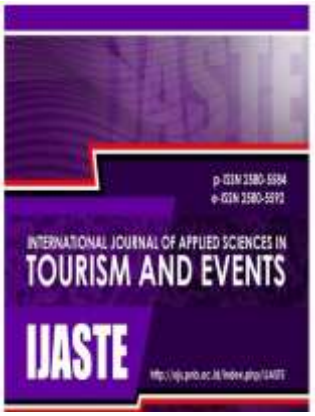
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The Application of Technology in Museums

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Abstract

Purpose: This research set an objective to answer how could technology is applied in museum to encourage interest of tourist to visit museum as destination.

Research methods: Research has been done through Focus Group Discussion (FGD) and depth observation conducted on January 2020, in Jakarta. Nine informants/participants involved during FGD, including 5 museums (public and private), 2 technology providers, and 1 museum users community.

Results and discussions: Strong cooperation between museums and technology providers have been elaborated, in several museums in Jakarta. Both parties will try to add more platforms through video mapping application, projection mapping, virtual tour, and internet of things (IoT) operations. Process of increasing experience and immersion encounters obstacles, to provide additional experience to visitors, so that all five senses that exist in visitors, can enjoy all museum collection.

Conclusion: Technology could embrace interaction and immersion to add more experience value on visitors. Thus, tourism industry would be more attractive with the presences of museums.

Keywords: *immersion, interaction, experience, museum, technology*

INTRODUCTION

In relation to cultural tourism, the existence of museums is believed to be a core for cultural development process and human civilization, at the same time. With collections in form of historical objects, as well as objects related to human culture, museums have taken an important role in providing education, especially for tourists who visiting a destination. In its function in terms of cultural education, museum also holds an important function to inherit values from past life. Through the museum, there is a bridge of inheriting culture from previous generation to the next generation. Museum also made people and tourists aware about how importance is of preserving a value from the past to the modern era. As mentioned by Absalyamova (2015) that museum preserves and maintains the diversity of cultural heritage as a resource for sustainable tourism development.

Thus, the importance of a tangible high-value collection from the previous era to the current era, Ministry of Tourism was aggressively carrying out museum-based tourism development. State government also sees the existing museums abroad, where museums often become more than just tourist destinations, but also historical studies of human anthropology, such as Louvre Museum in France, Terracotta Museum in China, Rijksmuseum in Netherlands, British Museum in United Kingdom, and the Pergamon Museum in Germany. This is what the Ministry of Tourism looks at as one of opportunities and strategies by implementing culture-based sustainable tourism. Then, finally number of museum collections is growing. The establishment of museum was also carried out by involving private sector, in

every province in Indonesia. Every activity for the sake of the activity is designed by using museum as event venue.

Among many areas that are considered as leading tourism destinations in Indonesia, Jakarta stands as one of the most popular tourist destinations particularly for education purposes. A report from the Ministry of Education and Culture (2019) reveals that there is a total of 453 museums in Indonesia. Forty-two of them are general museums, while the rest is specialized or themed museums. Mostly the museums are concentrated in Java region, with DKI Jakarta (64 museums) and Central Java (54 museums) as the leading cities. Based on the ownership, museums can be classified into three types: (1) national government & provincial government museum; (2) regional government museum; and (3) private museum.

Government regulation stated that museums must be standardized. However, according to the last report, there are only 102 museums that have been standardized, while the other 351 museums are not yet evaluated. The result shows that 27 museums in the A grade, 29 museums are in the B grade, and 46 museums are in the C grade, which means that they still need a lot of improvement to achieve the intended quality.

Museum conditions who have lacks innovation, has implications for the declining number in interest of tourists to come and dig deeper into the collections in the museum. Innovations in museums have begun in several developed countries. In Louvre museum, the use of technology has been done by using audiovisual media in several types of collections. One form of technology use in an art performance with exhibition-based is also done in a mall in Jakarta, called Galeri Indonesia Kaya. The form of innovation carried out in this art exhibition uses the artificial intelligence method. Artificial intelligence assists to emphasize the creation of intelligent machines that work and react like humans. As Zhao (2012) mentioned that technology could enhance interactive environment established at virtual museum.

The two forms of innovation that have been carried out by the art exhibition performance form should also be replicated by other museums in Indonesia, especially those that do have a fairly high cultural collection. It cannot be denied the dependence of tourism in Indonesia on culture itself. But it cannot be ignored that cultural preservation in Indonesia will be very difficult to do without the help of technology. Artificial Intelligence technology will certainly provide the innovation and novelty of the museum as a destination in Indonesia. As Pallud (2017) described that museum should be placed as a cultural learning center. The interaction with technology as being intuitive and interactive, will make visitors experience higher levels of cognitive engagement, cultural engagement, and thereby ensuring positive learning experiences.

The origin of the museum can be traced back to the establishment of kuntskammer or cabinet of curiosities in the 16th Century (Richman-Abdou, 2018). Owned by the noble and the elite, the purpose of kuntskammer was to collect natural objects, manuscripts, and artefacts from different areas or continents as a private collection of the owner. There was no special interest and classification of the collection since it was mainly used as a storage room for the wealthiest to enhance their social status.

The transition between private collections to public collection begun in the 18th century. At this period, many famous museums were built, such as the British museum that made more than 71,000 objects collected by Sir Hans Sloane accessible to the public (British Museum, 2019). From then on, the collection keeps expanding. Afterwards, the formerly random collections started to be more systematic and the purpose for social status changed into a means of acquiring knowledge. It possessed a greater purpose rather than just satisfying an individual.

When museums first transformed into a public institution, the main purpose is for education and communicate the object to visitors. According to Anderson, Ed. (2012) the functions of museums are to collect, preserve, and interpret objects with additional benefits for leisure, socialization, and relaxation. Meanwhile, Pekarik et al. (1999) and Silverman (2002) add other functions namely introspective and therapeutic respectively. Considering this, there is a shift from an internal focus to an external focus on the visitors' experience. In contrast with the previous approach which brought the collection to the public, nowadays,

visitors' demands, and interests can influence the development process of a museum in terms of theme, collection, and other related strategies.

In 2015, the Ministry of Education and Culture succeeded in persuading the government to release a Government Regulation (Peraturan Pemerintah) No. 66 related to museums to enhance the development of the museum sector. According to this regulation, there is a tangible and intangible heritage. Under the tangible heritage, there are cultural heritage object and museum. In Indonesia, the three main purposes of museums are for research, education, and entertainment.

Besides the certification, UNESCO and the late Ministry of Culture and Tourism (2011) have collaborated to make 'Practical Guide for Museum Revitalization in Indonesia' strategic planning report to aid the improvement of local museums. There are also several initiatives to promote traditional culture and museums in Indonesia, for example, Komunitas Historia Indonesia (Indonesian Historical Community), Asosiasi Museum Indonesia (Indonesian Museum Association), and Indonesian Heritage Society. One of the most unique programs by Komunitas Historia Indonesia is "Menginap di Museum" where participants spend the night in a museum while learning about the museum and building network with fellow museum enthusiast.

Thomas and Brown (2001) believe that in the 21st century, learning will move beyond the classroom. In the digital age, information and knowledge are cheap and easy to access without social or locational barrier. In other words, people do not have to visit a brick and mortar building, be it a classroom or a museum, to satisfy their curiosities. With a swap of fingers, all the information needed is already available. Other methods of learning such Massive Open Online Courses (MOOC), using creative commons, and digital library enable people to learn faster. Moreover, in terms of entertainment, besides competing with other tourist attractions like cinema and theme park, museums also compete with in-house leisure activities such as watching Netflix or playing games.

This situation raises a challenge, what can museums offer in the 21st century, both in terms of education and entertainment? How can we incorporate technology in the museums? How can we use it to help museums to overcome this challenge instead of making people stray away from the museum?

Additionally, visiting a museum often comes with many boundaries such as to not touch the object, to not take a picture, and there is a notable distance between the objects and the visitors. Mostly the experience relies on one sense only, namely seeing, whether it is seeing the object or reading the explanation text. However, considering the previous challenges, it is important for museums to design the exhibition with laboratory mindset (Armstrong, Howes, and Woon, 2015) so that the visitors may utilize several methods of learning: listening, sharing, making, comparing, critiquing, and meaning-making.

Visitors should be able to actively participate in the exhibition and engage with objects kinaesthetically or cognitively, thus creating an experiential museum (Hein, 2006). If visitors can get a one-of-a-kind experience by visiting the museums, it will be a unique selling point for the museums to compete. Besides the interaction between the visitor and the display, Mouw (2015) explains that interaction between the visitor and other visitors is much needed to form a lively sense of community.

Virtual Reality (VR) technology aims to provide an immersive environment that can enhance the storytelling process. Although the term is getting popular these days, there are still difficulties to classify the types. It led Carozzino and Bergamasco (2010) to create a taxonomy of VR devices based on the interaction axis (non-interaction, device-based interaction, natural interaction) and immersion axis (non-immersive, low immersion, high immersion). Immersion can be evaluated from visual, acoustic, haptics, and motion.

Another similar study proposed by Beck, Rainoldi, and Egger (2017) classified virtual reality systems in tourism into three categories based on immersion and presence: non-immersive (within a screen), semi-immersive (projected into a huge screen or a wall), and fully immersive (with a headset such as Google Cardboard or Oculus Rift). Considering this, many display systems and installations can be classified as virtual reality technology although the degree of interaction and immersion may vary. Even Augmented Reality (AR) can be

considered as a non-immersive VR with device-based interaction, but with emphasizes on the combination of the actual and virtual world.

These are four examples of museums that utilize virtual reality technology to leverage visitors' interaction and experience. The most basic display system that can be used to improve interaction in the museum is a multi-touch table or screen. Hornecker (2008) did a research of visitors' participation in using 'Tree of Life' table at the Berlin Museum of National History, otherwise known as Museum für Naturkunde Berlin. The table provides interactive information and mini-quiz so that visitors can learn while playing. Even though the research found out that not all users improve their understandings about the exhibit, the visitors, especially the younger demographic, still find the experience fun. However, most of the senior users felt that installation is overwhelming.

VR technology to help immersive storytelling can be seen in This Must Be Hell installation at Minnesota Historical Center (Mouw, 2015, p.102). The installation illustrated the horror of World War II D-Day by using a prototype of a paratrooper plane. Visitors can step inside the plane to watch a video of the war on the cabin walls and take a look at the digital scenery from the window. The ambience was created to help visitors to imagine themselves inside the war, empathize with the victims, and evoke an emotional response to provide an engaging experience.

It is important to preserve heritage for future generations. According to that, some heritage sites have limited access or prohibit access from the public because of the fragility of the objects, including Cave 220 at Dunhuang, China. The Pure Land AR installation provides a solution for that (Kenderdine and Shaw, 2015, p.206). The developer took panoramic pictures of the cave then integrate it with the augmented reality system. When visitors using an application on their mobile device to scan the room, they can see the wall paintings of the cave. It requires active participation from the visitors to track the whole paintings in the cave. Besides that, a visitor in any part of the world can take a tour to the Cave 220 even without visiting China.

In Taiwan, Din, Bailey, and Lin (2015, p.141) used technology to raise awareness for heritage preservation in Yuan Min Yuan site with Qing Emperors' Splendid Gardens exhibition. One of the installations was built based on the Qianlong Emperor's Southern Inspection Tour scroll that was enlarged and then projected on the wall. Furthermore, the 'interactive displays use a sensory device to trigger descriptions of different sceneries, locations, shops, activities, and imitate daily conversations among people from the scroll.'

In Indonesia, there are several national and private museums that utilize digital technology in their displays or installations, namely: Museum Nasional Indonesia (Jakarta), Galeri Indonesia Kaya (Jakarta), Museum Gedung Sate (Bandung), Trupark Museum (Cirebon), History of Java Museum (Bantul), Museum BPK RI (Magelang), Indonesian Heritage Museum (Batu). All museums are located in DKI Jakarta and Java.

According to the observation, most of the technologically advanced museums are private museums with paid or free entrance. For example, Museum BPK RI and Monster AR—as the developer—have created a set of augmented reality/non-immersive virtual reality installations where visitors can interact with the touch screen, play games, and see 3D figures of important buildings. Besides that, Monster AR has a museum digitalization program. They will provide a free consultation, free concept design, and free budget estimation for Indonesian museums (Monster AR, 2019).

Based on those backgrounds, this research set an objective to answer how could technology applied in museum. The researcher argues that this research is important and urgent to be conducted by considering that this can be a pilot project in order to explore the side of innovation and creativity in the museums in Indonesia. At the same time, this research certainly can be a guide for using technology application, in the form of museum collections based on other kind of exhibitions. Thus, through this research, there will be a higher interest in getting to know how culture and history of the Indonesian people are, increasing interests in visiting a museum, and improving level of tourism growth in an area.

RESEARCH METHODS

This research is conducted by using a qualitative research approach. This research will analyse how do some museums in Jakarta provide technology influences towards cultural arts at the museum. Meanwhile, this research find some challenges and solutions on the technology application. The approach will be taken by looking at phenomena as a whole and deep through focus group discussion (FGD) activities and observations as a form of additional data collection. Pre-research has been taken in Galeri Indonesia Kaya, at Grand Indonesia, Jakarta as one of a corporation who promotes integration between artificial intelligence technology and cultural tourism. Pre-research has found that an artificial intelligence technology could upscale visitor's experience during their visit at a cultural arts destination.

Data was collected through a focus group discussion (FGD) by inviting several relevant participants. FGD defined as a way of collecting qualitative data, which involves engaging small number of people, focused around a particular topic, or set of issues, where facilitator or moderator, could stimulate between participants, to produce an interactive encounter (Wilkinson, 2004). During the FGD, researchers stand as moderators, to create group interactions, to have widens range of responses, to answer a broad research objective.

FGD process has begun by deciding target informants or participants, to contact, arrange schedule, and delivering some terms of references. All questions during FGD have been categorized by type of participants. Most of the questions are related with possible ways to construct and apply technology at the museum.

All participants are divided into three main categories. First category is the museum, who have used, either completely or in partial way, technology application at their museum. Second category is the technology developer, in particular the virtual and augmented reality, and have done several projects at the museum. Third category is the museum users. From museums, there are five museums who present during the FGD, namely Museum Macan, Museum Bank Indonesia, Museum Nasional, Galeri Nasional, and Museum 3D Magic Art. From the second category, there are 9 Matahari and Monster AR who attended the FGD. And from third category, represented by Komunitas Historia Indonesia. All questions discussed during this FGD, have been formulated, and terms of references has been sent to all participants, several days prior to the event.

Data analysis will be conducted descriptively qualitatively by also applying some relevant theories, especially regarding the theory of application for artificial intelligence at the museum. Secondary data in the form of statistics and numbers will be elaborated and analyzed more deeply, so as to find a correlation and its relationship with the formulation of the problem. After all data has been collected, it will then be analyzed using qualitative descriptive. The process begins with data verification, data reduction, data presentation, and then drawing conclusions. In addition, analysis in the form of comments or suggestions will also be concluded to be a recommendation in reviewing the application of technology in museum.

RESULT AND DISCUSSIONS

Based on the results of this research through a focus group discussion, several FGD participants conveyed several conditions related to technology applications that had been created and implemented. In first participant category, FGD participants came from museums, represented by the Head of Museum or another representative. There are five museums joint the discussion, including Museum Macan, Museum Bank Indonesia, Museum 3D Magic Art, Galeri Nasional, and Museum Nasional. From Museum Macan, it was conveyed that this museum currently has 800 collections of art works, mainly paintings. Technology applications have been run at this museum, is focusing on the Art Plus application program. This application is being used, in addition to the value of visitor immersive experience. Another technology which is also used are the security functions. This security functions are conducted through CCTV cameras and RF.ID applications. From the experience of the Museum Macan, technology is seen to have a very positive impact on their collection's safety.

The next participant is Museum Bank Indonesia. This museum has lots of collections are in the form of money and pennies, which is still related to banking activities. Current

technology applications have begun to be used for the process of recording collections owned by Bank Indonesia. In activating the technology application, Museum Bank Indonesia has worked together with Monster AR and 9 Matahari, in particular during technological developing process. Other technology applications which have been used are interactive media, which is implemented through sensory models, by using special applications. In the meantime, Museum Bank Indonesia plans to continue its video mapping project, to increase the visitor's immersive and interaction experience at this museum.

The third museum that participated during FGD and shared its experience is Museum 3 D Magic Art. This museum has some collection of paintings by six painters, from South Korea and four street painters, around the typical tourist destination of Jakarta, Kota Tua. The technology applications currently being used by this museum, is in brightness and lighting technology system, in various collections of paintings. This museum believes that through this technology, they could add device-based interaction, and increase high immersion of their collections.

The fourth participant from the museum is Galeri Nasional. At the moment, Galeri Nasional has 1,800 collections which are dominated by art forms. Their first technology application which currently being used is a database system, which has been carried out via integration through security and conservation. Another technology application is Google 360, which could add more visual immersions to their potential visitors. This application provides visitors with a virtual tour experience. They have been working in collaboration with Google Indonesia. This gallery also builds up third technology application by using their security technology, which uses CCTV cameras. It is currently used for collection's security.

The last museum is Museum Nasional, which stands as a museum that being regulated and managed by central government. This museum has some very diverse collections, ranging from historical relics of Indonesia since prehistoric times to modern times. Museum Nasional considered as museum with the most complete collections in Indonesia. Some technology has been applied by Museum Nasional. First technology is collection database, to keep the management updated with current collection. For second technology application, carried out during process of data collection objects, which will facilitate the searching process and controlling objects during data collection. This process is carried out through a data mutation process. The third technology application, is the implementation of Google Street View, as a collaboration with Google Art Institute. The fourth technology application, is a pilot project, by developing story-based narrative technology in each of the existing collections. This technology will encounter haptics and real objects, increase visual immersions, and create device-based interaction.

The second category of informants who took part during FGD process, to map technology applications in the museum, is technology developer companies. The first informant from this category is 9 Matahari. This company has developed many types of technology, including at Museum Bank Indonesia, and more specifically in the field of Virtual Reality and Augmented Reality. However, for now, 9 Matahari is focusing on developing various types of new technology, projection mapping, in particular. Projection mapping, which is a type of projection technique which is usually used to turn objects, and often by irregularly shaped, into a display surface for video projection. These objects may be complex industrial landscapes, such as buildings, small indoor objects or theatrical stages. Since then, the 9 Matahari has always been consistently in working with museums, such as Museum Fatahillah and Museum Bank Indonesia, in supporting the visitor's experience. Current mission of 9 Matahari is to develop several museums as a strong vehicle for tourism, especially in Jakarta. 9 Matahari realizes that the museum's biggest challenge in applying technology is the budget, which is released by its shareholders.

Another technology application developer invited on discussion is Monster AR. The technology that has been developed by Monster AR is using Augmented Reality and Virtual Reality in increasing user experience, not only in museums, but also in public spaces. The Mixed Reality is a new form of technology that will be developed in the next phase. Monster AR believes that content is a major challenge in technology development, nowadays. This challenge requires collaboration between users and developers. In its prediction, Monster AR

estimates that the Internet of Things (IoT) would be the next trend in technology applications. In order to help the museum, Monster AR is being committed to the campaign, called Gerakan Digitalisasi Museum. This campaign will include free consultations, free concepts, and free cost estimates, for museums who eager to apply technology.

The third category participating in this FGD is the museum-loving community, represented by the Komunitas Historia Indonesia. Komunitas Historia Indonesia has desire on technology applications to be developed immediately at the museum, to invite the public as well as tourists to travel to the museum. This community exemplifies several museums abroad, which succeeded in adding more applicable technology to the experience of the visitors, through virtual reality. Collaboration between the museum and technology providers should be facilitated by the government, in this occasion, is Ministry of Tourism. One pillar that could be prepared is to construct The Law of Museum.

To realize the application of technology in the museum, all stakeholders will face several challenges. The first challenge obtained during discussion is an external challenge, which is there is still no integration between the museums and other stakeholders, in this case the integration between directorate of culture and tourism. In the discussion, solution which could be used to overcome this external challenge by establishing a Museum Organization, under the Ministry of Education and Culture (Kementerian Pendidikan dan Kebudayaan). This organization will be part of directorate of the ministries, with the tasks including: making the Law of Museum (Undang-Undang Museum). This organization will assist any licensing process of the museum's establishment, as well as conducting standardization and quality control, and also could stand as a bridge to collaborate with other outside parties. This organization could connect all museums in Indonesia, especially museums which are located in similar area (for example in Jakarta or in Bandung), so that visitors can buy tickets through one merchant. The third solution is to connect the museum in an area, with other non-museum tourist destinations. These three solutions are supported by an opportunity as tourism will be Indonesia's biggest foreign exchange contribution, in the near future. Moreover, there are many programs related to historical activities and cultural activities carried out by the government, in the framework of 75 years of Indonesia's independence in 2020.

The second challenge is human resources quality. Museum management board has delivered several complain about the quality of curators who play a significant role during managing the museum. Curator is currently seen to be not familiar with development of technology and its benefits for museum's collection. Solution raised during discussion is by providing education (both from historian community and universities) related to technology that can be implemented. Technology applications should be applied in museums to increase visitor experience, human interaction, and visitor's immersion. This education process can be accompanied by providing examples of technology applications in museums abroad. These museums can collaborate and consult with universities, or the historian community in making proposals, for technology applications. In addition, these museums can take advantage of free consultation programs offered, such as 'Digitalisasi Museum' which is initiated by Monster AR.

The third challenge occurred is archiving and database collection security. Digitizing archives process can be the moment of first technology application strategy, which could be implemented. The museum can consistently scan the objects with a 3D scanner, so that all data collections will be stored not only in the form of photos or dual dimensions. These data do not need to be recorded manually, and data collection process is not only recorded in series, but object per object. One application that can be used to facilitate database recording and provenance is Artplus Application. And an application that can be used for tracking process is RFID Tracking. RFID Tracking can be object tracking, especially if these objects are often moved or lent outside the museum. Data and object security in the museum will be more assured with both applications. However, the use of CCTV cameras is still highly recommended, to be accompanied by regulations governing the safety of collection items.

The fourth challenge most often experienced by museums is limited of funds. Museums also face financial stability and difficulties. The process of implementing technology in a museum certainly requires commitment from all museum stakeholders and requires funding sponsors. The search for sponsors could be done in parallel with an increase of level

of tourist who visits the museum. Financial management is extremely important to keep the stability of museum's financial condition. Regular events can also increase museum revenue. Most museums in Indonesia have very cheap entry tickets. Currently, the cheapest museum ticket is Museum Aceh, which is only fifteen hundred rupiah. The most expensive museum ticket price is Museum Hari Darsono, which reaches two hundred and fifty thousand rupiahs.

The fifth challenge found in this study is access difficulty to the museum, or museum position in a less strategic location. As solution, the ticket purchase process, which is still conventional, can actually be integrated with the payment application model that is commonly done by the public, such as Ovo or GoPay. The museum can work with online ticket sites which are widely used by travelers when they are traveling. Purchasing museum tickets can actually be integrated with the purchase of travel tickets, event tickets, or tour packages. In the current era of social media, museums are also required to have attractive and regular tour packages, which can be communicated on social media.

The sixth challenge raise by the museum users or visitor's point of view. Survey results from museums indeed indicate that visitors are less interested in visiting museum. Visitors feel bored because they do not feel entertained while in the museum. On the other hand, visitors still do not understand the information/messages to be conveyed, and do not feel educated after visiting the museum. Museums need to rethink to combine both the entertainment and education dimensions, through technological interventions by making interactive installations. One game application has been done at Museum Bank Indonesia, where visitors can use their kinetic and psychomotor senses in a game. Technology actually performs as a tool, so indeed it is more important to inaugurate content in museum objects properly. Another solution is to create visual dynamic, based on technology through virtual reality so that even if visitors are static (examples stand in one location), they can feel dynamic experience (examples of application can be seen in 'Journey to the Center of the Earth' where the screen seems to bring visitors from the deepest layers of the Earth to outermost surface). Another possible technological application are the operation of touch screens, video mapping, and augmented reality, to take advantage of social media momentum, where documentation will become a free promotional tool. Creation of immersive experiences can be realized with an attractive ambience design. Thus, it can touch emotional side of visitors, through dramatic experiences. One implementation could be possible on 'War Collections', where visitors should feel panic and fear, experienced by the people at that time, from visual, kinetic, and smell.

Manually, visual dynamic can also be built by preparing temporary exhibitions which always change within a certain time period (outside of permanent exhibitions). This will make museum always able to offer new things. In the era of Artificial Intelligence technology, museums have been able to implement the Internet of Things (IoT), which means every installation or object can be related to other objects. All sensors in an object can be controlled from one place. IoT can also be operated through collaboration with telephone providers. Visitors can get notifications on their smartphones before and after visiting the museum. Although a tour guide is mandatory on visitor's experience, by IoT, museum can add more experience and interaction by preparing audio in the form of podcasts or applications. Audio content not only describe archaeological data, with a conservative way of description, but through storytelling with a casual description, for example 'Silent Walking Tour' application. Visitors can later use headsets whose voices are captured through radio waves.

Boredom of visitors can be overcome by improving the hospitality services of museum stakeholders. Hospitality can be commenced from the warmth of employees, greetings, smiles, and comfortable facilities such as clean toilets, fragrant lounges, and the attractiveness of public facilities. Technology application process through hospitality, can be carried out with the use of Augmented Reality technology as well, which is enabling to welcome visitors or through interactive map applications.

The seventh challenge is lack of evaluation process carried out by the museum to increase visitor satisfaction. Unlike hotels, restaurants, or tourist destinations, museum currently has not implemented an objective survey yet. Visitor evaluation process can be actually done through an application of artificial intelligence or chip processing. Through big data analytic system, visitor data will be processed, both from online ticket purchases, visitor

satisfaction surveys, engagement with display tools, and other data retrieval processes. Results will certainly be useful for experience design process, to formulate the upcoming product, and beneficial to provide a different side of engagement, according to the visitor's habits and interests. This will encourage the experience of visiting a museum which is not only general point of view, but personal.

The last challenge found was process of increasing experience and immersion. Technology developer also often encounters obstacles to provide additional experience to visitors, so that all five senses that exist in visitors, can enjoy all museum collection. For solution, museum should hold an event for the activation function, for example 'Night at the Museum' or 'Meet Me at the Museum' which has been initiated by Komunitas Historia Indonesia. Museums can also build café facilities, working space, study space, or rent out locations for other educational activities, so that museum's atmosphere will be more attractive. To invite visitors to learn about museum before making visitation, data access in virtual, or virtual visit, can be developed by museum. Museum can also apply technology, in building virtual museums or online exhibitions such as what has been generated by Museum Nasional, in collaboration with Google Art Institute. Websites, virtual data, and virtual museums can be utilized as method of promotion so that potential visitors can find big pictures related to museum collections. This will attract more visitors to travel to museum. On the other hand, museums can assist academics in carrying out research.

CONCLUSION

Strong cooperation between museums and technology providers has been elaborated, in particular in several museums in Jakarta. Augmented Reality and Virtual Reality are two most applications, adopted during these implementations. Meanwhile, museums have established several platforms for security and data collection purposes. Both parties will try to add more platforms through video mapping application, projection mapping, virtual tour, and internet of things (IoT) operations. Furthermore, technology providers have begun some persuasive actions, particularly through free digitalization campaign.

The collaboration should achieve requirements which have been set by stakeholders, including users or visitors themselves. Both museums and technology providers have to be ready with challenges. External challenges indicated by lack of integrated management, could be resolve through establishing new law of museum. Most of challenges are taking place in inside the museums. Three main obstacles faced are human resources quality, database security, and financial difficulties. Capacity building and synergy could be the solutions, involving historian community and academicians.

Most of other obstacles are felt by users or visitors. Survey results from museums indeed indicate that visitors are less interested in visiting museum. Visitors feel bored because they do not feel entertained while in the museum. Museum also located in lack of strategic area. Evaluation process has never been carried out by the museum to increase visitor satisfaction. Moreover, process of increasing experience and immersion encounters obstacles, to provide additional experience to visitors, so that all five senses that exist in visitors, can enjoy all museum collection. Technology could embrace interaction and immersion to add more experience value on visitors. Thus, tourism industry would be more attractive with the presences of museums.

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FIGURE AND TABLES

Table 1. List of Participants of Focus Group Discussion

Day, Date : Thursday, January 30th 2020
Time : 11.30 – 16.00
Location : Happy Room, Harris FX Sudirman – Jakarta
Topic : Technology Application in Museum

No	Name	Position	Type of Informant
1	Way Dwi Arifianto	Director (9 Matahari)	Technology Developer
2	Rizal Pamungkas	Director (Monster AR)	Technology Developer
3	Ernida Rere	Manager (Museum 3D Magic Art)	Museum Manager
4	Dandy Indarto	Manager (Museum Bank Indonesia)	Museum Manager
5	Bambang H.	IT Manager (Museum Macan)	Museum Manager
6	Ujang Mulyadi	Manager (Museum Nasional)	Museum Manager
7	Jarot Mahendra	Manager (Galeri Nasional)	Museum Manager
8	Furqon Abdurrazar	Staff (Monster AR)	Technology Developer
9	Asep Kambali	Komunitas Historia Indonesia	Museum User
10	Peni Zulandari S.	Universitas Prasetiya Mulya	Moderator
11	Made Handijaya D.	Universitas Prasetiya Mulya	Moderator
12	Aulia Ardista W.	Universitas Prasetiya Mulya	Moderator
13	Ida Bagus Agastya	Universitas Prasetiya Mulya	Assistant Researcher

Figure 1. Ideas from FGD Participants

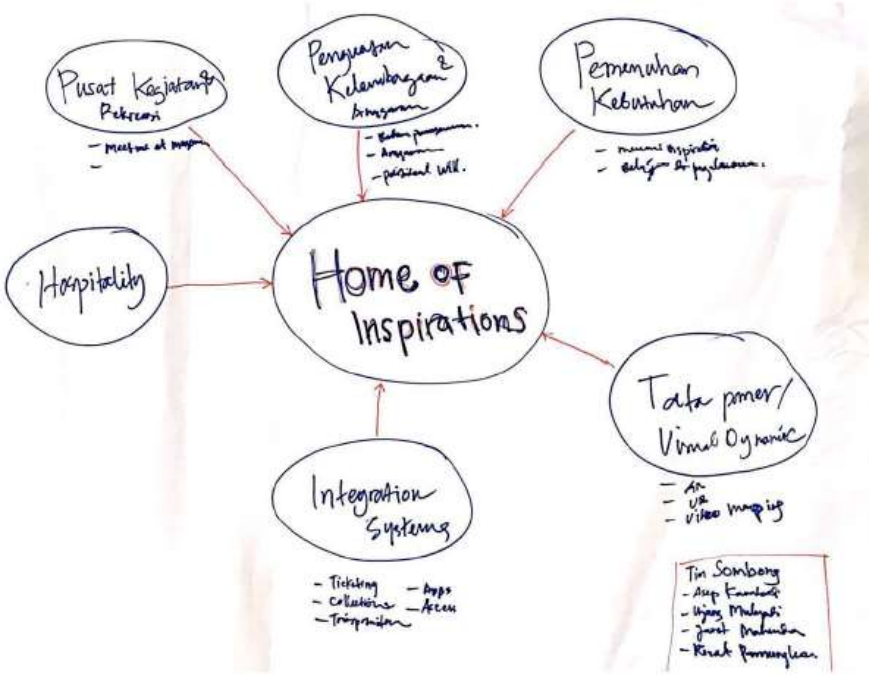


Figure 2. Types of Technology Application (FGD Summary)



Figure 3. Taxonomy of Virtual Reality in Museums (Carozzino and Bergamasco, 2010)

