Smart Museum Based on Regional Unified App[1]

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Abstract

In a society undergoing rapid changes, future museums will contribute to human culture by means of smart-museum technology that promotes active interaction with the public. Several museums in New York have already begun distributing free mobile applications for this purpose. Likewise, the National Palace Museum of Korea has developed an application to provide visitors with helpful information related to its exhibitions. Apps developed so far, however, are concentrated in exhibition information, experimental programs, or the collection information of an individual museum. If the Jongno museum unified app, which could be universally used in Jongno district where museums are concentrated develops and contains information about different museums, it would reduce the cost and provide useful information to visitors. Based on location information and the regional route, this app would be comprised of information concerning admission, opening hours, exhibitions, collections, trial and educational programs. Information about the routes connecting museums would also be provided. The Jongno museum unified app would contribute to the possibility of a new form of smart museums where local museums are linked together.

Keywords: *Smart museum, Jongno, Local museum, Network, Jongno museum unified App*

1. Introduction

Recently, the supply and use of smart phones is rapidly spreading all over the world. Future museums will communicate with the public in the way of smart museums and contribute to human culture. Smart museums are the environment where visitors can gain access to contents in museums using smart devices and participate in museum activities anywhere. In smart museums, visitors can acquire information about exhibition and activity programs using smart devices, search data in museums, and participate in museum activities through an interactive environment in various ways. In the era of smart phones, many museums develop applications and narrow the distance between museums and the public. Museums located in New York such as the American Museum of Natural History, New York Museum of Modern Art, and Brooklyn Museum have released free apps, and have begun using activities connecting museums and smart devices. In Korea, the National Museum of Korea and National Palace Museum have developed exhibition guide apps.

Current apps have been implemented in a way of presenting the contents of each museum. This study searches for an app combining museums concentrated in Jongno, a historical area of Seoul, and will indicate the possibility of one unified museum consisting of individual museums in a local unit.

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2. Smart App in Museum

In the rapidly changing smart era, world leading museums in New York develop and show various apps for communicating with visitors. The American Museum of Natural History(AMNH), where exhibits of all kinds of living creatures on the earth including dinosaurs, fossils, and human bodies, has developed *Explorer* which functions as a guide for visitors at the museum. The AMNH app consists of information about the exhibition, museum tour, food, souvenir shop, restroom and emergency exits. The exhibition menu introduces the most popular collections such as the Blue Whale, Tyrannosaurus, Moai in Easter Island, and Star of India. Using the app, visitors can easily find a fiberglass duplicate of a 94-foot female Blue Whale, Tyrannosaurus, one of the biggest dinosaur in the world, and the 563.35-carat 'Star of India', the world's biggest blue sapphire. Visitors also can find the names of exhibition halls, and search exhibition contents in alphabetical order. This app provides the *12 Stop Dino Tour, Night at the Museum, and Earth and Space Tour* as well.

MoMA, the center of modern art, has developed an app presenting 32,000 collections of the museum. It also provides exhibition information, life of artists, movie schedule, and visiting information. This app contains special tour programs such as the Visual Description for the handicapped, *Modern Kids* for Children, and *MoMa Teen Audio* for teenagers.

BklynMuse, an application developed by Brooklyn Museum (BMA), can find collections using a GPS system. Visitors can decide what they want to see on a visiting day, and obtain related information. BMA also released a *Mobile Collection* app which introduces its collections.

Using the mobile application at a museum increases visitor's interest in the exhibition and maximizes the educational effect. In-Ae Kang suggests that mobile devices connect the distance between online and offline, and integrate online and offline spaces. Due to this integration, learning is possible anywhere and anytime. When smart learning is a form which actively supports interaction between individual learning and a learner, she defines the smart museum as a museum where the concept of smart learning is adjusted, and indicates that the principle of integration can be explained as a special feature of the smart museum. In regard to the smart museum we can anticipate that every technology operates together [1]. The possibility of a smart museum and smart learning is based on the assumption that a considerable portion of the public use smart devices.

In Korea, due to an increase in the supply of smart devices, life pattern has been largely affected. From July 1, 2012 to September 15, Korea Communications Commission and Korea Internet & Security Agency surveyed nationwide 30,000 households and its 73,063 household members, and reported the ′2012 Survey on the Internet Usage′ on December 13. According to this report, 63.7% of the research targets aged 6 and over have smart devices such as smart phones, tablet pc. 91% of the 20s, 87.5% of the 30s, and 72.3% of the 40s have smart devices. Following the increase of smart device penetration rate, the Internet access rate has also increased. Due to the tendency of lowering data usage charge and extending network infrastructure, the Internet usage rate through smart devices would be increasing continuously. In this circumstance, Korean museums develop various apps. The National Palace Museum in Jongno, Seoul, showed the history of the Vietnam imperial family, exhibition guide, and visitors guide through *Treasures of the Vietnamese Nguyen Dynasty,* a special exhibition app. It provides foreign language guide tour hours, photos and information of collections, and movies, and helps visitors' understanding

Figure 1. Treasures of the Vietnamese Nguyen Dynasty Special Exhibition App

Current apps, however, have been developed in a way of presenting contents of each individual museum. This study gives attention to museums in Jongno which have a history of Seoul, and discuss ideas concerning developing an application unifying these museums. First of all, the present situation of museums in Jongno needs to be understood.

3. Status of Museum at Jongno

Jongno is a symbol of Seoul which has been a focal point in terms of its historical and cultural manner including its geographical location. It has been in the center of Korean history since 1392, when the Joseon dynasty set up its capital. There is a tremendous amount of vestiges and relics from the Joseon dynasty around its Palaces. Furthermore, Jongno is a treasure house of cultural contents with many cultural assets such as Changdeok Place and Jongmyo Shrine selected as a UNESCO world heritage site.

Jongno had also been a center of Politics and Economics. Among 5 palaces of the Joseon dynasty, there are still 4 Palaces as Gyeongbok Palace, Changdeok Palace, Changgyeong Palace, and Gyeonghui Palace, and the Central government complexes as well as the U.S., Japanese and Chinese Embassy. In addition, it has been playing an important role as the center of liberation and the foundation of Korea. Even when Korea was under the rule of Japan, struggling memories of adversity are engraved in the name of Jongno. In Jongno, there are many tracks of cultural elements through the economic development. There is a street of movie theaters named Danseongsa and Piccadilly, and Daehak-ro of Hyehwa-dong is a favorite hangout among younger people boasting its attractions. Daehak-ro is very famous for its wide selection of performances, art crafts, and exhibitions. Furthermore, Insa-dong emerged as a tourists' favorite and became a Korean tradition itself. In short, Jongno is the most important place of Seoul in terms of political, economic, as well as cultural manner with its infrastructure.

There are over 800 museums in Korea, and as of 2011, 137 museums are located in Seoul. Especially, there are 51 National and Public museums in Jongno [2]. It is 6.4 percent of the museums in Seoul. Among them, 37 percent are in Jongno.

3.1. National Museums

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Japanese and Chinese Embassy. In addition, it has been playing an important role as the center of liberation and the foundation of Korea. Even when Korea was under the rule of Japan, struggling memories of adversity are engraved in the name of Jongno. In Jongno, there are many tracks of cultural elements through the economic development. There is a street of movie theaters named Danseongsa and Piccadilly, and Daehak-ro of Hyehwa-dong is a favorite hangout among younger people boasting its attractions. Daehak-ro is very famous for its wide selection of performances, art crafts, and exhibitions. Furthermore, Insa-dong emerged as a tourists' favorite and became a Korean tradition itself. In short, Jongno is the most important place of Seoul in terms of political, economic, as well as cultural manner with its infrastructure.

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3.2. Public Museums

There are 2 museums that are run by Seoul in Jongno. The Seoul Museum of History shows the history and traditional culture of Seoul while permanent exhibitions display the capital city of Joseon dynasty, everyday life of Seoul citizens, cultures and development of Seoul. Also, there is a wide variety of trial programs. Especially, this museum pursues open-minded management towards Seoul citizens as an urban history public museum and at the same time, a multi-use culture center. As an urban history museum that represents the capital city, a study of the city and communities is making steady progress.

The Seoul Education Museum that is run by the Seoul education office exhibits the development of the system and the origin of education, categorized in accordance with the time period as time of enlightenment, resistance during the Japanese colonial era, liberation and the Korean War. For social education programs, the museum offers Chinese character lessons for children and an overnight museum for elementary, middle and high school students.

3.3. Private Museums

In Jongno, apart from the national museums, there are 28 private museums. The private museums are owned and run by individuals. A total of 44 private museums consist of 3 university museums and 13 art museums. Categorizing with its theme, they can be divided into folklore, food, clothing, funeral, living culture, housing culture, printing and publication, religion, medical science, liberal arts, ancient arts, modern arts, design, *etc*.

Table 1. Classification of Private Museums with its Theme

Subject	Museums	Number
folk	Gahoe Folklore Museum, Myungin Museum, Seoul Museum of Chicken Art, Sungkyunkwan University Museum, Lock Museum	5
food	Tteok Museum	1
costume	Bona Museum, World Jewellery Museum, Hansangsoo Museum, The Korea Museum of Modern Costume	4
funeral culture	Kokdu Museum, Mokin Museum, Shuim Museum	3
living culture	Bukchon Museum, Museum of Korea Straw and Plants Handicraft	2
printing and publishing	Samseong Museum of Publishing, The Presseum-Newspaper Museum	2
housing culture	Asian Art Museum, YooGeum Museum	2
religion	Central Buddhist Museum	1

medicine	Medical Museum, Choonwondang Museum of Korean Medicine	2
humanities	Young-In Literary Museum, Museum of Humanities, Poem Museum, Hahn Moo Sook House	4
traditional art	Sangmyung University Museum, Museum of Korean Art, Hwajeong Museum	3
modern art	Kumho Museum, Daelim Museum, Bukchon Art Museum, Savina Museum, Sangwon Museum of Art, Sungkok Art Museum, Arco Art Center, Art Sonje Center, Art Center Nabi, Ilmin Museum of Art, Zaha Museum, Total Museum of Contemporary Art, Whanki Museum	13
design	Seoul Design Museum, Jong Ie Nara Paper Art Museum	2
total		44

Each museum shows its characteristics through its own unique and various collections from ancient to modern times. Folk paintings, masks, cock crafts, and keys are examples of relics which reflect the life of people. There is a museum that exhibits the rice cake, one of the Korean traditional foods, and a museum that exhibits the accessories from Africa. Some of the museums exhibit the Korean traditional embroidery. There is a Korean museum of modern costume which exhibits the changes of modern clothing. Also, there is a museum that preserves the living culture of the Bukchon district, and even a museum of indigenous straw and plant handicraft. The Museum of Publication exhibits the history of newspapers and printing technique. There are museums that exhibit the statues of the Buddha, paintings of Buddha, handcrafts for bier, a wooden figure, *etc.* Furthermore, some museums exhibit ancient furniture based on Korean-style homes. Some museums exhibit the tiled roof from the antiquity era up to Joseon dynasty. There are museums for eastern and western medical science, humanities, and modern literature. There are more than 10 museums that exhibit the various art works from ancient to modern times. Like this, various kinds of Jongno Museums have a broad cultural heritage. Various kinds of temporary exhibitions are continuously being held by utilizing their own collections, and many trial programs are held for children, the public, foreigners, multi-cultural families, *etc*.

What we have to focus on the museums of Jongno that have a potential of upgrading their values by building a collaboration network.

3.4. Current Issues of Museum at Jongno

There are 51 museums including the national, public and private museums in Jongno. However, there are no organizations to make them connected. Thus, it is not easy to make those museums as one. There are only a few cases where those museums build a network and help each other.

Furthermore, the private museums of Jongno district improve their management [3]. In order to overcome these setbacks, it is suggested to make a museum belt by adopting a structure of an ecomuseum to revitalize the museums of Jongno. This is based on an idea that the community, supports from government, and people of Jongno can lead a collective effort [4]. The researcher divided the museums in Jongno into six areas, and discussed ideas on how to connect the core museums in each area.
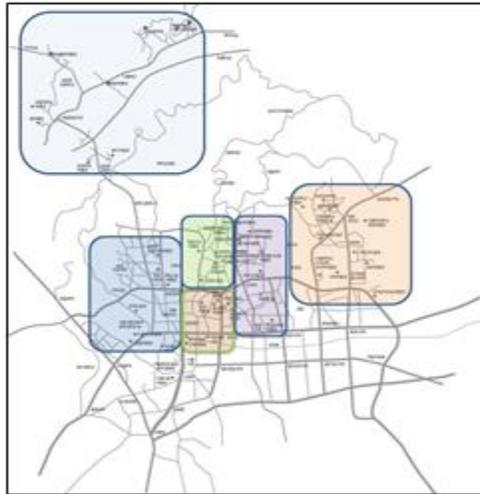
Figure 2. Map of the Museums in Jongno District

Now there is the Jongno Museum Council, but it is not fully supported by the museums. Visitors have to find information by visiting each museums website or calling them up personally. Customer services and their network allow all museums of Jongno to be linked together.

On this point, we need to focus on the participation of the Museums of Nina Simon. They support the various experience of content experience. Those organizations provide a 'platform' which connects the contents creator, distribution centers buyer, users, critics, and the co-workers [5]. Lack of communication among museums of Jongno will create a gap between visitors and museums of Jongno in the end. Now is the time when museums of Jongno have to think over how to communicate with visitors while building up the network for each museum.

4. Jongno Museum Unified App

In Ae Kang announced 'Smart museum' is the case where 'Smart learning' was utilized which supports the interaction among users and it can be learned anywhere by using a smart phone. If small museums of Jongno develop the universal App, it can provide much beneficial information to visitors. Each museum can provide appropriate information such as an entrance fee, hours of operation, permanent and temporary exhibits, information on collections, trial programs and education programs. They can even provide the routes that connect those museums.

If the App is developed in cooperation with each museum, a 'newsstand' type of app where collections of each museum are updated individually will be appropriate. Examples of 'newsstand' are used by iPhone and iPad from Apple. The magazine called Zinio offers the readers information provided by magazines from all over the world, and there is a magazine developed by 'Fobikr' in Korea. Especially, 'the magazine' won an award as the best App from the '2011 Korean Mobile Awards by MOIBA.

Figure 3. Unified App as Newsstand Type (ⓒApple, ⓒFobikr)

If the unified App uses the newsstand type, users can create their own contents after installing the 'unified App' by choosing the museums they want. It will be unnecessary to purchase the audio guide because the 'unified App' can provide the text, images, audio and movie clips. If free Wi-Fi service can be given, it will be more beneficial for visitors for downloading the App and its contents in order to upgrade the efficiency.

4.1. Sample of Established Jongno Museum Unified App

The following figure shows the schema describing its structure and inner function of the unified App based on the flow of a visitor's route. The Jongno Tteok (Korean rice cake) Museum is the example.
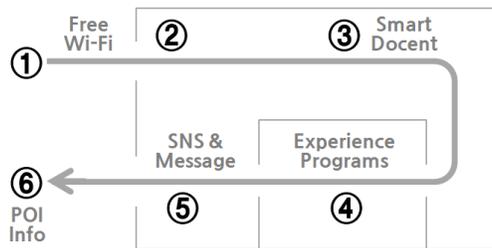

Figure 4. The Schema Examples of using Unified App through the Route

1. When visitors arrive in front of the entrance of a museum or ticket booth, it will notify the availability of the Jongno rice cake museum in the unified App. Now, visitors install the 'unified App' or each content that they want. Prior to this, we need to establish the free Wi-Fi services near the ticket booth, inside or in the gallery, or the whole museum.

2. Visitors open the 'Jongno Tteok museum' from the 'unified App' as they enter the gallery. This will help visitors better understand by listening to the introduction of the museum and the purpose of the exhibition. The example of the rice cake museum introduction follows. "In the old days, our ancestors made rice cakes using ingredients that are in season, and shared with their neighbors. Rice cakes played an important role both as a nutritional supplement and a spirit of mutual help." In addition, an explanation of the special exhibition can be added. For instance, the purpose of exhibition for a wooden rice-cake pattern can be given as below. "Pattern of wooden rice cake is quite various from the existing objects to abstract concept. In fact, there are more cases where it is an abstract concept than existing objects."

3. When the visitors put the number on the exhibit, 'Smart Docent Service' will be activated by providing additional text, image, audio, and movie clips. It can substitute the old Docent

service with an audio guide, and movie clips. For instance, it can show the process of making rice cakes by explaining various tools for making rice cakes.

Figure 5. The Example of Smart Docent Service with Images and Movie Clips

4. 'Unified App' might be beneficial for trial programs by using similar contents. Especially, the rice cake museum can provide a direct experience by making rice cakes with various ingredients, which interests children and even foreigners. By checking the time table of trial programs through the App and making a reservation, it can save on waiting time. Depending on the situation, visitors can make a reservation for the program they want.

5. During or after watching, it is possible to send a message to a curator for QNA. By merging existing QNA bulletin boards and SNS, mutual interactions between museums and visitors will be enhanced.

6. After visiting, if the 'Unified App' provides visitors with the information about the nearest museum or tourist attraction or fine restaurants, it can bring many benefits to the local economy.

4.2. Function of Unified App and Module Information

To increase the effectiveness of the Jongno Museum Unified App, it is desirable to have a 'searching module', 'communication module', and 'producing module.' Users use the search module to find the appropriate museum and contents. By using the communication module, users can obtain news and information, and give feedback. The App supplier can upload contents and updated information through the producing module.
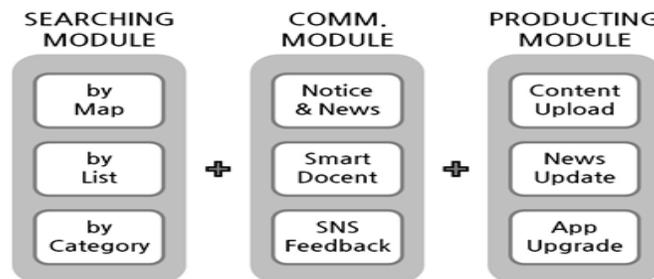

Figure 6. Formation of Jongno Museum Unified App

4.2.1. Formation of Search Module

The search module provides passage toward contents to users in various ways. The search module provides three functions; map, list, and categories.

The first function is the map based search. It marks museum distribution in the Jongno district and finds neighboring museums or a specific location. Using the GPS function in smart phones, it can calculate and show the distance between museums. It is useful when a visitor decides based on distance and not simply a theme.

The second function is the list based search. It arranges a list of museums in an alphabetical order, or groups museums by similar exhibition. It provides recommendations regarding the visitor's age as well. It is desirable under the circumstance that a destination is already decided, further information is needed, or a visitor's preference and standard is clear.

The third function is the category based search. It shows recommendation according to activity type such as exhibition, experience, and events. When a visitor prefers a specific exhibition type, visits with children for a field trip, or visiting purpose is different, this search is desirable.

4.2.2. Formation of Communication Module

Visitors can obtain information before or after visiting, and have an active attitude toward the exhibition using the communication module. Before visiting, visitors check related news and announcements, on visiting time, they use further detail information, and after visiting they use this module as a tool for exchanging opinions. The communication module provides announcements, smart docent, and SNS service.

The first function is announcement. It provides news about new exhibitions, recommendations, special events, or updated contents, and helps visitors to check before visiting.

The second function is smart docent. When a visitor activates the app, it provides sound or text description following the location. If a visitor enters a collection number, the audio guide works. Artist description and additional information is also provided when a visitor scans the QR code.

The third function is SNS. It connects the Q&A board on the museum website to SNS like Twitter and Facebook, and provides answers to a visitor's question automatically on the app. This function can provide more detailed explanation than the ARS guide, and provides personalized information through real-time response.

4.2.3. Formation of Producing Module

The producing module helps curators to easily produce contents and upload new information, and therefore increases the effectiveness of the app. It was difficult to edit contents because the previous producing method requires the programmer' sassistance. Using the producing module, however, minor museums can update contents without additional cost. iAuthor, Apple's recent e-book producing program, is a good example. When a new version of the unified app is released, the contents format of each museum is also updated automatically.

5. Conclusion

The rising issue is that there is no connectivity among the nearest museums. If a 'Unified App' can be provided to those visitors, they can select the appropriate museum by considering the purpose and preference. Furthermore, they can find the information of the trial programs of places, times, fees, contents, routes on the map, etc. Eventually, merging the spirit of Jongno with museums can be recognized as one unified brand, and Jongno itself will be the networked museum with unified connectivity and this kind of recognition will make people visit Jongno.

By development and usage of the Jongno Museum Unified App, individual museums of Jongno would interact with the public through open information. Furthermore, the Jongno Museum Unified App will implement a new form of the Smart Museum associated with local museums, and seek direction for future museums.

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