illustrate the uniqueness and uniqueness of each faculty so that it can provide an overview of the journey of the Universitas Negeri Malang in cross-times.

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References

[1] Harari Y N 2013 Sapiens A Brief History of Humankind, (Tangerang: PT Pustaka Alvabet Anggota IKAPI)
[2] Amelola S & Nugraha H D 2013 Perkembangan Media Informasi Teknologi Terhadap Anak Dalam Era Globalisasi. Pros. The 5th International Conference on Indonesian Studies: “Ethnicity and Globalization”
[3] Indria I A G M 2016 Revitalisasi Museum Manusia Purba Gilimanuk: Revitalization Of Ancient Man Museum Of Gilimanuk. Jurnal Forum Arkeologi. 147-158 29 3
[4] Arinze E N 1999 The Role of the Museum in Society (Public lecture at the National Museum, Georgetown, Guyana)
[5] Bay H 2014 Interactive Museum Guide: Fast And Robust Recognition Of Museum Objects, (Computer Vision Laboratory (BIWI), ETH Zurich, Switzerland)
[6] Sumardio Bambang 1997 Bunga Rampal Permuseuman (Departemen Pendidikan dan Kebudayaan Direktorat Jenderal Kebudayaan, Direktorat Permuseuman)
[7] Prasetyawan Daru amd Mulyanto Agus 2010 Digitalisasi Koleksi Museum dengan Aplikasi E-Kios
(Studi Kasus Museum Sonobudoyo Yogyakarta) (Yogyakarta: Seminar Nasional Aplikasi Teknologi Informasi, SNATI)

[8] Mulyadi Mohammad 2012 Riset Desain dalam Metodologi Penelitian. Jurnal Studi Komunikasi dan Media. 71-80

[9] Horan Genevieve A 2013 Digital Heritage: Digitization of Museum and Archival Collections. (Department of Political Science in the Graduate School Southern Illinois University Carbondale)

[10] Gerantabe F and Aquent Creative Team 2008 Adobe Flash Profesional Digital Classroom. (Canada: Willey Publishing)

[11] Sihite B 2013 Pembuatan Aplikasi 3D Viewer Mobile dengan Menggunakan Teknologi Virtual Reality Jurnal Teknik POMITS A397-A400

[12] Azuma R T 2013 A Survey of Augmented Reality. Pres. Tel and Vir. Env 355-385

[13] Wardani, S. 2015. Pemanfaatan Teknologi Augmented Reality (AR) Untuk Pengenalan Aksara Jawa Pada Anak. Jurnal Teknologi, 104-111

[14] Irfan, Mohammad. 2013 Pembuatan Video company Profile Pada Belukar Mach Dikelurahan Jayengan Kecamatan Serangan Kota Salakarta. Jurnal FTI UNSA 121

[15] Munir 2013 Multimedia Konsep dan Aplikasi Dalam Pendidikan (Bandung: Alfabeta)

[16] Astutik Novi P 2009 Pembuatan Multimedia Company Profile Balai Riset Perikanan Budidaya Air Tawar (Project Report. IPB)

[17] Carrier Michael and The Centre for British Teachers 1980 Takes 5 Games and Activities for the Language Learner (London: Nelson)