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Digital Museum Consortia: A Prototype for Interconnected and Accessible Database Design

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The Rochester Institute of Technology
College of Liberal Arts

Digital Museum Consortia:
A Prototype for Interconnected and Accessible Database Design

A Thesis Submitted in Partial Fulfillment
of the Bachelor of Science Degree
In Museum Studies
Performing Arts & Visual Culture Department

By Ben Heller

May 2015

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Abstract

The evolution of the internet and devices allowing access to it indicate that users trend toward networking and interconnectivity in their daily lives. Museums have started to tread into this territory—that is, crafting, managing, and maintaining an effective internet presence and ancillary content tools—on their own. However, many museums still rely upon the earliest types of education and interpretation tools, such as audio tours and recordings that address content from one collection.

Moving beyond a single institution's holdings, a shared database of museum content including photos of artifacts and objects, historic documents, and videos would allow users to examine pieces they enjoy and to find similar works at other locations. A single application providing museum collection capabilities and visitor access would benefit both sides.

To support this claim, this thesis first provides a literature review of application use in museums that is supplemented by statistics of visitor use of museum mobile offerings. This historical overview yields a list of needs, interests, and obstacles to such an interconnective model. The third section constitutes the building blocks of such a model: database design, application design, and a web-accessible mirror site which are visualized in the prototyped content. The fourth section hypothesizes the future and expected impact of a shared network topology.

Introduction

Museums are institutions that have historically made use of technology to better organize, display, and protect their collections (Bautista 27). In as early as 1952, the Stedelijk Museum had Short-Wave Ambulatory Lectures in which visitors would carry around a small portable radio and earphone allowing them to listen to localized radio broadcasts for exhibits. Complications with radio technology led to the use of portable cassette players for audio tours which became the standard used worldwide for many decades (Tallon, xiii-xiv, xix). More recently, motion activated recordings, computer kiosks, personal digital assistant (PDA) tours and other approaches to use technology for visitor engagement have been tried. These offerings however tend to focus on just one point of view and may not be appropriate for all visitors. A system which allows visitors to learn about topics of interest while moving at their own pace is the necessary next step to increase learning potential and interactivity within the museum.

Beyond the museum, advances in information technology shape the way that people live, learn, and interact with the world today. In the study “The iPhone Effect,” people rated internet access to be a necessity just after having a home and a car, showing it to outrank television and phone (Petrie, 2010). Mobile technology makes that access portable and allows users to access whatever content they may desire from anywhere. Visitors now expect digital content and access to it wherever they may be.

Many institutions are offering such content in some form or another. Over 50% offer at least some sort of audio tour, but visitors want more. Costs, as well as challenges in creating and designing content, are the biggest issues identified by most museums. Sixty-three percent surveyed showed a willingness to partner with other institutions. This is the key to creating the necessary infrastructure for such content (Atkinson, 2012).

A shared database spanning museums of any type, with any content, would create a comprehensive system to solve many of these issues. Visitors would have a single point of access to a variety of institutions and types of content. Costs should be shared and the system decentralized into a consortium taking much of the load off any one museum. Visitor and curator alike would be able to access, comment, and improve the experience for others. An application, available for various device types such as the Apple mobile operating system (iOS), Android, and Windows would allow for quick and concise content access anytime from anywhere.

Literature Review

Technology in the Home

The advent of the internet and the resulting growth of communication technology has had a great impact on the daily life. People are now able to access content and research whatever they may desire from the comfort of their own homes. Many now consider the internet to be a necessity in everyday life, and even find it hard to remember what times were like before the “World Wide Web” linked everyone together. Mobile technology took this another step further and gave users the ability to access the world’s knowledge anytime and anywhere.

The Chicago Museum of Science and Industry’s “Digital Media in Everyday Life” survey from 2011 shows the growth of ownership and comfort with technology. The survey found that around 30-40% of adults and around 50% of teens own smartphones. These ownership statistics have continued to grow. Adults and youths both trend towards mid- to high-comfort levels with technology. Twenty-two percent of adults and less than 10% of youths rated themselves low. Over 80% of the adults who rated themselves as having low comfort levels with technology were over the age of 35. Those who rated higher in comfort levels with technology were the most

likely to own a smartphone; while those who rated low trend away from any sort of technology-- even ATMs or self-checkouts. This group will never be that interested in technology.

Platform-wise, adults trend towards Android and youths towards iOS. This is just a trend however and supporting both operating systems is a must to cover the greatest audience. On average, users prefer free apps, but the 2012 report by the American Alliance of Museums (AAM), "Mobile in Museum's Study," found that about a third of the average users' apps were purchased. The average number of apps installed was twenty-nine, with about twelve being actively used monthly. The same survey found that over 50% of smartphone owners used their device not just as a phone, but as a browser, global positioning system, media player, etc. Over 70% of users had taken photos or browsed the internet on their devices.

Statistics show that the general population is making heavy use of mobile technology in their daily lives and growth is not slowing down. When a person is able to learn and experience a multitude of things freely via the internet the impact of a museum is lessened. If a person has grown a habit to instantly check on the internet when something catches their interest, will the content that they may expect from a visited museum be there for them?

Technology in the Museum

Technology enhanced experiences at museums have become fairly prevalent with around 50% of both US and UK museums having some sort of offering. Around 23% offer some form of user owned device, or Bring Your Own Device (BYOD), application. Ten percent have a museum owned device system and 14% have some of both. Museum owned device systems are more common in large museums with higher visitor counts. The other half with no offerings note

issues in both funding and staff capable of designing such content. However, 25% of those with no offerings do have plans to begin development.

Over 50% of the museums surveyed believe that such offerings are crucial to visitor engagement and that visitors expect it. 66% state that engagement is their main goal and 43% are interested in bringing their collections to a wider audience. Management and content creation is largely done in-house with about 94% controlling their own BYOD solution (Atkinson 2012).

Concerns and Complications

Visitor Engagement

According to the 2012 “Mobile in Museums” survey, two-thirds of museums state visitor engagement as their key goal in creating mobile content. What is necessary in an application to accomplish this? It is the ability for the visitor to control their experience. “It’s Personal: One Size Does Not Fit All” in TrendsWatch 2015 discusses how each visitor’s needs and interests will vary. Free choice learning allows users to go at their own pace and focus on their preferred type of learning. One person may be a hands-on learner and prefer access to small games while another may be visual and enjoy videos and picture guides. Additional features such as bookmarks and tags allow for personalizing suggested content and exhibits.

Digital applications also allow visitors to engage in various types of communities. Museums have always been a community of interest. The institution creates a place for focused learning and interaction with others over a certain topic of interest. “Modern” art, history, and science are museums that have existed for their local communities for ages. Local is the key word. A visitor needs to live nearby or be visiting that area to experience the museum's content. A person may have a great deal of interest in a certain form of art or type of science but have no

museum or community related to that subject close enough to visit. Technology and the internet now allow visitors from anywhere around the globe to join their communities.

The online database along with user generated content and comments allow museums and users to further evolve into two other types of communities. A community of practice or knowledge gathers information in an informal, yet organized manner. Users may tag, comment and edit information within the database much like Wikipedia. The learning experience is organized and accessible, yet open and inviting. Much of the base content will be administered and locked by museum personnel to keep things clean and accurate, yet the community will be overlaid allowing visitors to further engage with content.

Communities of Inquiry will also be able to flourish. This type of community learns by discussing, questioning and challenging content. This can exist to some extent in the physical museum between close visitors or discussion groups. However having discussion via an online forum for each piece allows users to discuss content with other visitors they would have never met otherwise. Open global discussions bring a whole new depth to inquiry that a local museum group could never obtain.

All these communities intertwined and easily accessible create a large network of users. Bautista references Mark Granovetter idea on the strength of weak ties, “A large group of weak ties is more powerful than a small network of strong ties in relation to innovation” (pg19). This new open community of many individuals, typically strangers, allows for a collective learning experience not possible with a simple visit. Being at the museum—experiencing content in person is key to beginning the experience—but it can go so much further with an application for research and discussion (Bautista, 16-21).

Museum Benefit

Moving to a system such as this is a big change and institutions will need reasons to support it and migrate over. One of the biggest benefits would be the ability to globally showcase their content. Visitors already using the database for one museum will discover artifacts from other museums thus creating interest. Every participating institution serves as a sort of advertisement for the other museums.

Beyond the benefits offered to their visitors though, they will want quantifiable benefits. By design, the database is a shared entity, with servers hosted both on site as well as at other museums and off-site locations. This leads to very simple and redundant backups of digital data thus protecting the institution automatically. In addition, the system is easy to use—allowing both curators and volunteers to add content quickly and in a well-organized manner.

That simple volunteer work also allows for a major benefit with such a system. Volunteer work is already commonplace in museums since it allows for reduced costs and increased community engagement, but requires training and is limited. When used on a broader scale with multiple users (perhaps at once) and unbound by geography, such a system of group volunteerism is known as crowdsourcing. A digital system that can be accessed from anywhere allows visitors to help create content more freely. Simple acts such as tagging, linking related articles and discussing a piece can be done by any registered visitor. Power users can be selected for additional access allowing them to edit, organize and correct other visitors' entries. Unfortunately a system this large and open can lead to misuse such as incorrect tagging or unrelated arguments in discussions but trusted volunteers can help maintain the system.

Crowdsourcing could also allow for further visitor engagement and museum benefit by holding design votes and discussions. Visitor curated exhibits exist but generating them through

a global community platform can lead to much more input and interesting results. Media such as photographs and videos of exhibits and artifacts could be created by visitors and uploaded to the database after curator approval. All these uses of crowdsourcing alleviate some of the work load on museum staff while also increasing visitor engagement. This is a win for both sides (Merritt, 2012).

Taking part in a highly visible and global system like this also increases scope and visibility for grants and funding. An initiative to increase the museum's scope will help justify spending to digitize collections and work on new exhibit content. A small museum, which may have only been receiving local support, can broaden its horizons by supporting online users nationwide or even across the globe.

The biggest benefit to an online system is to apply big data analysis. This would provide useful insights. Gauging visitor interest in exhibits or certain artifacts can be difficult on location but the database creates hard statistics of such data. Favorites, page views, discussions, and so on provide useful statistics for each exhibit and artifact. Visitors using the system may be actively discussing and favoriting a piece that is in storage while a physical exhibit is getting rather low views. This allows curators cater to the audience in ways not easily possible without such statistics. (Merritt, 2014)

All this data allows museums to better engage and teach their visitors, while also allowing the visitors to help and contribute to their museums. It becomes a large digital ecosystem wherein each side evolves along with the other. Instead of stagnating trying to find the right exhibits and content for their visitors, curators can essentially ask the public directly and instantly receive their feedback.

Hardware and Software Management

An undertaking such as this will require a scalable system of dedicated hardware able to grow as institutions join. A hub and spoke model will be the most efficient way to go about it; with a data center that contains web access and all the museums' content, but also local content hosted at each museum. This creates not only redundant copies of content, but distributes load as well. Visitors accessing content from the museum itself will be able to quickly and reliably access the data from local servers, while off-site and online users will receive it from the more robust data center.

Considering that visitors will be accessing large amounts of data for certain types of media such as audio and video, a free wireless service at each museum is essential. Requiring a visitor to use large amounts of mobile data to access content for the museum they are standing in will lead to disgruntled visitors and lower access. In addition, many youths have tablet devices with no mobile data plans (Beasley, Part 1). By providing free wireless access classes of students with tablets or laptops are able to access and research the content without parents worrying about mobile data usage. To reach the largest possible audience smartphones should not be the only focus, but tablets and personal computers as well.

With the need for a centralized data center and management of software and hardware, it is likely a new entity will need to be created solely for this project. Existing examples of such database consortiums would be the Digital Public Library of America (DPLA) or Google's Cultural Institution. By sharing costs among various museums that are partaking in the service, a separate, small group of technology-focused individuals would be able to host, manage and troubleshoot the centralized datacenter. Around two-thirds of multimedia offerings are managed with content created in-house by museums, but almost all institutions outsource hardware and

troubleshooting to third parties (Petrie). Doing so likely comes at a rather large cost and slow support. A dedicated body for technology in museums could provide the needed expertise and keep it readily available.

Temporary Exhibitions

Temporary exhibits may potentially be a cause for problems since the items included in such a display may be owned by multiple institutions and may travel to other sites. In this case, any data entry for such objects and exhibits in the database are up to the owning institution. The easiest way to input such objects is to input them under the owning institution's collection and information, but to allow for it to be linked by other museums and their exhibits when on display there. If content owned by a museum that does not use the database is displayed in a museum that does, it is up to the owning institution to determine access. That institution may decide to have information about related works added, but they will also need to accept that content as being permanently associated with the database. Since the database and its associated content will include visitor input and discussions, deleting content is not an option. That is, deleting any entries related to items on view during a temporary exhibit will not be viable. Works included in any temporary exhibition may become permanent *digitally* through this exhibition.

Paid Content

Some museums charge for various types of memberships. Many may also be concerned that having their content freely available to view online could lead to decreased visitor counts. This is a manageable concern since it will be possible for a museum to set certain exhibits and

database content behind access restrictions making such content members only. This would create an easy way to control access. An institution could hand out cards or email members a code to input to their database accounts to unlock the extra access. It would be up to the museum to decide if codes should have multiple uses for families with multiple user accounts.

Freemium access via in-app purchases is another viable option. Online payment services such as PayPal or Google Wallet could even make this possible from the web version. The app and general content is free for users to download and use but certain groups of content could be accessible only via purchase (Proctor, Chapter 2). Using this system for blockbuster exhibits or very popular collections could increase a museum's funding at a modest cost to visitors. When a user tries to access a piece from an exhibit, they could be prompted to pay a small fee directly from their phone to gain access to all the pieces from that exhibit or collection. The proceeds then go to that museum.

Accessibility

Creating a large resource for various types of multimedia also raises the issue of accessibility. Many visitors wanting to enjoy the content may be unable to hear audio or read documents. Accessibility features could also allow visitors different ways to interact with the content in ways they may prefer. Examples include dictation of text files while viewing a piece or a magnified display. Being a large digital database makes it possible to integrate the system with services like Google translate to read back text or convert audio into captions automatically. Providing a standard set of accessibility services will allow the system to provide these features with reasonable accuracy. Each individual institution is also free to add higher quality captions to video files or record audio versions of text documents.

Children's Access

The largest educational benefit for a system such as this would be the fact it can allow students from any location access to collections. Young children do not have the freedom to travel and experience museums even if something catches their interest; having a system to browse and discover can substantially open a child's horizons. What may start as a class project with a school owned iPad when visiting a local museum can lead to browsing other institutions and discovering new points of interest.

Providing ways to keep children engaged and interested also becomes much easier with a digital system. The addition of gamification can help by providing feedback and concrete goals. Badge and trophy systems are commonplace in both video games and many online communities. These systems could be added into the system for everyone but they are especially useful for children. Browsing pages, posting comments, and visiting physical locations could all be counted on a per user basis. Every five, ten, twenty, and fifty hits could award the user a badge on their profile proving their dedication (Figure 6). It may seem rather simple but the added goals and ability to show and compete with friends typically leads to increased use.

Children's access to a large online community however comes with many caveats. Censorship of potentially inappropriate museum content would be one. Many believe that, seeing as it is art, it should be open for everyone. However many parents do not want their children seeing anything too sexual or violent. The easiest way to fix this would be to have a setting in the database for each work of art allowing curators to block the object from child users. The commenting and forum community is another big concern. Should children and adults share the same commenting boards? Most likely having a completely separate application for people under

16 or so is the best way to go. This version would block the inappropriate content and have its own forums. Once a child is old enough to swap to the adult version their account will be upgraded. Having this separate system for children may seem excessive but it allows parents and teachers the option of bringing their students into the museum world in an open digital way, while still maintaining a level of safety. Parents can always give their children access to a family account for the full version if they feel it is appropriate for their use.

Database Design

The database's design is critical for a project of this scale. In order to achieve high performance the data must be organized carefully to prevent unnecessary reads and focus on frequently queried content. The system will have many different types of institutions which have unique requirements, however, and many fields one uses may not even be considered at another. To resolve this issue, the database is designed with a tiered approach allowing each object or artifact to have a great deal of content without being bogged down with fields it does not need.

Each object will initially be catalogued in terms of required fields. These fields will exist on all objects and nothing can be added without fulfilling each of these. These mandatory fields state only the base criteria of an object, yet are shared globally for ease of management and search. Every object must have a name or a title, a creator or source, date of origin, owner, and location. Some of these fields may have different types of values such as an owner institution or a person's name, but will have standardized input for each variation to keep entries consistent. A fossil may simply have an era for its date of origin while a painting may have an exact year. Though these fields are broad, they are necessary to begin the framework for the database.

The final required field exists in predefined forms as object type. This is a list of predefined values—one to which the object must adhere. Common ones such as painting, sculpture, or document are easy enough; yet not all objects will be able to be categorized in such broad, familiar terms. Historical objects and pieces of natural history could be defined as a simple artifact but a volcanic rock will require different fields than a Civil War-era gun. To keep the database clean, these initial object types will be a predefined list to choose from that will seldom, if ever, be changed.

Allowing the database to grow, yet keep existing entries clean and easily searchable, requires a method of growth that is additive yet separate to maintain performance. The addition of tags with detailed fields on top of the tiered types is one way to do this. A World War II ambulance would be listed as a *Vehicle - Automobile*. This object type would include fields such as make, model, color, however many users may want to know more about it and be able to query similar objects. Information related to WW2 Vehicles, such as assigned unit, location of duty, ID number and so on is desirable but not necessary for every *Automobile*. By adding a detailed tag “WW2 Vehicle” to the object which contains its own fields to fill querying becomes possible.

In the database each object starts off in the master database with required fields and then is added to an object type table. From there it can be tagged into various subject type tables. Each table begins with a unique object ID allowing the system to find every instance of an object and retrieve all known fields. This design supports efficient queries since each query only needs to check the master table and then related tables for the object.

In addition to the object database, a person database with a similar tiered design will exist. This includes artists, scientists, etc. as person types instead of object types. On top of that

the person can then be tagged into fields of study, artistic styles, locations of work, and so on. This allows for users browsing objects to hop over to the creator, or discoverer, and learn more about that person without having all those fields replicated with each object.

The database alone is not all of the content that needs to be accessed. Users will also expect pictures, audio files, documents, videos and even interactive game content. These files will vary widely by format and size. Instead of being part of the database itself these will be uploaded and tagged to object and person IDs and stored in a separate content management system. When a user accesses an object, the system queries the fields and prints out all known tags and information as well as priority marked files such as main thumbnail images and short video samples. A list of extra content will also be offered allowing the user to choose if they want to access in-depth videos or more images.

Importing Data

Getting content into the database will be the largest task each museum will face during the startup phase. Many museums will already have their own collections and databases in one digital format or another. For these institutions a few options will be possible. The easiest would be to export their existing database fields into large spreadsheet files which could then be imported into the new system. The system API could also be used to set criteria and pull content from existing databases. However, the large problem with this will be variation in table design and the addition or changes of fields. Generating spreadsheets of collections or object types will allow for editing before import. While time consuming, this will insure entries start off clean and can then be easily managed with the database tools.

For museums that want to start fresh adding content or add new content after initial imports to the database will have various methods. Large bulk imports via spreadsheets will allow for multiple entries to be added quickly. A web content system like this shines in its ability to use the web based tools to edit and add new objects in a quick and simple manner. This will allow volunteers, even ones not physically at the museum, to add artifacts, upload digital content, and begin tagging subjects without the need for curator involvement. This will allow a group of volunteers with power user access to crowd-source database imports and quickly add new collections or convert large old physical databases into a digital system.

Governing Body for Tables

Once the database is established editing fields and tables that already exist is undesirable since it would require potential editing of large amounts of data. The best way to deal with this would be to elect a small governing body to decide the addition of new fields and tables and potentially changing existing ones. Having a curator or representative from each museum that uses the database discuss and vote on changes and additions would allow changes to be made in a controlled process. Most new tag tables will be easy to add in but having a quick vote or check to make sure they are not duplicated or unnecessary can also help keep things clean and manageable.

Artifact Entry Sample

Figure 1 displays a sample entry for an artifact in the database. The object starts out by being listed in the main table with its required fields. Once this basic entry is in and an object ID

generated the object can be linked to other tables. The first major table would be the object type— in this case a sculpture. The object type tables include various optional fields to further describe that item by its basic type such as medium, materials, etc. These are the tables that would be initially filled on object creation by a curator or volunteer.

After that, however, the tagging begins. All users, from curators to visitors, can tag an object in various subject tables. This sculpture is of a human figure, so the simple human tag is an easy choice. That table will have a multitude of optional fields to describe the person in the painting such as their gender, body features, clothing, pose and so on. Users can freely add values to the fields if they are untagged and later users can vote those tags up and down allowing the community to ensure correct information.

Each piece can have an unlimited number of tags as well. Another user may come along and tag this piece as Impressionist, or perhaps Contemplative. Each of those tags would have its own optional fields to fill out. Some of them may overlap, but by having different tags for style, subject, content, etc., users will be able to search and query by certain tags and fields of interest allowing for all types of discovery from different angles.

Application Design

User Account

Per user accounts are one of the most important cornerstones of this application. Each user has their own account to save favorites, post comments and discussions, and obtain badges. Guest access for demo or quick access could be possible but without a login the user's experience is limited. Allowing Facebook, Google, or Microsoft-synced logins with the application are a quick and easy way to make sure users log in to save their content. However, a

user will still want to finish registration by setting up email and other account details. Email will allow notifications and linking of content to view at home, and profile details will be viewable on the comment and discussion forums. Having an account is also necessary to associate museum membership to access members-only content (Figure 2).

Content Access

The app will have a variety of ways to access museum content allowing for different methods of interaction and discovery (Figure 3). Browse, a simple hierarchical system, allows users to browse through collections in different ways. Starting at the museum level they could then drill down to exhibits or categories to see all the different artifacts a museum may have. As they browse they can select a piece to access its information page and favorite it, add comments or browse related content. Figures 4a, b and c display the progression of design for the object page layout.

Manually browsing for objects while at the physical location can be tedious and even complicated when a user is not sure what piece they may be looking at. Live Tour allows for a much simplified interaction with the piece via a number of automatic detection options. Simple Quick Response codes (QR codes) could be posted on labels near a piece allowing the application user to press a button that will use the device's camera to scan the code and bring up the object's information right in the app. If a museum opts for beacon technology with their wireless network the application can even use Global Positioning System (GPS) tracking of the user device to know which piece they are closest to and display its information.

Once a user has started creating favorites and become used to the tagging system they can then also browse via Favorites and Tags. This interface shows favorites lists and tags the user

constantly visits or comments on. The user can then select a favorite or tag of interest to get random related pieces. This substantially increases the chance of interesting discoveries the user would likely have never come in contact with. Museums a great distance away that also use the database may have similar objects a visitor never would have discovered.

Discussion and Commentary

Each object and artist entry will have its own forum for users to comment on pieces or discuss related topics of interest. This is not a single thread but open to creating new topics for discussion. Moderation of these forums will be mostly community controlled with users being able to report problems and super users, museum volunteers with extra granted rights, who will be able to delete and clean up posts if necessary.

Accessibility

Optional features for accessibility are key to helping visitors better use the application. Simple additions such as a read-back mode for text can be useful to everyone. Being able to listen to content while browsing and viewing an object can provide a more immersive experience. Subtitles on videos can allow them to browse video content in a quiet gallery without disturbing other visitors. Adjustable dot-per-inch and font settings could allow for easier reading on different size devices.

These settings will be accessible from the application menu allowing a user to choose what accessibility features they want to see on pages (Figure 5). This prevents clutter if someone should choose not to use them. Having a selection also provides statistics for interest in the feature. On that note, however, many visitors may not want to be identified as using the feature.

For this reason, the app may leave them anonymous or hidden from statistics when using accessibility features. Such data is useful for museums to create more content and what types of content are best suited for these tools. As a matter of privacy, giving users the option to be excluded is recommended.

Big Data Visualization

Many museums using more modern websites and visitor tracking methods have started to display visualizations of their big data. For example the Indianapolis Museum of Art's Dashboard shows visitors, Facebook fans, endowment data, and more in a visual graph form that displays not only current data but history and trends. Others, such as SFMOMA's ArtScope, show graphical representations of search queries and database content. Views like these are not exactly necessary to visitors but they are interesting to see and can help display popular trends in content to aid in discovery. It can even encourage donations by providing concrete numbers and trends in collection growth.

On the side of a curator, student, or volunteer, this data can be very useful. Trends show what topics, museum types, locations, etc. are showing increased interest and which need to evolve to bring in more visitors. This database takes that information a great deal further by adding many more types of data and trends. These statistics can include hits on certain types of media such as audio or video recording under specific types of art. The number of visitors using accessibility features for different kinds of content. Even querying global hits to certain types of exhibits by nation is possible. A database on this scale can query all kinds of interesting data for use in research, exhibit design and even marketing.

On top of the application and web pages built in search functions the database would benefit from the release of an Application Program Interface (API) for users. APIs allow tech savvy users to query and pull content from the database to link to their own related websites or acquire research statistics. The Natural History Museum in London has a Data Portal for their specimen collection allowing visitors to search through their data but also includes access to their API for more extensive access. Many scholarly users would find such a function very useful in a database this size. However it could potentially run into issues with licensing as far as museum membership content goes. Using it simply to sift through big data and statistics and not necessarily content would be a good middle ground.

Web Accessible Version

In addition to the mobile application an HTML5 website to access the content is recommended. As statistics show many visitors have smartphones now but there is still a large population that does not, especially among older visitors. Many will also prefer to use a bigger screen and keyboard/mouse to browse content while at home. Having multiple points of access to the database that use the same user account and have similar interfaces will allow a larger audience to gain access while also allowing for preferred mode of access, be it phone, tablet, laptop or computer.

The use of the relatively new HTML5 technology would allow for fast and interactive design very similar to the native application but accessed through a web browser. The overall experience can be very similar, yet be easier to use for some due the physical interfaces of a computer. A visitor may even elect to bring a laptop for the larger screen and keyboard, allowing them to browse while physically at the museum yet with a more comfortable device. PC based

access could also allow for various new views and features which are not as practical on a touchscreen device. For example big data views, graphs and advanced tag searches with visual representations can be much easier to view and interact with on a large screen with a mouse.

A web-based version also has some benefits over a native device application even when accessed from smartphones. For one, the access is live so there is no need to update a local application to receive new content and fixes. Using the web standards also means that any relatively recent device will be able to access the content. Blackberry or Ubuntu phones, for example, would not have a native app developed due to cost constraints but would still be able to access the web-based version. (Forbes, Proctor Chapter 3)

Future of Museums and Expected Impact

Research shows that visitors are coming to rely on technology in their daily lives at an ever-increasing pace and younger generations continue that trend. To remain current museums would benefit from new ways to organize and share their content with technology savvy visitors. Current web and application offers are a start, but something on a larger and more comprehensive scale will allow visitors to interact with content and each other instead of simply browsing small blurbs of information. Creating such a system and maintaining hardware for large scale internet offerings would be exceedingly costly however. Banding together as a consortium of museums to create and maintain one shared system would be beneficial to all organizations involved.

Having access to an application in the museum will get visitors to try it out and recommend it to friends and family. With the addition of social features and competitive badges the system will be able to grow exponentially as interest grows. The addition of entire student

classes using it for school projects will bring it home and expand into the family. Over a short period of time many visitors from local areas of museums using the database will have knowledge of or have used the application. Growing interest in these markets will help other museums adopt the system allowing it to become more comprehensive and add more features.

In the not too distant future it is likely museums will be able to obtain visitor memberships from people worldwide and not just locally. Opening market focus to everyone who may be interested in the museum's community, be it art, science or anything in between, will increase visitor activity and potentially increase donations and funding. In the digital age museums do not need to fight to maintain their local visitors and be isolated institutions. Banding together in this digital age and creating consortia will lead to the creation of the new museum, while maintaining their physical location and visitors.

Design Prototypes

Figure 1 – Database Entry Example

Main Table (Required Fields):

- Title
 - The Thinker
- Creator/Source of Origin
 - Person: Auguste Rodin
- Date of Origin
 - Range: 1880-1881
- Owned by
 - Institution: Cleveland Museum of Art
- Location
 - Institution: Cleveland Museum of Art
- Object ID
 - Auto-generated value to link tables

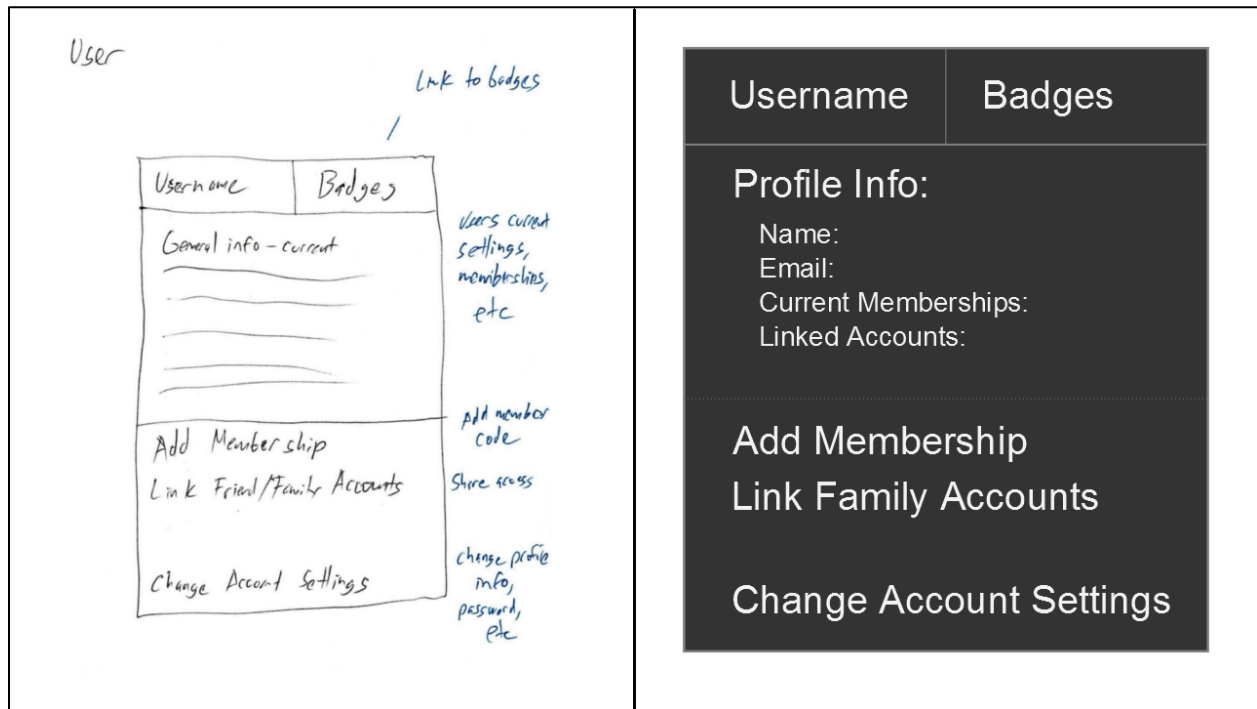
Object Type Table:

- Sculpture
 - Medium
 - Bronze- Casted
 - Surface
 - Unpainted

Subject Tag Tables:

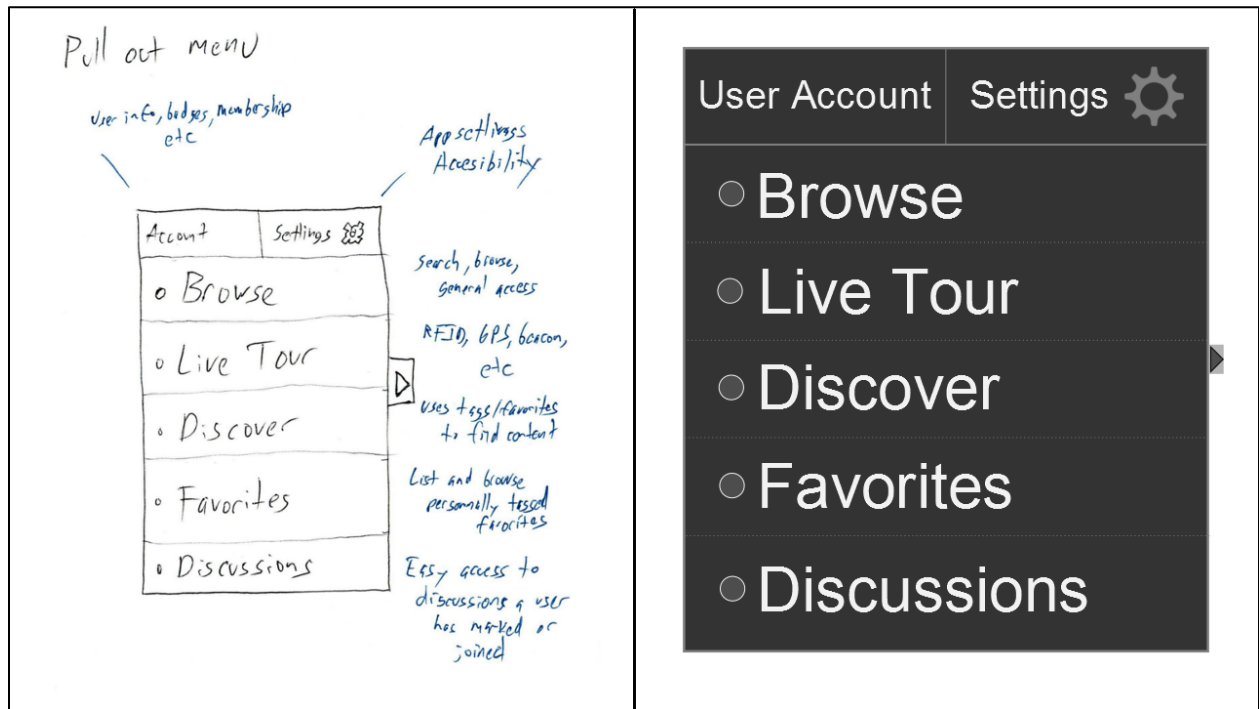
- Human
 - Gender
 - Male
 - Hair Type
 - Short
 - Pose
 - Sitting
 - Clothing
 - Nude
- Damaged
 - Cause
 - Explosion- Bomb
 - Damaged Area
 - Legs
 - Base
 - Repairs
 - None

Figure 2 – User Page Design



The user page provides access to account settings. It lists current profile information about the user such as name, email, memberships, and so on. It also gives access to adding new memberships, linking friends or family to the account for shared access, and the badge system.

Figure 3 – Pull-out Menu Design



The pull out menu is a quick way to access the various possible sections within the application. Account and settings bring the user to said pages, while the other options are quick hops to the other ways of navigating the collections.

Figure 4a – Object Page Design

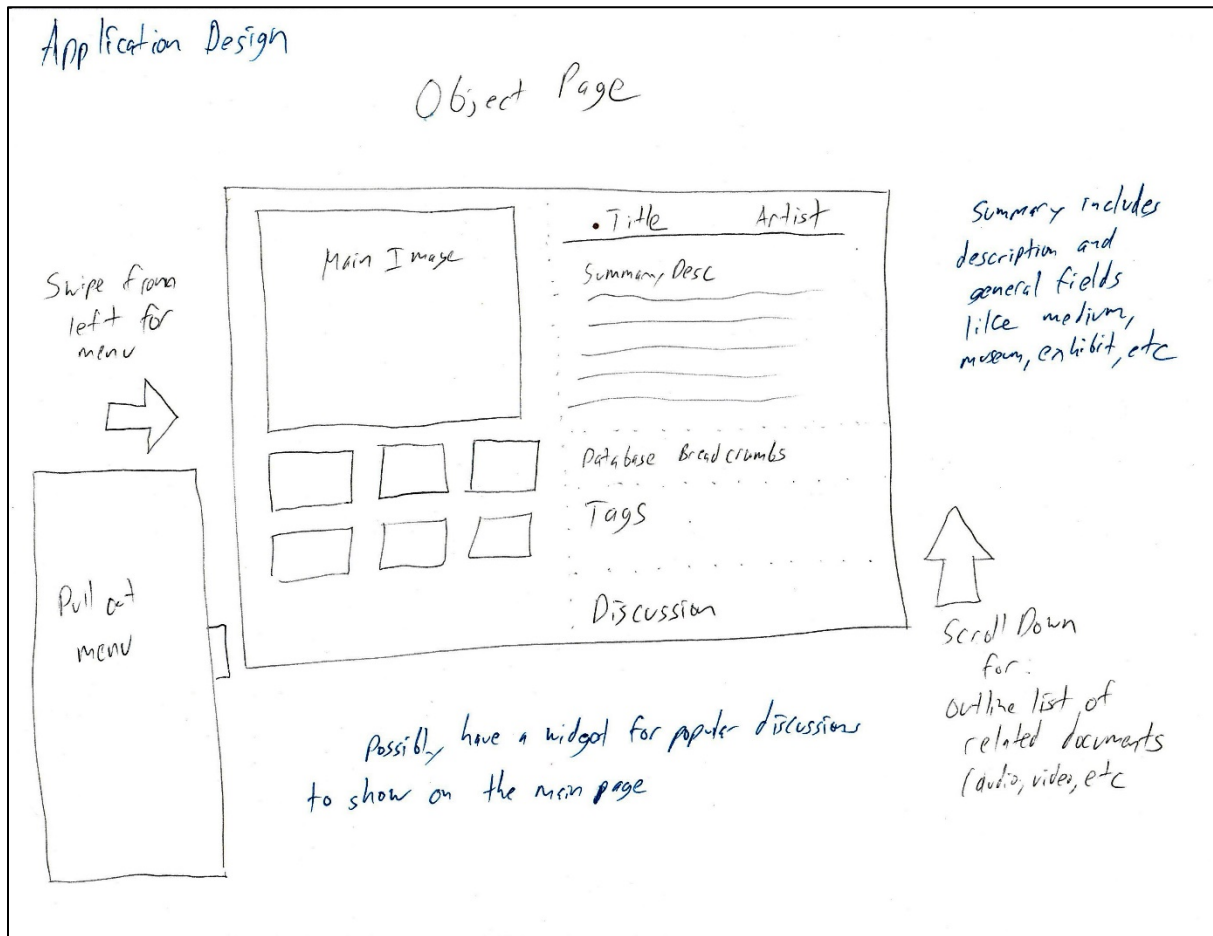


Figure 4b – Object Page Template

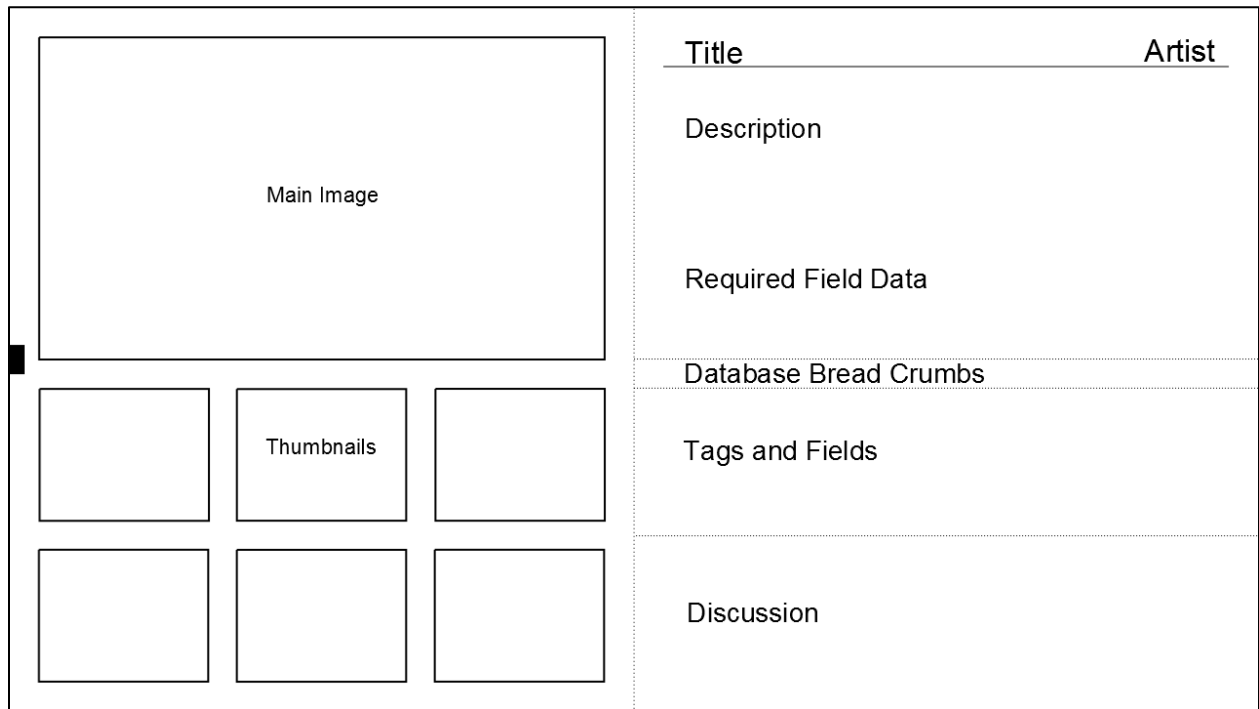
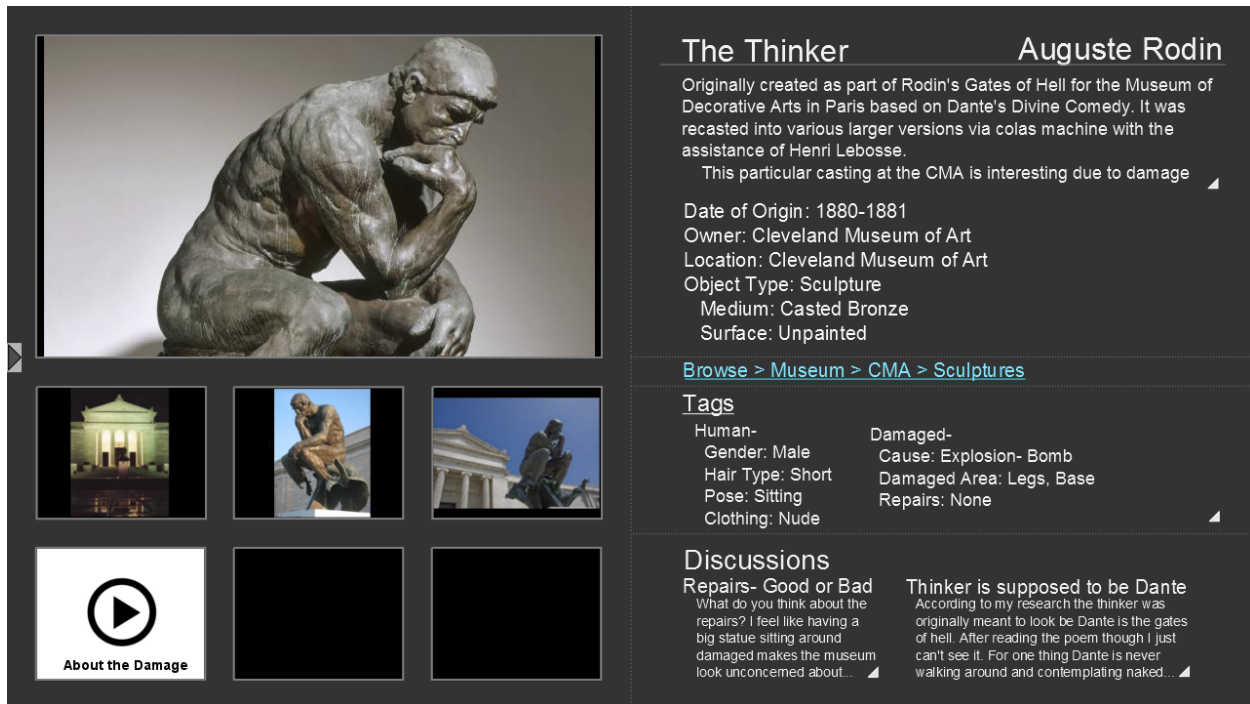


Figure 4c – Object Page Example



The Thinker **Auguste Rodin**

Originally created as part of Rodin's Gates of Hell for the Museum of Decorative Arts in Paris based on Dante's Divine Comedy. It was recasted into various larger versions via colas machine with the assistance of Henri Lebosse.

This particular casting at the CMA is interesting due to damage

Date of Origin: 1880-1881
 Owner: Cleveland Museum of Art
 Location: Cleveland Museum of Art
 Object Type: Sculpture
 Medium: Casted Bronze
 Surface: Unpainted

[Browse > Museum > CMA > Sculptures](#)

Tags

Human-
 Gender: Male
 Hair Type: Short
 Pose: Sitting
 Clothing: Nude

Damaged-
 Cause: Explosion- Bomb
 Damaged Area: Legs, Base
 Repairs: None

Discussions

Repairs- Good or Bad
 What do you think about the repairs? I feel like having a big statue sitting around damaged makes the museum look unconcerned about...

Thinker is supposed to be Dante
 According to my research the thinker was originally meant to look be Dante is the gates of hell. After reading the poem though I just can't see it. For one thing Dante is never walking around and contemplating naked...

About the Damage

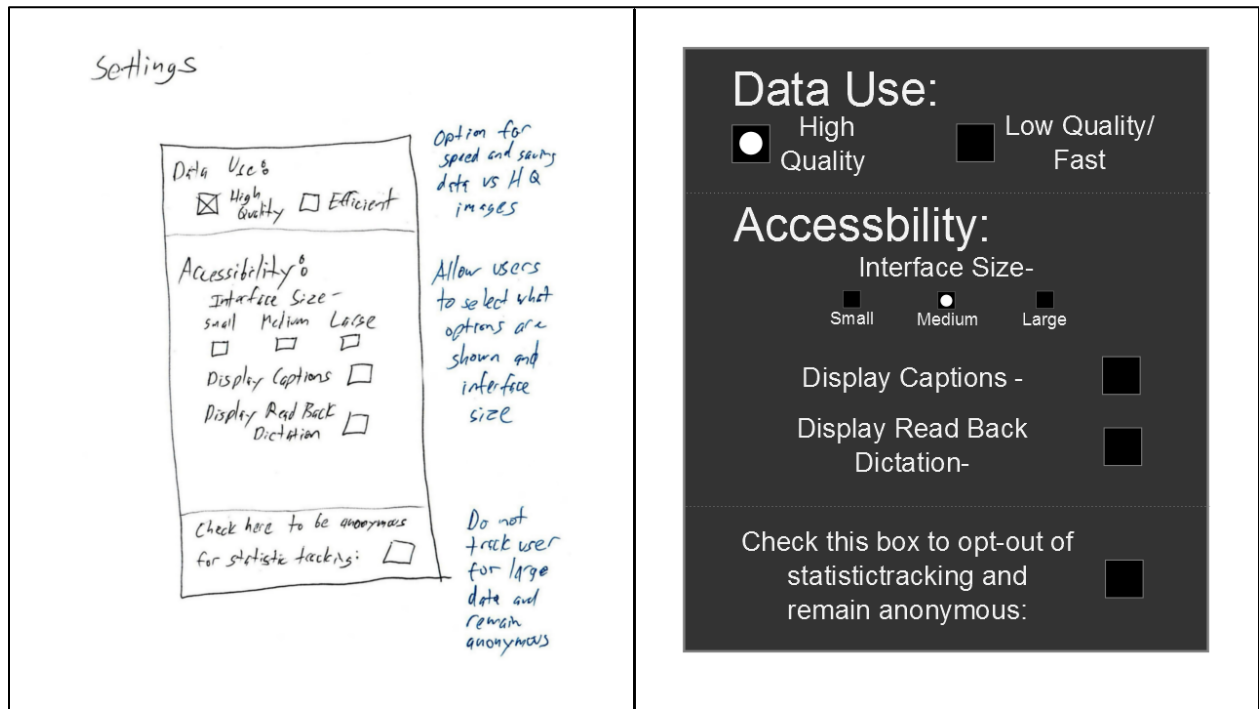
The object page is the main location for all data relating to any one piece in the collection. As such, it has a great deal of sections all in one page. Keeping things separated visually with a simple design keeps the information from all of the museums clear and intuitive. The left side is dedicated to related documents, initially showing those with priority and the main designated image. Thumbnails at the bottom can be clicked to bring them up to the larger view. These thumbnails may include videos or text documents by name for quick and easy access to often-viewed content.

The right of the page is focused on fields and text. Title and artist are easily seen at the top. Beneath, the simple description and main required fields are listed as well as object type and its additional fields. A simple breadcrumb menu follows displaying the way the user has reached this page allowing them to quickly jump back a few steps in their browsing experience. Next are

the tags that users most voted on and their additional information. Finally, popular discussions are displayed with a small blurb from the first post.

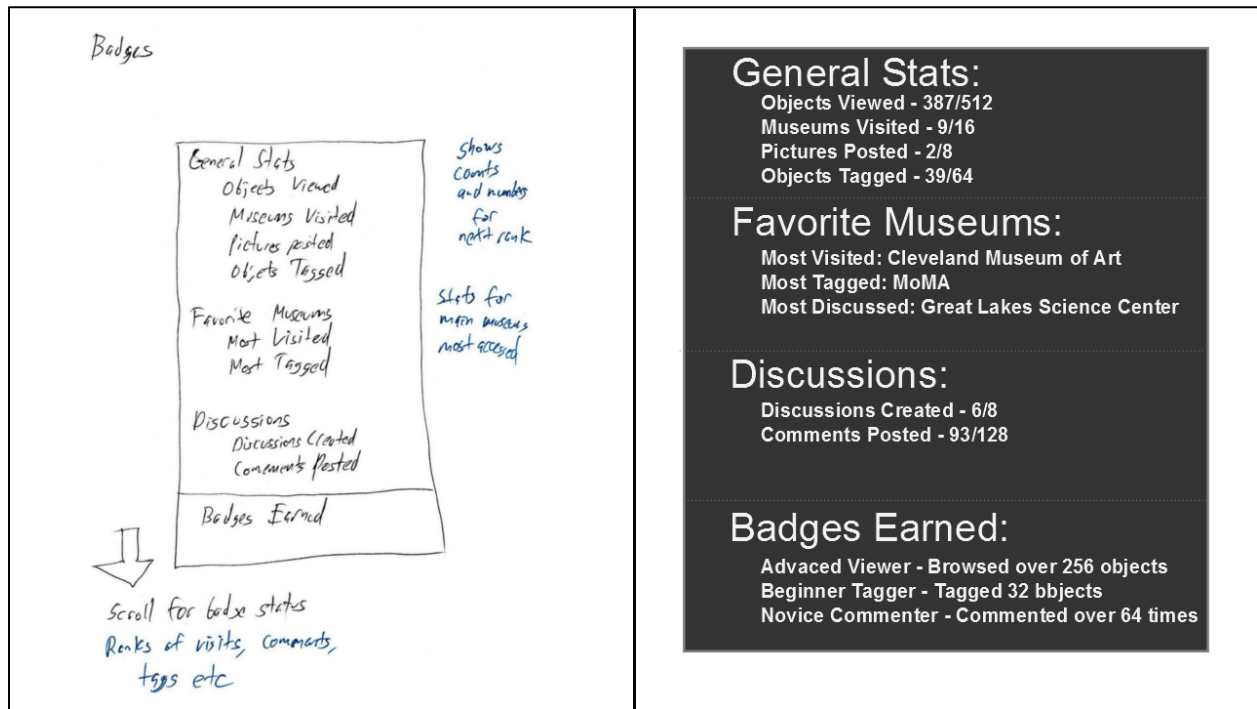
All these sections are designed for quick general knowledge, but can easily be drilled down for further access. Clicking the name of the section such as tags or discussions brings a user further into that information. Clicking on the tag or discussion itself brings up that exact area. The white arrows listed next to sections are visual cues to the user to expand that section to take up the full right half of the screen for easier reading and un-displayed content. The right arrow box on the left shows a user they can pull out the menu at any time.

Figure 5 – Settings Page Design



The settings page allows the user to set various features. Data use allows for the decision between quick lower quality browsing which will help when on mobile data or high quality for use on local wireless. The biggest features to control however are the accessibility options. Here, the user can decide if pages will display extra buttons for read back or captions on videos as well as the interface size for easier reading. The user may also choose to opt out of named statistics tracking for big data and prefer to remain anonymous.

Figure 6 – Badges Page Design



The badges page is accessed from the user’s account and allows them to see their own statistics. A user can visualize how many posts they have seen, museums they have visited, and their discussions record. This page also has rankings for these statistics and gives small visual rewards on the user profile. This page shows the current number as well as the number required for the next rank. Scrolling down reveals the earned badges of that user.

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