Reflecting on the Development of Viewshare Visualization Platform

Trevor Owens

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Introductory Note

My work on the Viewshare project over the last two years has already moved through several iterative cycles of research and development. So this piece is less a proposal and more of a retrospective design narrative. My goal in this essay is to explicate and illustrate some of the things I think we have learned about building tools for visualizing, interpreting, exploring, presenting and providing access to digital cultural heritage collections.

Briefly, Viewshare is a web application which the Office of Strategic Initiatives at the Library of Congress has developed over the last four years. The goal of the project is to create an easy-to-use web tool for individuals at different organizations to create interactive visual interfaces to digital cultural heritage collections[1]. For more background and introduction to the tool, or to request an account to try it out, visit the website, Viewshare.org. For the last two of those years I have been working as a project manager on this project. Staff at the Library of Congress have served as subject matter experts and have managed the work of the development team, a company called Zepheira.

In this paper I begin by explaining the research and development process behind Viewshare. While this project was not explicitly planed as a Design Based Research project, the iterative agile software development approach we have taken is very compatible with design based research. In this first section of the paper, I focus primarily on the types of data we have collected, and continue to collect, and the kinds of insight which that data collection has provided us in our development process.

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[1] For background and reference describing the project and its use and goals I have included an appendix with a draft of a forthcoming short article about the project which will appear in *Perspectives on History: The Newsletter of the American Historical Association*

In the next section, I go into detail about a few of the specific changes we made to the tool through our iterative development process. I end this section with reflections about how our changing understanding of our user's needs and wants prompted us to make a significant shift in our thinking about the nature of the project goals and workflow. Specifically, we started the project thinking that the goal was to have users create visual interfaces to digital collections. While that remains a central project goal; we have largely shifted to understanding that the process of developing these interfaces is itself a valuable process in which our users come to a deeper understanding of their collections.
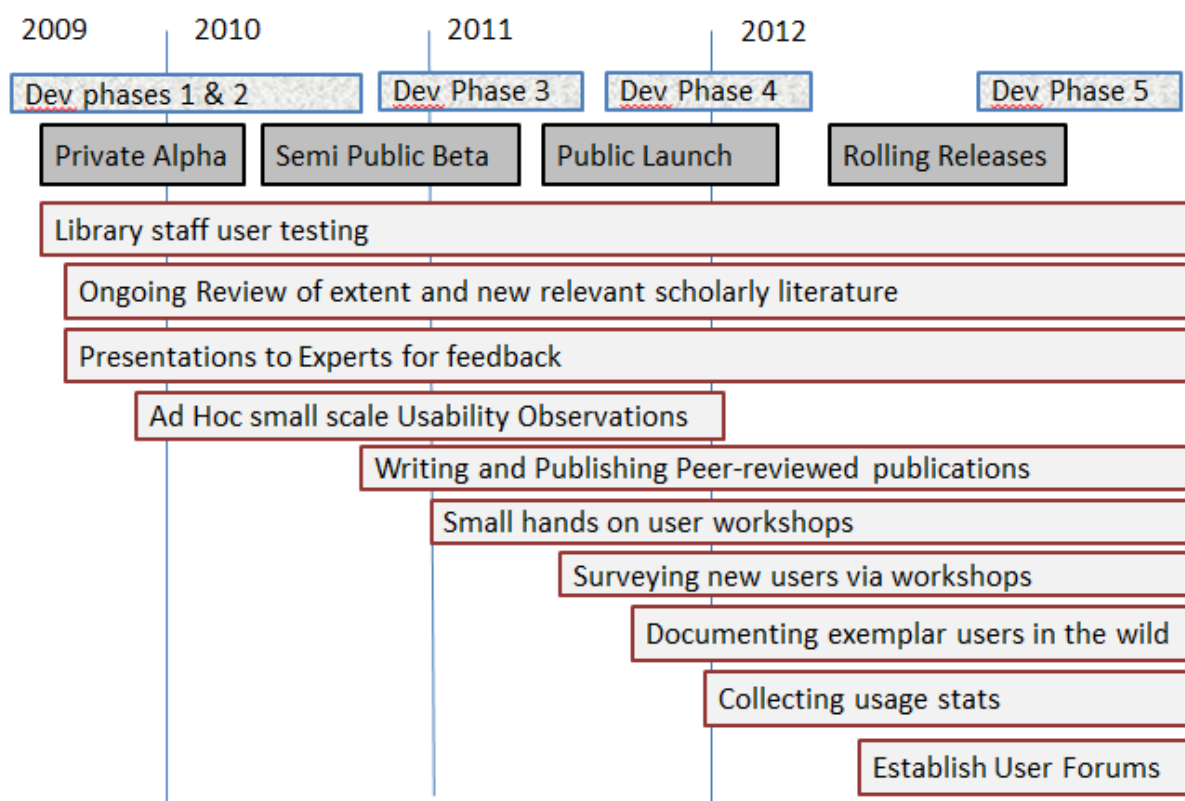
In the final section of the paper, I go into some detail about a particular new approach we have taken for collecting valuable data. Now that we have publicly launched the tool for use by different individuals around the nation we have begun to seek out users who are doing particularly interesting work with the software. We have begun to interview these users and in some cases to co-author papers with them on how they are using the software to solve particular use cases. In our case, this serves as further data collection to inform design, as direct feedback from users, and as a way to promote the project. Together these three sections offer reflection on the design of this particular project, the lessons we have learned and how those lessons might apply to the development of related systems for visualizing and exploring data.

Iterative Research and Design Process

The diagram below illustrates the phases, the iterative process of design, and development and the various modes of data collection we have engaged in over the course of the project. As the project progressed from early development phases through a small private alpha test with internal staff members, to a semipublic beta with a few partner organizations, to a public launch and ongoing outreach program for rolling releases it has moved through

increasingly sophisticated modes of data collection. This process is quite similar to many of the steps in Bannan's ILD process. The phases of work map quite nicely onto Bannan's stages of informed exploration, enactment, local and broader evaluation (2003). I will describe each of those modes of data collection and the kinds of information those modes have offered. From there, I will explicate how several of the revisions to the software's design we have engaged speak to a larger shift toward thinking about the process of creating an interface to a collection as iterative and dynamic instead of thinking of it as linear and discrete.

Viewshare Development Phases, Releases and Data Collection

2009	2010	2011	2012
Dev phases 1 & 2		Dev Phase 3	Dev Phase 4		Dev Phase 5

Private Alpha — Semi Public Beta — Public Launch — Rolling Releases

Library staff user testing

Ongoing Review of extent and new relevant scholarly literature

Presentations to Experts for feedback

Ad Hoc small scale Usability Observations

Writing and Publishing Peer-reviewed publications

Small hands on user workshops

Surveying new users via workshops

Documenting exemplar users in the wild

Collecting usage stats

Establish User Forums

For the remainder of this section of the paper I will briefly describe each of the 10 ways we have collected data and how that data collection informed and informs our design process.

Library Staff User Testing

As soon as there was a functional prototype of the software a small team of library staff began attempting to use it. Before the creation of an Alpha version of the software the contracted developer team created a series of example visualizations of collections which the tool would be able to let users create. The alpha version of the software allowed individuals to create these kinds of visualizations, but had a significant number of problematic UI issues and a range of data loading problems. Through these early rounds of testing the tool's feature set was refined to meet further needs.

One key value of having this early testing staff participate is that they have continued to participate as users and testers over the entire life of the project. It is very useful to be able to consult with a team that has worked with various versions of the software over time and is primed to point out any changes in the features that negatively impact their use of the tool.

Ongoing Review of Extent and New Relevant Scholarly Literature

The Viewshare team brings together individuals with different backgrounds, digital libraries and archives, digital humanities, computer engineering, and user experience and user interface. All of these participants think of their roles in the project as both designers and researchers. To this end, the group is continually engaged in keeping up with ongoing research and both technical and scholarly literature.

Presentations to Experts for Feedback

Once the basic workflow and functionality was in place the team began presenting on the project at a range of professional conferences. The goal of these presentations was two-fold. First, to solicit direct feedback and input on the project from subject matter experts who have not participated in the design and development of the project. At several of these presentations we received feedback that directly resulted in the development or refinement of additional

functionality. Second, to generate awareness of the project in the various professional communities we participate in. Building a general awareness of the work has continued to be essential in helping to find, connect with, and think about how to better work with, other related projects.

It is hard to estimate the value that we have gained from people who participate in our presentations, or follow our updates on our blog, who have suggested that others with related interests look in to our project. In several cases, these presentations have resulted in other researchers and developers downloading our entire project and tinkering with it. The project is open source software, and the moments when we can get others to try and work with the source code have resulted in refinements to the codebase that have made the tool significantly more sound.

Ad Hoc Small Scale Usability Observations

As the tool moved into a private beta stage we revised our documentation to make sure it was robust and easy enough to follow for anyone to just pick up the tool and work with it. We started creating accounts for staff members at the Library of Congress and for individuals at our partner institutions. We could glean a fair amount from seeing the views that these users created, however, some of our most valuable interactions were with individual staff members at the library who requested help troubleshooting the software. Staff members across the institution were invited to beta test the software. What was ideal about this situation is that the staff represented a broad cross section of what we imagined as our user community; library, archives, and history professionals with subject matter expertise and widely ranging technical competencies. Whenever possible we took these support requests as opportunities to observe users trying to make sense of the tool on their own. Instead of telling the user how to solve their

problem we would start by asking them to show us where they encountered the problem on their computer.

Simply watching individuals puzzle their way through the interface is always a valuable source of information, but beyond this, by having them explain their thought process as they ended up finding a problem served to clarify key issues in the user interface and the process and workflow. Understanding patterns in how our target users thought about the tool helped us both refine it and how we talk about it to make sure that we were explaining the software in a way that made sense to our users.

Writing and Publishing Peer-reviewed Publications

We started publishing peer-reviewed essays and scholarship on the project at a relatively early stage. Coming from a strong background in qualitative research I stand firmly committed to the notion that scholarly writing is not simply a process of communication of findings, but also a critical part of reflective practice. Writing and co-authoring these pieces with different members of the team has served as a way for team members to commit to paper and refine our working and evolving theories about the design of this system and its implications for the design of other systems. In this sense, the writing process serves to help team members share their developing ideas with each other and the broader scholarly community. For example, in working on updating the review of literature for our most recent publication (Bailey & Owens, 2012) we ended finding a series of new publications from humanities scholars on the process of visualization that has further validated and refined our thinking on the subject.

Small Hands-on User Workshops

As the project moved into a broader semi-public beta the team began to host face-to-face and webinar based workshops. These events represented a natural scaling up of our efforts and

required the software to be significantly more preformative. Many of these workshops have been

run as "bring your own data" workshops, which have been particularly valuable at finding edge

cases with user data. Simultaneously with developing the software we have needed to develop

the training and workshops that makes the software itself intelligible. Running and evaluating

these workshops serves the dual role of further testing the software and observing users and

providing an opportunity to develop outreach and training materials.

Surveying New Users who Participate in Workshops

Whenever possible, the team surveys users about both the quality of the workshops and

their comfort at accomplishing a set of particular tasks with the software after the workshop.

With a primary focus on ensuring that the software is germane to our users professional

situations, we ask a series of questions targeted at finding out if the users feel that the software,

in its current state, would be useful and applicable to their work. This process has helped to

guide decisions about new feature developments, refine the delivery of the workshops, and

further reflect on user experience. For reference, I have included brief reports on the results of

these surveys in Appendix B.

Collecting and Interpreting Web Usage Data

Along with the public launch we have now started tracking usage of the software through

a series of metrics. These include general web metrics, things like visits to the site from Unique

IP addresses, which are useful at charting the success of various outreach efforts. Most

importantly, our analytics data provides information about the most visited views users are

creating and the sites that users are embedding views in. This is far and away the most useful

information we can gather. In these cases, we can see what of the views users are creating that

they find valuable enough to broadly share, either through the Viewshare site or by embedding

them in their own sites. When we take the conception of design based research as a kind of engineering research this kind of evidence provides the richest kind of evidence. Evidence of target users making use of the software because they believe it serves some of their goals. It is the equivalent of seeing the plane fly and knowing that it works in aeronautics. The tools users can tell you why the tool is useful to them and that provides a particularly rich space to understand the success of the project.

Documenting Exemplar Users in the Wild

After the public launch we have started to attract users who have no direct connection to the Viewshare project and its development. We have been particularly excited to document and understand some of the particularly compelling and useful examples of usage that shows up in the wild. As previously mentioned, we find many of these users through our analytics data, but beyond this we have started following up with the users who are doing particularly interesting and novel things with the tool. In two cases, which I will further describe below, we are exploring ways of trying to use interaction with these users to simultaneously refine our designs and invite their commentary, to draw attention to their innovative use, and to further promote and reach out to more users.

Establishing User Forums

We have just launched a set of integrated user forums to start soliciting feedback from users and help users troubleshoot their use of the software. Our hope is that this can become a major resource as a knowledge base for users seeking information about using the software and that it can serve as a public space for us and our users to refine new feature requests into use cases we can use to develop new features.

Collectively, these various streams of data have resulted in some significant changes in the design of the software. In the next section of the paper I will describe how some different streams of this information resulted in a range of individual changes to the platform that collectively moved us to think in very different ways we are thinking about the value the software offers to our users.

From Interface as Product to Interface as Process

The original goals behind the Viewshare project were to make it easy for librarians, archivists, and others working with cultural heritage collections to be able to quickly create interfaces to their collections. Over the course of iterative development cycles a series of responses to user's feedback, usage data and observations of users the project's primary goals have shifted from a primary focus on creating interfaces as products to focusing on the value that comes from the process of developing an interface to a digital collection. Importantly, this is a somewhat subtle shift, the visual interfaces our users create are still an important goal for the project. Ultimately, we want to provide our librarian, archivist, curator and historian users with the tools to create dynamic interfaces to their collections that help their end users (students, researchers, members of the public, and other constituencies) explore and understand particular digital collections. However, it has become clear that we first need to make the tool work as a platform for helping the librarians, archivists, curators and historians explore and understand their collections. The shift is a substantive one, in that it has reframed how we think about and approached parts of our design process.

Beyond reporting all of the different kinds of data we have been collecting I also wanted to give an account of how that data has influenced our thinking in the iterative design process.

**Redefining the Workflow: From steps in a process fiddle and iterate**

The original workflow put the user in the situation of walking through steps in a process. It started with importing data and moved through eight steps which each took place on a different page. This had the value of providing individual decisions for the user to make at each page and the user could see their progress through the steps in the process in the green progress bar/navigation tabs at the top of their screen. You can see what this looked like in the image below.
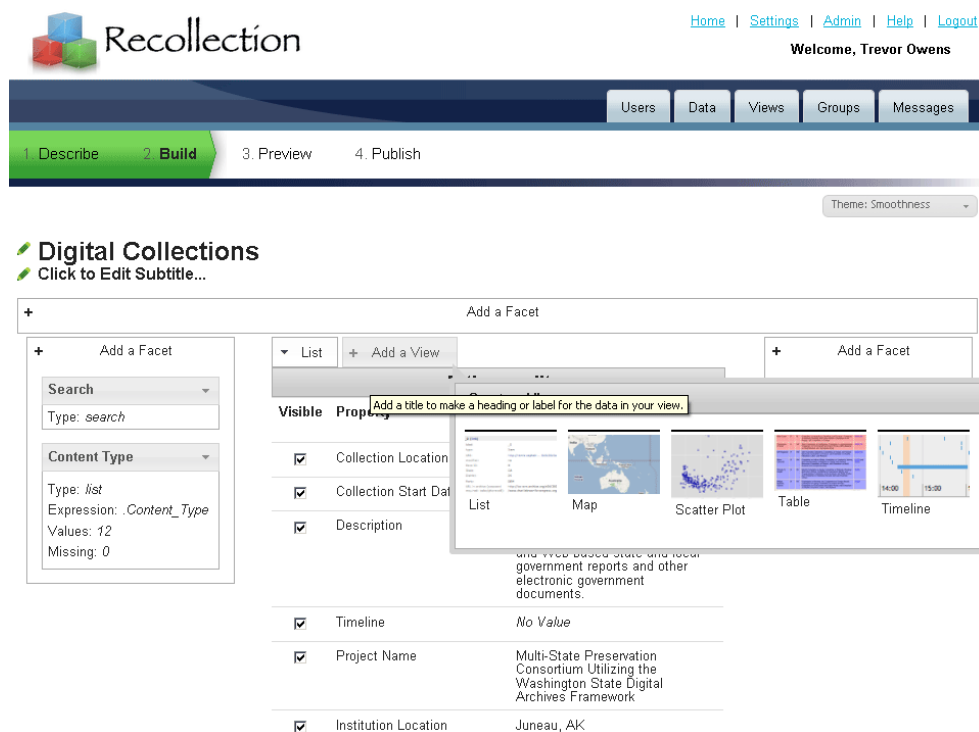
This step in a process approach resulted in some significant user consternation. Even in the early user testing with library staff it became clear that this was not working. It did not seem like users could go back and forth between configuring the view, previewing the view, and publishing the view. Throughout the ad hoc testing and early workshops it was clear that this

workflow was problematic. Users would find issues with their data, or issues that would result in the user needing to go back several steps earlier to change their decisions and then move back through the steps to see the result of those changes. Further, it seemed that many users would get to the final steps and see their views and be underwhelmed with them. For example, all of the items being geolocated in the same place on a map, or the item images not showing up in a gallery view. In each of these cases users were likely to posit that the tool didn't work, or hadn't made what they wanted.

We had suspicions that the steps in a process approach was making users think they had less control and autonomy and that, particularly based on the rather problematic and rough around the edges data that users were bringing, we needed to find a way to get the user interface to encourage users to experiment and to make it easy for users to rapidly see the results of their decisions as they worked. Alongside these changes in interface design, a recent article from human computer interaction researchers came to our attention as part of our continued engagement and exploration of literature related to our project (Heer & Sniderman, 2012). Their approach supported our own findings that it was better to think about these kinds of visualization designing projects as an iterative process. As a result, we completely removed the steps metaphor, significantly decreased the number of pages, and provided much more compact interface for view building. The results of these changes are visible in the new interface for building views shown below.
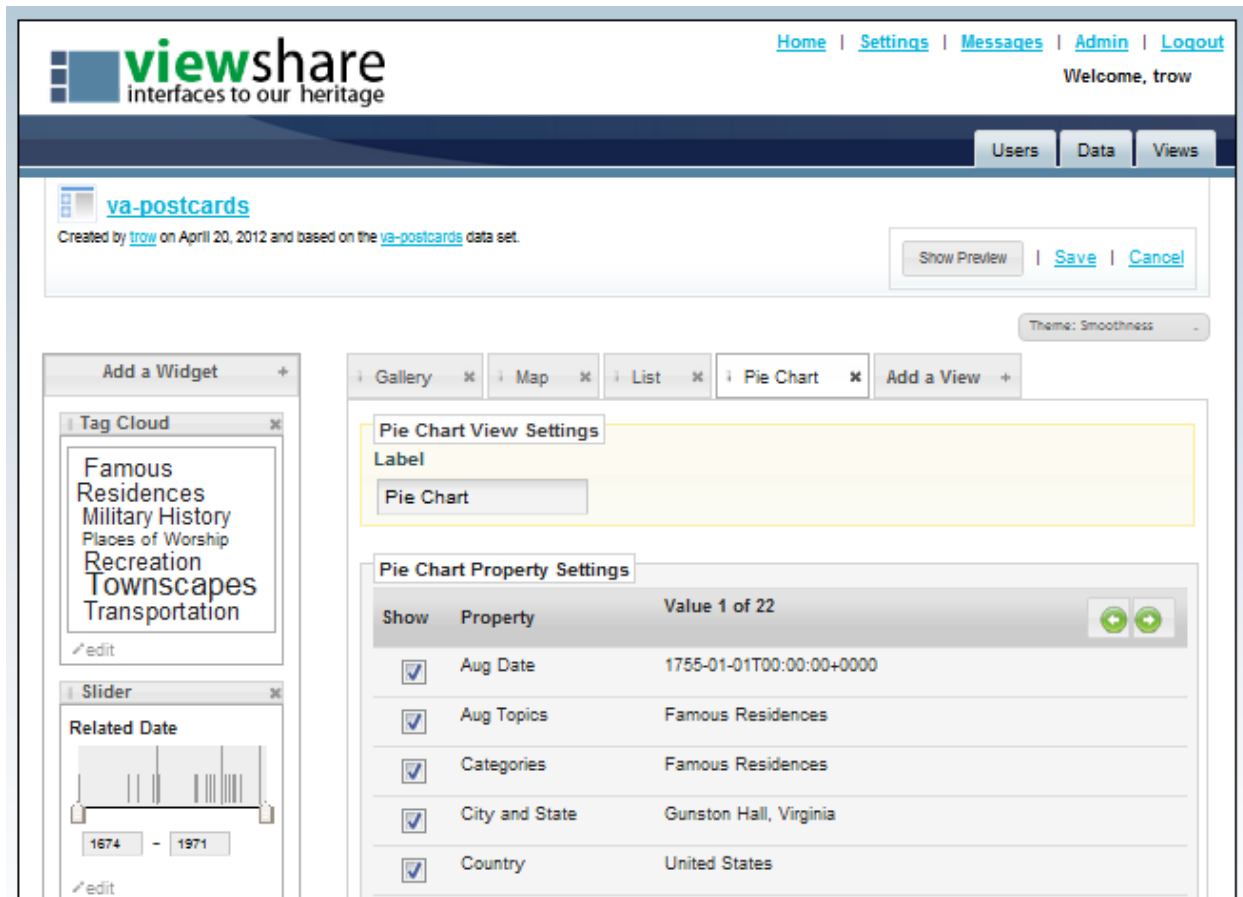
In the image above you can see how the four parts of the steps in a process have been merged in to a single page. This works much more like a mixer or a switchboard. The central components of this are now the full range of pieces you can manipulate. The interface now offers show preview not as a different page that you navigate to but as toggle that one can click to pivot back and forth from viewing the interface you are creating and configuring the interface. In the case of the widgets available on the left hand side of this interface, this was actually carried a step further. When you click to edit a widget you see exactly what the resulting configuration decisions will look like as you manipulate them. Then when you save them you see what the resulting individual widgets will look like side to side. Based on the success of this approach in user testing we are likely to push it even further.

The development team is trying to think about how we could adjust the interface to find a way to make the changes to the larger displays, what are now viewed by toggling back and forth between the preview and the configuration, directly visible as the user manipulates and configures them. This remains a bit of a user interface challenge, but the results of these changes so far are very promising and are encouraging us to go further. Since implementing these changes we have seen users developing much more robust interfaces, we have seen more users embedding those interfaces, observations of users working with the tool have shown them to be much less frustrated and our long time users and testers have responded very positively to how this change in workflow has made the tool much easier to use.

These changes and tweaks to the user interface and workflow have made the tool more useful and usable. Beyond this, however, these tweaks and changes over the course of the development process have also caused us to rethink some of the core ideas about what exactly this software does and should do. In the next section I will briefly describe how the accumulation of these small changes has slowly redefined and reshaped the projects goals and its focus on a particular user audience.

Meta Reflections on Building Viewshare

The linear process of view creation in the previous versions of the software represented the key ideas behind the project. The idea was to help librarians, archivists, curators and historians create interfaces to digital collections that their users and patrons could use to explore and understand the value of those collections. As we built the tool, and worked with the librarians and scholars we were testing it with, it became clear that the linear process wasn't working. Our users knew they wanted maps, timelines and image galleries, however, they didn't know which of these kinds of interfaces was going to work well in what configurations with their

collection information. Furthermore, when they did create interfaces the process frequently resulted in showing them a range of inconsistencies in their original collection data. As we put in improvements to help these users find out what would be meaningful ways to visualize their data we realized that this task, helping custodian of digital collections (curators, archivists, librarians, or scholars) to understand, interpret, and remediate their data was a necessary step toward creating the interfaces. Beyond that, it was a step that was quite valuable in and of itself. In this sense, we have shifted from thinking about the end product, the visualizations and interfaces, as the primary value of the tool to instead think about the process through which a librarian or archivist working with the tool comes to understand much more about their collection, as a central value that this tool, and other visualization tools, could provide.

The diagram below illustrates how we have changed our thought process about creating interfaces to cultural collections. Instead of walking through the step-by-step process we have come to see that once our users see their visualizations they often want to return back to tweak and fix their data to restart the process of importing, augmenting, building and sharing. So the green arrow introduces the cyclical nature to this process which had been missing. It is likely that this kind of cyclical and iterative approach to designing software workflows will be of general value for projects that aim to offer scholars environments to engage in exploratory work with data sets more generally as well.
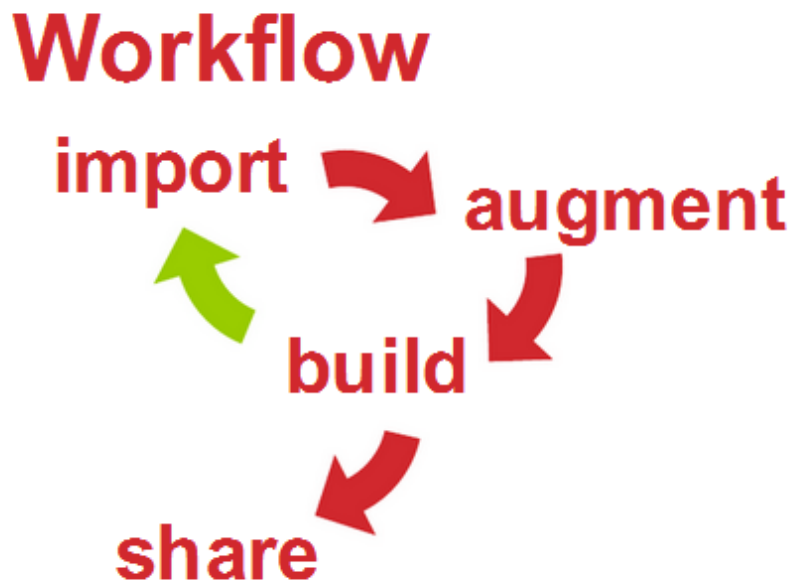
Theorizing Evidence From the Wild Toward an Opportunistic Design Based Research

Jennifer Brancato digital archivist at East Texas Research Center, Stephen F. Austin State University, created a Viewshare view of a set of funeral records. She then directly embedded that view in the collection homepage page. I was curious to learn more about the collection and to chat with her a bit about her experience using Viewshare. Using our basic web analytics tools I saw that the page she had embedded the view in on the East Texas Research Center's website was directing some traffic to the Viewshare site which led me to ultimately contact Jennifer about it. It turns out that she saw a Facebook post about Viewshare and had used the documentation to teach herself how to use the tool.

What was exciting here is that a user found our tool through our work in outreach (contacting a range of list serves to invite participation, running online webinars, writing up short pieces on it for newsletters) and because the result of her use of the tool is public and I could see it through our analytics I found a use case, and an example data set that I could work with and think about as an exemplar.

From the web stats I could see which data sets were being used, that is which have become actually useful. I saw how it had been integrated into the homepage of the ContentDM site she manages and was captivated by the data, instantly thinking up ways that I could further explore it. She found the new view I was working on and contacted me over twitter. A few weeks later I was giving a talk about the project at a conference, included her view as an example, and was thrilled to find that she was right there at the conference.. This represents a tremendous sense of validation of value, that beyond the people we set up to use it, we are finding people who beyond seeing potential value in the tool are making extensive use of it as part of their ongoing work in their roles at unaffiliated organizations.

Beyond simply acknowledging this story, I decided to go a step further and Jennifer was willing to do an interview about her use of the tool for the Library of Congress digital preservation blog. Here the goal was two-fold, first to learn more about what she thought was useful in the tool, how it fit her needs and second to be able to directly share the value she saw in it with anyone else. Think of this as one part data collection, one part user feedback, one part promotion and outreach and one part software documentation and further user story and use case development.

The full interview is published on the Library of Congress blog. But I have provided the following excerpt from it below.

> Working with Viewshare is pretty straightforward. We use CONTENTdm so I knew I had a couple of options for importing data. First I tried using the OAI harvester. I had trouble with the harvester, so I exported a TXT file from CONTENTdm, saved it as CSV and then directly imported the CSV file into Viewshare. Within 30 minutes I had my first view. Admittedly it was not pretty. The student and volunteer workers transcribed the data exactly as it was. Therefore we found many inconsistencies because different undertakers recorded the information. So I spent a weekend cleaning up some of the data. I fixed typos, standardized terms for race and religion, verified cities and counties, and found latitude and longitude for each cemetery.

Jennifer's experience, and comments, confirm and help to further refine how we are thinking about the tool. She chose to stress that it only took her 30 minutes to create her first view, which while it was not "pretty" it had shown here what the tool could do and working through her first cycle of using the tool showed here the potential value that it could provide and also showed her problems with her original data set. The original dataset had exact transcriptions of the digitized pages in her collection. This is great for some cases, but is terrible for when one is trying to treat that data as a structured data set. At this point, the software had in effect informed her that she needed to tweak those inconsistencies and normalize her data. After she fixed those inconsistencies, which only took her a weekend, she then reloaded her data and embedded the view in the collection homepage.

We are currently working on more extensive collaborations like this with other users, for example, we are in the final stages of co-authoring article with an archivist from the National Gallery of Art who has been using the tool (I have attached the current working draft of this forthcoming paper as Appendix C). This co-authored essay explores her usage of the software, explains what value she has found in using the tool, and helps document how the Viewshare software can be used with art collections.

Discussion and Conclusion

Through four years of software development this project has significantly changed to meet it's users changing needs. We started in an ill-defined space, and learned a ton about what our users expectations, desires, and use cases are. In the process we have come to understand a lot more about how tools for visualization should work. Interestingly, the very lessons of this project are the same kinds of lessons that design based research offers to traditional evaluation

research. We were thinking about this as steps in a process, but our users really wanted

something they could use to explore and come to better understand their digital collections.

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Appendix A: Draft of Forthcoming Introduction to the Project for Perspectives on History: The Newsletter for the American Historical Association.

Viewshare: Digital Interfaces to Cultural Heritage as Scholarly Activity

By Trevor Owens and Jefferson Bailey

The Fulton Street Trade Card Collection generates significant patron interest at Brooklyn Public Library. This collection of 245 late 19th and early 20th century merchant trade cards from Brooklyn, New York,.has generated so much interest that it has been digitized and is now freely available online. The cards are an interesting set of source material for work on the history of Brooklyn, advertising and a range of other topics. From Brooklyn Public Library's website you can browse through the lists of the cards alphabetically by address, business or creator. You can also search through the collections metadata. Like many digital collections, if you know what you are looking for, you can find it. There is so much more that an interface to this collection, and the thousands of special collections like it, could offer.

We can search through the metadata but it tells us little about aggregate patterns and relationships between the cards. Search and browse are not particularly good ways for helping us understand change over time, relationships between different categorical information, or to appreciate the spatial relationships between these objects. The Google style search box has become our default interface to digital content. The empty box in which you enter a term and are provided with a list of results. While search is powerful, the search box is only one of a range of ways that we can interact with digital collections.

Visualization as Scholarly Activity

We can do so much more than search and brose. We can display objects on maps, and timelines and an ever growing array of interactive visual interfaces. Visualizations quite literally offer a perspective, an interpretation of how one should think about and understand a collection of materials.# Visualization techniques can enable us enable us to see a range of aggregate patterns in collections, to explore
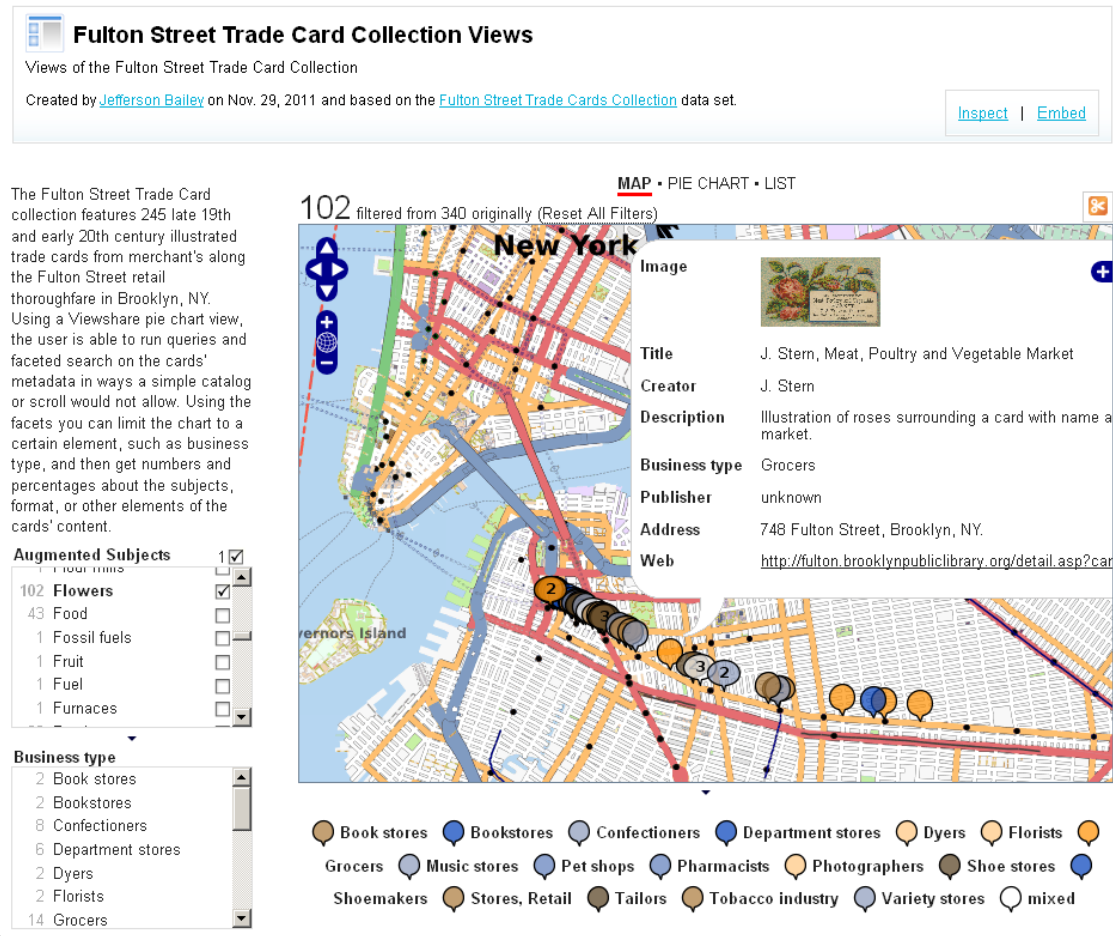
connections between artifacts over time across space and in such capacity authoring a visual interface is itself a mode of scholarly activity.

Beyond providing access, the process of visualization itself is increasingly being understood as a potential mode of scholarly inquiry. Visualization can be thought of as part of a hermeneutic research process.It is worth thinking of visualization itself as a process that is "generative and iterative, capable of producing new knowledge through the aesthetic provocation"#.In short, the development of an interface to a collection is itself an interpretive act which surfaces particular vectors for exploration and interpretation by end users.

Easily Creating a Rich Interface to the Fulton Street Trade Cards

The potential value of the interfaces we know from high gloss commercial sites is of limited value to the librarians at Brooklyn Public Library. While the is an audience of scholars and enthusiasts who would love to be able to explore this collection in a richer interface that audience does not represent the kind of commercial market that gets that kind of custom software development. To bring some of the power of those interfaces to collections like the Fulton Street trade cards the National Digital Information Infrastructure and Preservation Program at The Library of Congress has created Viewshare, A free, easy-to-use web application for creating dynamic visual interfaces to cultural heritage collections.

By using Viewshare, a collection manager, curator or scholar, with his or her knowledge of the contextual details of the collections, can create views that allow users to interact with this collection in ways not possible via a static web interface and also empower them to uncover collection-wide relations not evident or interpretable through traditional online gallery display or through item-by-item browsing.and search#.

Fulton Street Trade Card Collection Views

Views of the Fulton Street Trade Card Collection

Created by Jefferson Bailey on Nov. 29, 2011 and based on the Fulton Street Trade Cards Collection data set.   Inspect | Embed

MAP ▪ PIE CHART ▪ LIST

102 filtered from 340 originally (Reset All Filters)

The Fulton Street Trade Card collection features 245 late 19th and early 20th century illustrated trade cards from merchant's along the Fulton Street retail thoroughfare in Brooklyn, NY. Using a Viewshare pie chart view, the user is able to run queries and faceted search on the cards' metadata in ways a simple catalog or scroll would not allow. Using the facets you can limit the chart to a certain element, such as business type, and then get numbers and percentages about the subjects, format, or other elements of the cards' content.

Augmented Subjects

	Flour mills	
102	Flowers	☑
43	Food	
1	Fossil fuels	
1	Fruit	
1	Fuel	
1	Furnaces	

Business type

2	Book stores
2	Bookstores
8	Confectioners
6	Department stores
2	Dyers
2	Florists
14	Grocers

Image	
Title	J. Stern, Meat, Poultry and Vegetable Market
Creator	J. Stern
Description	Illustration of roses surrounding a card with name a market.
Business type	Grocers
Publisher	unknown
Address	748 Fulton Street, Brooklyn, NY.
Web	http://fulton.brooklynpubliclibrary.org/detail.asp?car

Book stores · Bookstores · Confectioners · Department stores · Dyers · Florists · Grocers · Music stores · Pet shops · Pharmacists · Photographers · Shoe stores · Shoemakers · Stores, Retail · Tailors · Tobacco industry · Variety stores · mixed

Screenshot of Fulton Street Trade Card Collection View: The user has selected to facet their display to only show cards with the subject "flowers" and has clicked on one of the orange pins associated with a grocer business type, and Viewshare is now displaying a particular grocer's card associated with that address.

After uploading a spreadsheet of the collection data, which includes links to the web-accessible image files, a user can begin building new interactive views. The entire process uses a simple drag-and-drop interface to build the interface. The original collection data includes plain-text place names which Viewshare can derive to associate points of latitude and longitude required to plot the items on a map. With that data, the user A map view can be built showing the exact location of each card's creator. A clickable pin on the map allows users to see a thumbnail image of the item and select metadata elements. By adding a facet to the view, a user can click on any facet element, such as business type "flowers" and the map will update to show only the location of the flower trade cards. Adding other facets such as date or subject will allow a user to further manipulate the geographic display.

The system currently allows a user to create a range of other views, including charts, galleries of images, more detailed list views, sortable tables, and timelines. It also allows users to add a series of other kinds of facets, including sliders that allow users to shift date ranges, weighted tag clouds that display the text values for a given values based on the frequency they appear. All these interface components can be quickly assembled to create an interface that makes sense for a given set of items. The resulting views become rich ways to interact with and explore the relationships between items in a collection.

The web has transformed our ability to access digital and digitized source material. With that said, the interfaces we have for exploring, connecting and understanding those sources leave considerable room for improvement. The idea behind Viewshare is to enable new ways to visualize and analyze cultural heritage collections. By providing these new levels of interactivity, the project is aimed at encouraging users to see digital collections less as discreet items and more as broad, unified data sets which can be manipulated and interpreted to form new modes of understanding. In this sense, Viewshare supports the ongoing efforts to involve existing cultural heritage assets in the growing use of information visualization in digital humanities research as well as providing cultural stewards a free, intuitive tool for the display and use of digital collections. We are excited to invite historians, archivists, curators, and students associated with libraries, archives, museums and universities to make use of this free and open source tool. To request an account visit http://viewshare.org/account/request/ to request an account today.

Appendix B: Two short reports on results from post workshop Surveys:

Report on the January 23rd, 2012 Viewshare Webinar

Summary

The recent Viewshare webinar was a resounding success, with almost double the number of

registrants, attendees, and survey respondents as the previous April 2011 webinar. Given the fact

that our WebEx registration limits had us turning potential attendees away, there is clearly

demand for additional demonstrations and webinars. Survey respondents provided valuable

feedback on both the success of the webinar as well as potential ideas for improving and

expanding future demonstrations and user documentation. Overall, registration and attendance

show an increasing awareness of and interest in Viewshare and the survey results show a solid

understanding of its use, features, and potential.

Broad Interest in the Workshop

There was significant interest in the Viewshare workshop from a wide swath of user

communities, especially in the academic and LAM sectors. Total registration requests numbered

over 175 people, with the WebEx maximum of 125 reached two weeks before the workshop

itself. Those unable to attend were sent a link to post-webinar screencast, offered personal

follow-up in creating account and views, and were put on a prioritized list for admission to the

next scheduled demonstration.

Workshop Attendance

All together, 72 participants joined us for the workshop and at least another 25 watched the

recorded screencast. A survey was sent to the 72 participants and we received 30 responses. In

comparison, our previous workshop in April 2011 had 78 registrants, 40 attendees, and 14 survey

respondents. The survey respondents represented the diversity of the user community. Including

Representatives from national institutions like Smithsonian Institution Archives, the National

Gallery of Art, National Institutes of Health, and the National Park Service; Representatives

from a range of universities, including University of Texas, Kent State University, Oklahoma

State University, and University of Louisiana; and Representatives from a range of small cultural

heritage organizations and sites, including Yosemite National Park Archives, and the Creole

Heritage Center.

Survey Analysis

The survey results were revealing. When asked if they had a good understanding of "how

Viewshare complements digital collections," 91% strongly agreed or agreed (46.7%, 43.3%). As

well, 87% strongly agreed or agreed they had a "good understanding" of Viewshare's features.

Responses were also strong when inquiring on the value of the tool, it being explicable to

colleagues, and its potential inclusion in current workflows (93%, 83%, and 83% strongly

agreeing or agreeing, respectively). Most impressively, 73% of respondents felt their

organization "could use Viewshare right now." Data importing and building views and facets

received high marks for being well demonstrated and understood (both over 90% for agree or

strongly agree). One area of potential improvement was signaled by 33% being neutral or

disagreeing that they "know enough to build and modify views." This was probably due to the

difficultly covering all the software's features and build-steps in a one-hour demonstration, an

issue noted in some user comments.

Feedback and Feature Requests

The survey responses included useful ideas on future features, with multiple users suggesting the

ability to import additional file types (audio & EAD specifically) and more customizable

interfaces (such as the ability to size pop-up windows or create slideshow views). Users also had

valuable demonstration feedback, suggesting more "themed" or task-specific demonstrations and documentation and also potential step-by-step work-through sessions where users build collections concurrently with the presenter.

Technical Details

The overwhelming response and number of registrants exposed the limitations of the WebEx software, both in hard-cap registration numbers but also in administrative logistics as far as maintaining the registration roll. Some users had difficulty logging into the webinar and the WebEx screencast video apparently obscures the host's mouse, making on-screen actions difficult to follow. Future webinars may merit the exploration of alternate online presentation methods.

Conclusion

Regardless of WebEx, the webinar was a demonstrative success in the number of attendees, registrants, and users and proves the continued interest in and adoption of Viewshare by the cultural heritage community.

Report on the April 19, 2011 Viewshare Webinar

With a small amount of publicity from digitalpreservation.gov, twitter and Facebook we held a WebEx workshop to demonstrate and explain recollection. This seems to be a cost effective way to promote the software and train users. Based on participation and evaluations from the workshop it would seem to be a good idea to do this kind of event on a fairly regular, perhaps quarterly. If you are interested you can view the recording of the workshop here http://bit.ly/rec_workshop_video Future workshops would continue to be general in focus but incorporate new features as they are available.

Workshop Participation

Altogether, 78 individuals registered for the workshop, of that 40 actually participated. A recording of the workshop was then sent out to all of the remaining participants so irrelevant of if they attended they were able to view the workshop. 14 of the workshop participants filled out a short survey evaluating the tool and the workshop. Participants in the workshop included a mixture of existing partners and other relevant organizations. This included NDSA members, like the National Library of Medicine, WGBH Media Library & Archives, and Harvard. Beyond our existing partners individuals representing a range of organizations participated. This included government agencies (like the State department) regional public libraries and historical societies (like Gadsden Public Library in Alabama and East Hillsborough Historical Society in Florida) and a significant number of individuals from universities (like Virginia Tech, Texas A&M and the University of Delaware).

Evaluating Recollection

When asked if they thought Recollection was a valuable tool all of the respondents either strongly agreed (79%) or agreed (21%). Beyond simply seeing it as valuable tool all of the participants either strongly agreed (43%) or agreed (57%) that they could see using recollection for their work, and 65% felt that their organizations could make use Recollection right now.

Evaluating the workshop

Similarly, after the workshop all of the respondents either strongly agreed (29%) or agreed (71%) that they could explain what the tool does to a colleague. Further, 79% of the participants reported that with the one hour online workshop and the documentation to refer later they felt they knew enough to use the tool. When asked specifically about their confidence at being able to accomplish 10 of the core tasks in the software's workflow all of the respondents felt they could accomplish six of them. One individual felt unprepared to derive standardized dates and

add a timeline to a view and two were unclear about how to derive latitude and longitude and break apart lists of terms. Future workshops should focus a bit more on these four features.

Top Feature Requests

Respondents were asked to rate the relative importance of a range of potential future features. Respondents expressed significant interest in all of the potential features. Directly editing uploaded data and supporting up to 10,000 items were the most important features, with a range of features focused on additional views and facets following closely behind, and features focused on additional import formats and augmentations following. These differences are, however, so small that it is best to not make too much them.

Technical Details:

In general WebEx worked as a great platform for hosting this event. One tricky element was that for this kind of presentation the fact that the presenter cannot hear the level of their voice on the call makes it difficult to keep the volume level consistent. For future calls it would be valuable to have two people administering the call. One person focused on demoing the tool and the other interjecting issues and questions that come up in the comments as the session goes. That way both presenters could interject if the other is getting quiet. The volume issue could similarly be resolved by having the presenter use a headset for the conference call.

Appendix C: Forthcomming paper for D-Lib a open access digital library journal.

Viewshare and the Kress Collection: Creating, Sharing and Rapid Prototyping Visual Interfaces to Cultural Heritage Collection Data

By Trevor Owens, Jefferson Bailey, Lauren Algee

Empowering users has long been a goal of digital collection stewards. Supporting discovery, use, and navigation of digital collections is a fundamental part of providing access and encouraging inquiry, interpretation, and knowledge. Digital collections, however, are dependent upon the interfaces through which they are explored and those interfaces do not necessarily encourage the modes of discovery that provide new insights. As data analysis and computational tools become more common and more familiar to users, digital collection managers will need to ask whether traditional interfaces truly support the increasingly novel and exploratory ways that users engage with online collections. For cultural heritage institutions, digital collections are often built around the same path-based information-seeking behaviors that characterize online-public access library catalogs. If you want a specific item, those catalogs are powerful tools by which to narrowly refine your query within the extensive bibliographic data associated with individual resources. But such directed searching often fails to complement the ability to iteratively explore, compare data trends, and engender the accidental wisdom that comes from visualizing collections in new ways. We have the tools to build and create these interfaces: navigating collections on maps, charting relationships between information in collections, and navigating through a range of faceted browsing techniques. With this said, it is both cumbersome to develop these kinds of interfaces and it is difficult to know exactly what will be valuable once presented within them. Viewshare, a tool developed by the Library of Congress, offers some interesting ways to help in both of these respects.

Consideration of Visualization Product and Process

Viewshare is a free, open software platform developed by the National Digital Information Infrastructure and Preservation Program (NDIIPP) of the Library of Congress that enables collection managers and users to create new ways of seeing and navigating digital collections. Viewshare was originally developed to enable NDIIPP partners to provide access to their digital collections through a shared interface. Once it became evident how the tool could accentuate the use and understanding of a diverse range of digital content from disparate repositories, it was clear the software would be of value to the broader cultural heritage community. Viewshare's primary function is as a platform for generating and customizing views that allow users to dynamically and creatively experience digital collections. We have written about the value of developing and sharing these interfaces to collections elsewhere (Bailey & Owens, 2012); in this essay we hope to explore more deeply an emergent use case for the tool that we think demonstrates its unique benefits.

As the development of the platform progressed, we saw an interesting trend in our own use of Viewshare as well as how our test account users were working with the tool. The process of rapidly creating these interfaces turned out to be more valuable in many cases than the final

product of the views. The tool is first and foremost a platform for prototyping interfaces and thinking about cultural heritage collection data. For many users, the interfaces created with the tool are useful ends in and of themselves. Particularly at smaller institutions, or for smaller collections, we see Viewshare as a platform for providing more sophisticated modes of access to collection content. However, at larger organizations we have seen the tool becoming something that can serve as a stepping-stone toward larger cultural heritage projects for online collections. Instead of wireframing an expansive, costly collection portal, it is possible to, in a matter of minutes, create an interface to a collection and uncover both the limitations of a collection dataset and also potential ways to enhance its presentation.

Viewshare's ability to expose the possibilities and limitations of a collection as a dataset is a function of its design, which recognizes a number of emerging technical and intellectual trends in the cultural heritage community. Viewshare acknowledges the heterogeneity of metadata types across a diverse group of repositories and thus supports a variety of collection ingest methods. Viewshare also adheres to linked open data principles by making the metadata that powers its interfaces open and exportable in a variety of formats. Viewshare's own code, being open-source, is also available for download and re-use. By prioritizing the openness of data, it provides an easy means of data ingest and facilitates quick and easy experimentation with visualizations and interfaces. Viewshare's open data principles also allow multiple users to create different views off of the same collection dataset. Viewshare also allows sharing of collection views through links, encouraging collaboration and group prototyping; the interfaces created using the software can also be embedded in third-party websites. The platform features a drag-and-drop view-building workspace and multiple preview options that allow users to test and refine their views prior to making them public. Most importantly, by allowing content stewards to create new visual interfaces to their collections, it capitalizes on the affordances of richly cataloged items and situates them in the nexus of an overall collection. The unique and detailed contextual knowledge of collection managers is accentuated by Viewshare's features – features that allow those managers to present digital collections as a corpora, an interconnected set of items sharing significant, meaningful properties, by creating dynamic interfaces that form a bridge between their curatorial understanding and users' exploratory, generative behavior.

This paper is a collaborative effort between two of the project's staff at the Library of Congress, Jefferson Bailey and Trevor Owens, and one of the users, Lauren Algee, Project Archivist for the Samual H. Kress Collection Database at the The National Gallery of Art. Lauren developed a view that we think exemplifies some of the most valuable cases for using the tool. After providing some context for the idea behind the Viewshare platform, we describe how Lauren came to work with the tool, what she used it for, and an explication of the value it provided her in her ongoing work on the Samuel H. Kress Collection Database project. You can skim ahead to actually interact with the view she created, which is itself embedded in this artilce. Our goal in presenting this essay is to provide an introduction to the tool, demonstrate its power visualizing

digital collections, and simultaneously offer a specific worked example of how it can fit into the workflow of a large project at a cultural heritage institution.

From Visualizations to Revelations

Visualizations offer a framing device, an interpretation of how both curators and users can think about and understand a collection of materials (Staley, 2003). Visualization allows users to ask new questions and explore the connections between artifacts over time and across space; it is also increasingly being understood not only as a means to provide access, but also as a potential mode of scholarly inquiry. Visualization can be thought of as part of a hermeneutic research process – a process that is "generative and iterative, capable of producing new knowledge through the aesthetic provocation" (Jessop, 2008; Drucker, 2010). In this respect, visualizations function as tools for a distant reading that focuses on the development of aggregate abstractions of information from objects which can help to warrant and provoke novel interpretations (Moretti, 2005). In short, the development of an interface to a collection is itself an interpretive act which surfaces particular pathways for exploration and interpretation by end users. It also gives users methods of arrangement and analysis that may disrupt traditional curatorial collocation. At its heart, Viewshare aims to empower both the end user and the librarian, archivist, curator or scholar creating the interface to undertake, a "highly serendipitous journey replacing the ordered mannerism of conventional search" (Ramsey, 2010). This view of visualization from the humanities also has significant resonances with emerging approaches to visualization tools more broadly. As Sinderman and Heer suggest in their recent development of a "taxonomy of tools that support the fluent and flexible use of visualizations," visualization "typically progresses in an iterative process of view creation, exploration, and refinement." Importantly, from their perspective, "meaningful analysis consists of repeated explorations as users develop insights about significant relationships, domain-specific contextual influences, and causal patterns" (2012). In short, there is an emerging consensus of the value of tools that support this kind of exploratory process from a range of disciplinary perspectives.

Those intellectual foundations are meaningless without building a tool designed for broad, easy use by a community with a wide range of technical skills. Bridging the ideals of open data, serendipitous discovery, and the didactic power of data visualization with a functional tool that is easy to use has been the fundamental challenge in building the Viewshare platform. In developing Viewshare the goal remains to create an application that is open, beneficial, and widely adopted. Viewshare was also designed to provide collection managers without deep technical skills an intuitive way to articulate and expose their significant knowledge of their digital collections. It needed to balance the complex demands of being "sophisticated, robust, transparent, and easy to use" in order to attract a broad user base (Borgman, 2009). Software tools, especially in the cultural heritage community, need to promote, encourage, and support an interpretive provocation. They need to empower both collection stewards and collection patrons to explore and understand, support both conventional curation activities as well as novel

interactivity, be easy to use, and encourage both close and distant reading, and facilitate iteration and demonstration (Gibbs & Owens, 2012).

The Kress Collection as a Viewshare Use Case

Funded by the Samuel H. Kress Foundation, the Samuel H. Kress History and Conservation Database Project began at the National Gallery of Art's Gallery Archives in 2009 with the goal of creating a relational database to hold information on the development and dispersal of the Samuel H. Kress Collection. Beginning in the 1920s, department store magnate Samuel H. Kress, his brother Rush, and the Samuel H. Kress Foundation spent nearly three decades amassing and giving away over 3,600 paintings, sculptures, medals, and decorative art, primarily focusing on works from the Italian Renaissance. The largest segment of the collection was donated to the National Gallery and included three-quarters of the works on display at the Gallery's opening in 1941 [7a]. By the end of the 1960s, the remainder of the Kress Collection had been distributed to museums, universities, and other institutions across the United States, making great European art widely accessible to average Americans.

At the beginning of this year, Lauren participated in an hour long webinar that Trevor, Jefferson, and their colleague Abbey Potter ran on using Viewshare. After participating in the workshop Lauren decided to experiment and use Viewshare with some of the data from the Kress History and Conservation Database Project to explore the potential uses of the platform. In a matter of hours Lauren had created the interface and visualization of the collection embedded below in this article. We will briefly describe the process Lauren worked through to build the view and then explicate what the resulting view communicates about the collection data.

Exporting, Uploading, Describing and Augmenting Data

Lauren began by exporting data on a subset of database objects, the 887 paintings in the Kress Collection for which purchase price information is known. Once in a spreadsheet, the data could easily be opened, examined, saved, and uploaded to Viewshare. For documentation and examples of the data import process you can review the [documentation for importing collection data](). After uploading collection data, it was possible to quickly describe the data by identifying those fields containing URLs, image URLs, and numerical data. After identifying existing city and state data as locations, Lauren chose to use Viewshare's data augmentation function to derive place names from points of latitude and longitude for each of the museums where a painting is located. Data augmentation is one the built-in features of Viewshare that allows the platform to facilitate the use of heterogeneous metadata and convert that data into standardized formation to enable its use in creating dynamic interfaces. Similar to Viewshare's ability to derive place names into geo-coordinates for map interfaces, it can also derive dates in the ISO 8601 standard format for creating timelines and converts replicated data element metadata fields

into a single field array. Once Lauren's dataset had been described and augmented, it was possible to begin building interfaces to her collection.

[embed here?]

Image 1: The functioning Viewshare view of the paintings in the Samuel H. Kress Collection History and Conservation Database

Building the View

If you request a Viewshare account, you can follow these directions to build out your own copy of this interface from the demo Kress collection data set. In Image 2 below you can see a screenshot of the view building workspace, in this case the screen for building a map display. Using simple drag and drop features and basic menus, you add widgets (like a search box, histogram sliders, lists and weighted tag clouds) that will control what is displayed in any of the displays. As you add each individual widget you are presented with the available data fields that can be used with that facet and a preview of what the resulting widget would look like with the given data field. A Viewshare view can be composed of many different displays, located on tabs at the top of the platform window. In the center pane, users can click between the tabs for each of the views and click the "add view" tab to create additional displays (maps, pie charts, scatter plots, lists, and image galleries). Each display can show different metadata elements from the overall dataset. Once you create a new display, you then set what data fields you want to use to power it, for example by selecting which data field has latitude and longitude information in it. You can drag and drop the data fields to reorder them and use the checkboxes to decide which data fields you do and do not want to appear in each display. At any point in the process, users can click the "show preview" button at the top-right of the workspace to see what the final view will look like. This iterative workflow -- toggling back and forth between display previews and the display builder -- is key to the design process and the act of exploring the relations within collection metadata. After Lauren worked extensively with her dataset, she published the view embedded above as Image 1. Now that we have explained how one can build this view, we will take some time walking through exactly what this interface communicates and offers. The reader is also advised to open the Kress Collection view in a new tab (using this link) in their browser in order to easily toggle between this article's elucidation of the view's meaning and the fully functioning view itself.

Image 2: Viewshare View Building Workspace (Map Display)

What the Demo Kress Collection View Accomplishes and Communicates

Viewshare's power lies in evidencing collection trends while maintaining item-level accessibility. The Kress database unites information for nearly every collection object to create a resource for object-based study of the complex relationships between Kress, his dealers, the

works themselves, the National Gallery, and the other institutions that possess Kress-donated items.Viewshare helps tell the wider story of the collection as a body of objects with a shared history, making otherwise hidden data patterns evident and creating new knowledge through an iterative design and use process. Its data visualizations empower user interpretations, but are built upon the core knowledge of the content stewards who define the dataset and create the tools, and thus the potential and limitations, of the views and facets.
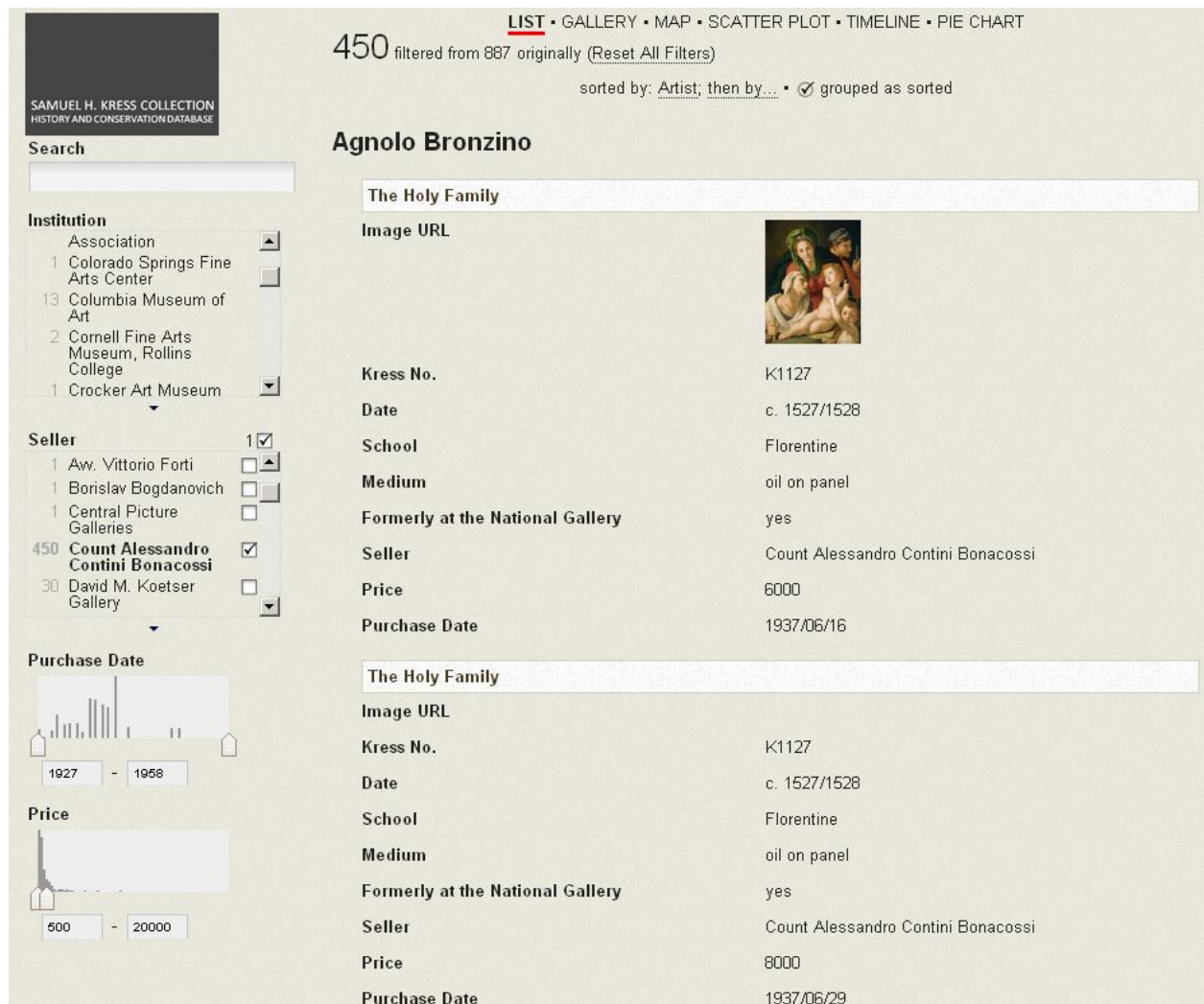
Image 3: The Kress Collection View (List Display)

Image 4: The Kress Collection View (Gallery Display)

On the surface, the list and gallery displays (Image 3 and Image 4) are simple inventories of all the imported records. However, these views expand the existing object-based framework of the data by allowing users to easily create complex queries exposing found sets for immediate

analysis. This exploration of the collection occurs through the use of the widgets which allow faceted sorting and other tools. In the Kress Collection displays shown above, users can choose to look only at objects tied to a specific institution or sold by a specific dealer, such as Count Alessandro Contini Bonacossi. At the same time, users can use the histograms and numeric sliders to further define their query by purchase date and purchase price. As an example, a histogram widget of the date span of Contini purchases reveals that the Kress's purchases from the seller peaked in 1940 and then greatly diminished, as seen in Image 3 (note the checked box in the Seller facet and the resulting histogram in the Purchase Date widget). This reduction in purchases from the Italian dealer can be linked to the start of World War II. The found set can also quickly be reversed to objects purchased after 1940 so that the specific details of these later purchases can be examined.

Switching over to a gallery display (Image 4), users can see the images of their found set and investigate if a shared purchase history results in common aesthetic attributes or offers novel insights into features of the collection not immediately evident in the metadata or objects themselves. This both brings up the painting images themselves, but also updates the facets and histograms, to show the related information of this range of paintings including custodial institutions, sellers, purchase dates and price range. While some of these advanced search elements and faceting are familiar from online catalogs, Viewshare's power comes from the ability to see the results of such searching automatically displayed in a variety of visualizations; toggling between multiple visualizations of the same data set or subset reveals shared characteristics and leads to a new understanding of the collection objects.

For example, all of the items purchased on a single date can be examined in each display, highlighting shared and/or disparate characteristics among the same group. Image 4 shows a gallery all the objects purchased June 16, 1937 (on the same Contini bill of sale); in this display one can easily see the visual connections between the works. All but 5 of the 34 paintings are of religious subjects and many feature a gold background. By toggling to pie chart view and looking at the same group of works by media used, it is clear that their similar appearances were achieved through similar means, most of them painted using oil or tempera paints, most often on wood panel and sometimes with gold leaf applied.
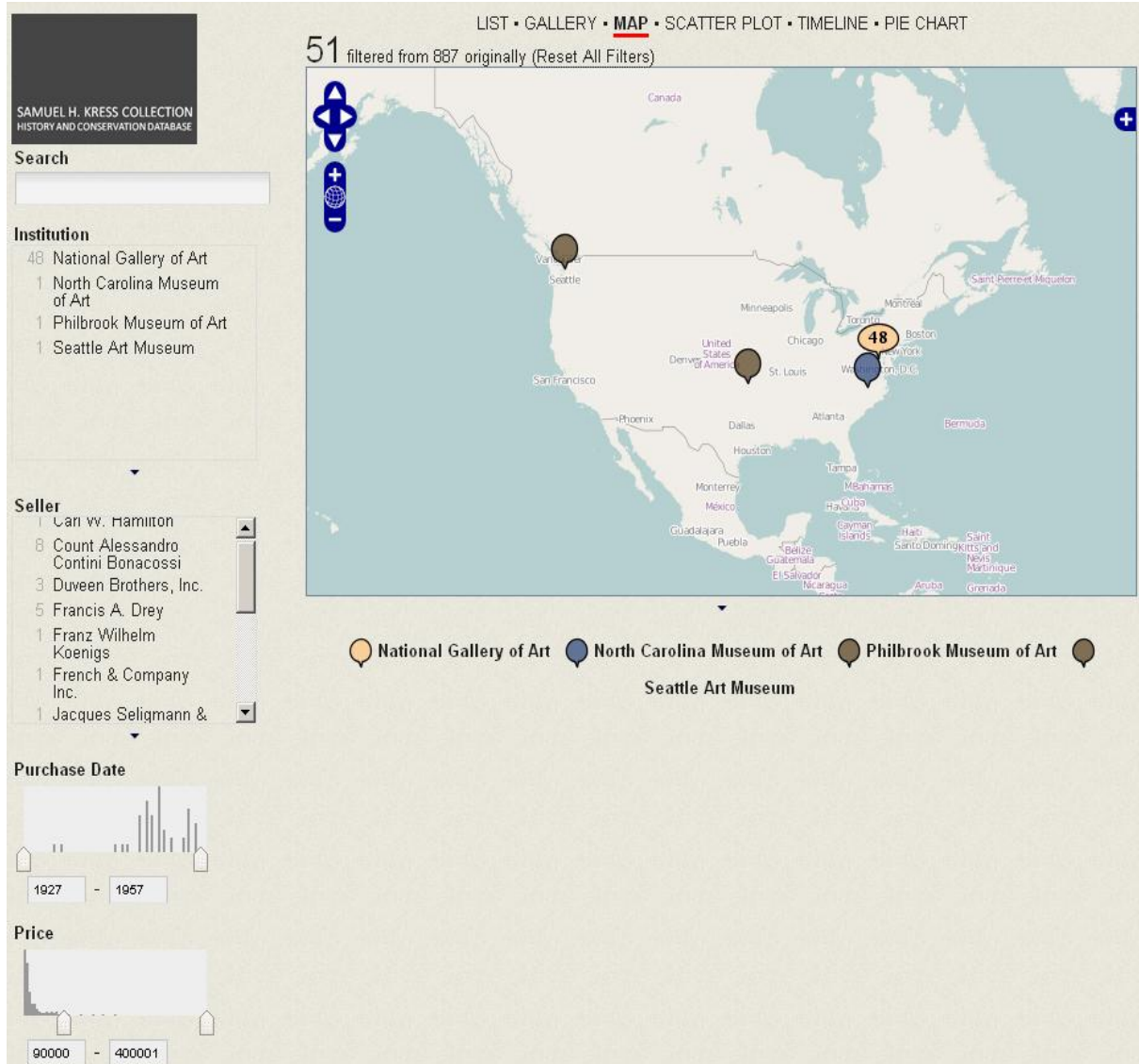
Image 5: The Kress Collection View (Map Display)

The map display allows users to observe how Kress objects are geographically dispersed within attribute groups. By using the numeric slider widget and defining a price range of $90000 and above, as seen in Image 5, one can learn that all but 3 of the 51 most expensively purchased works were given to the National Gallery of Art. Gallery staff, particularly chief curator John Walker, worked closely with Kress Foundation employees to evaluate the collection and decide its distribution, sometimes even requesting purchases specifically for the Gallery collection [7b]. Examining the data within the historically close relationship between the two institutions highlights that while populist, distribution of Kress art was not egalitarian.

The map display engenders other avenues of exploration. For instance, when one facet is defined, the information available in the other facets is updated along with the view itself. In the above example (Image 5), one can see within the Purchase Date histogram that most of these expensive works were purchased later in the time span of this collection. The Seller list widget shows the names of the dealers of these 51 works and a quick scan of the number of entries listed by each name shows which seller handled primarily high-priced works. Playing with these widgets in the map view exposes how the collection was dispersed over the time frame in which Kress bought and donated the items in this collection. For distributed collections like the Kress Collection, Viewshare's displays unify the items in a way not feasible in traditional catalogs and offers new methods of analysis and interpretation.
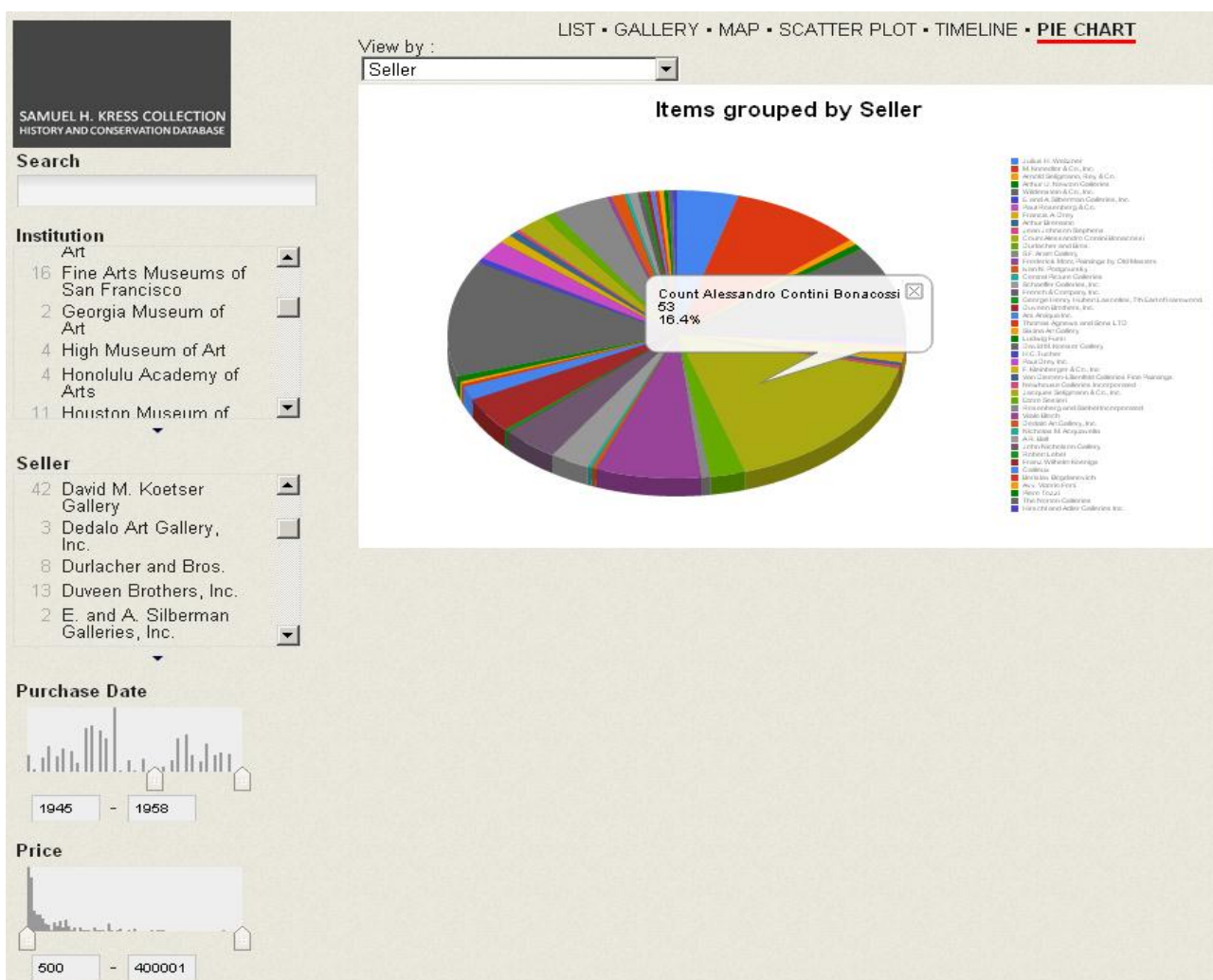

Image 6: Kress Collection View (Pie Chart Display)

Pie charts show the distribution of object facets among the data set. For example, in the Kress Collection users can continue to explore the relationship between seller and collector by looking

at the percentage of paintings sold by specific art dealers. Overall, Count Contini sold a 64.5% of the paintings. By using a date slider widget, we can determine that among paintings purchased by Kress before 1945, Contini was the seller for 92%. Conversely, as seen in Image 6, he sold only 19.6% of the paintings purchased by the Kress Foundation from 1945 to 1955. By placing this data of the context of known Kress history, the change aligns closely with Rush Kress taking over leadership of the Foundation and transforming the collection in terms of quality, focus, and scope [7c].
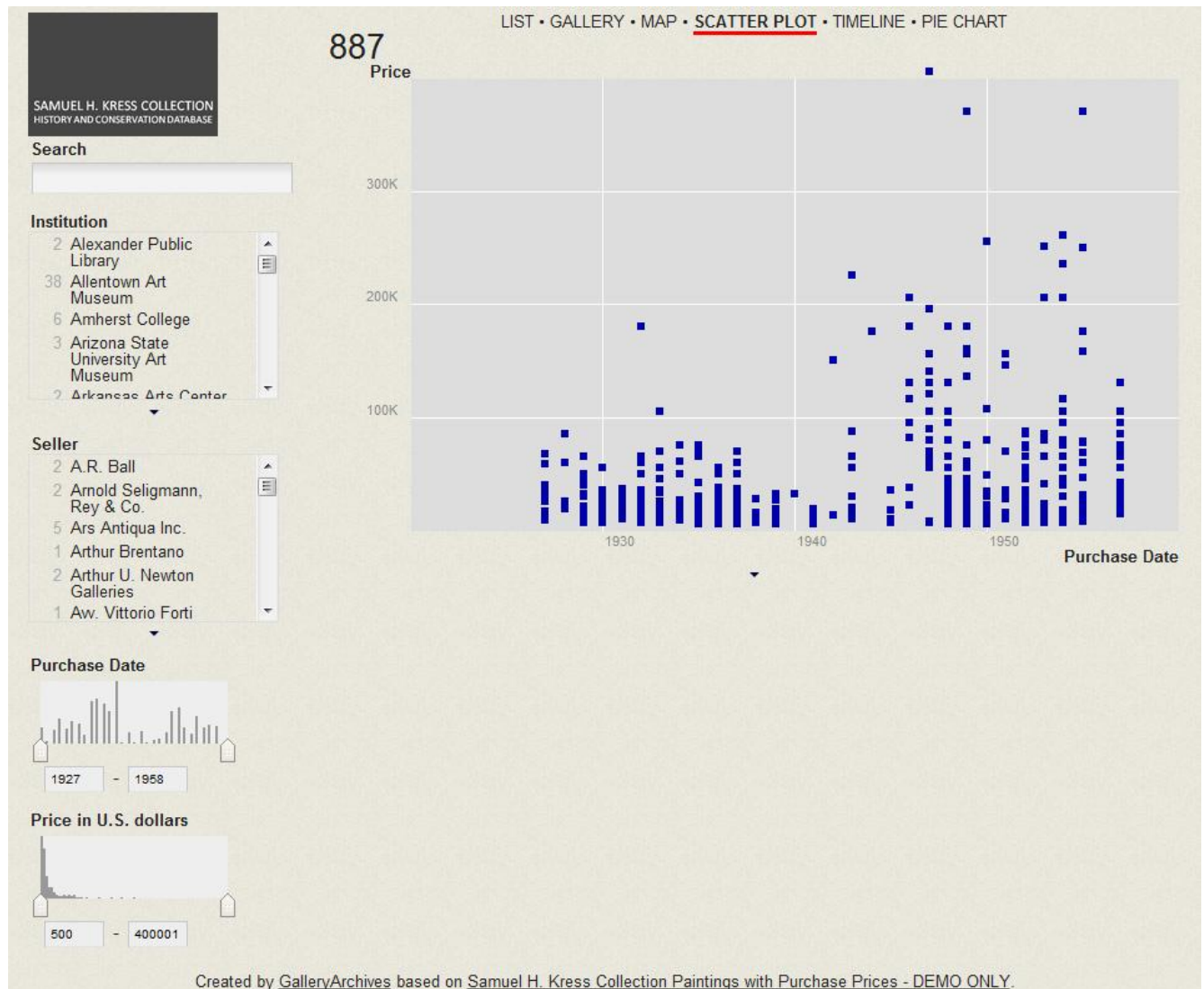

Image 7: Kress Collection View (Scatterplot Display)

Another unique interface to the collection is the scatterplot view. Scatterplots focus on the relationship between two quantifiable sets of data. In the case of the Kress Collection, painting purchase prices and purchase dates create a visualization of collecting habits over time. Looking at the entire data set as shown in the scatterplot in Image 7, it is clear that Kress purchased more

expensive works later in the formation of the collection, with the upwards distribution of prices beginning in the mid 1940s. One notes that this willingness to pay more for paintings, like the movement away from Contini, coincides with Rush Kress taking over the presidency of the foundation from his ailing brother.
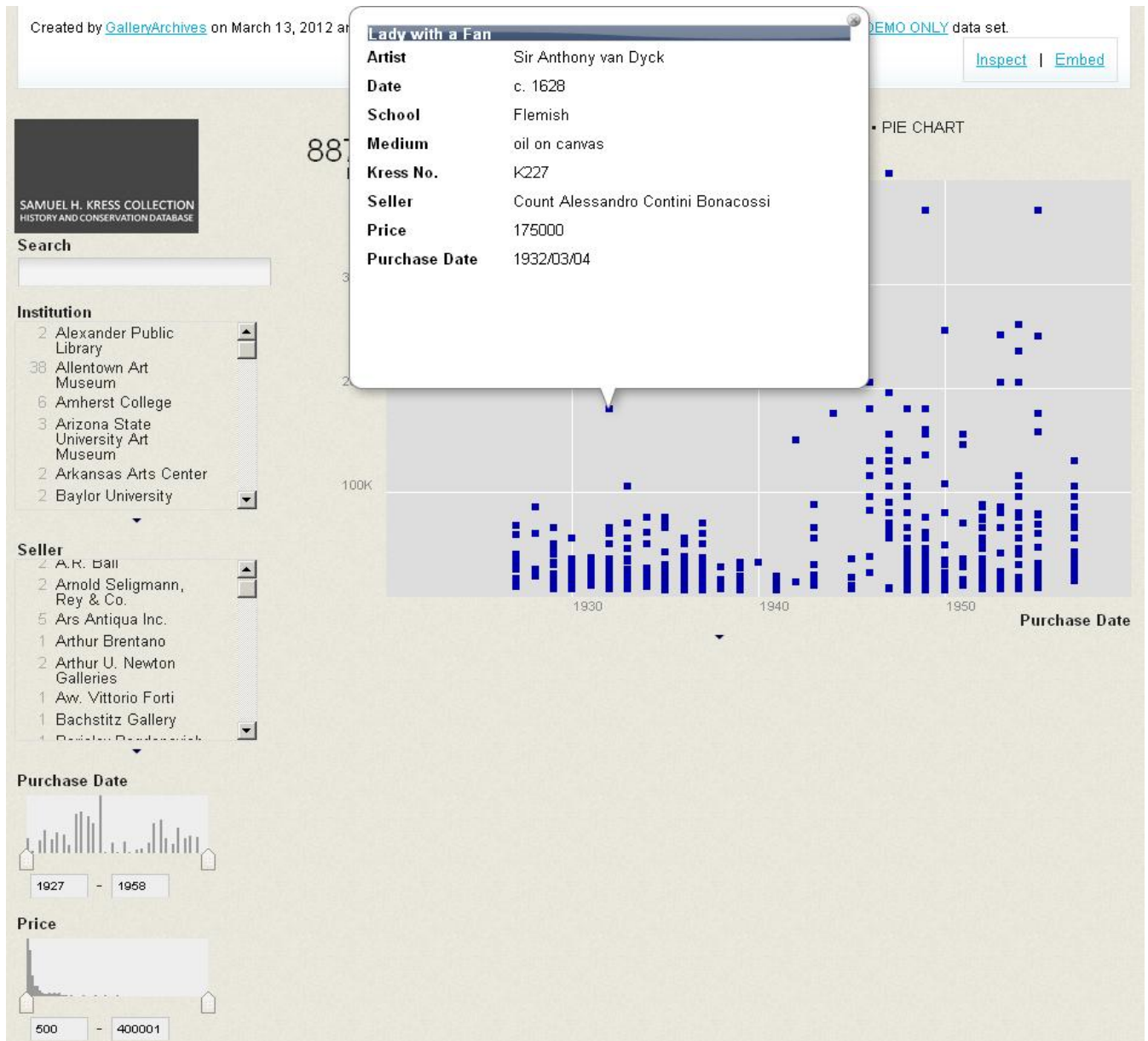

Image 8: Kress Collection View (Scatterplot Display, with outlier information)

The scatterplot also makes it easy to find and probe outliers, allowing users an analytical entry-point organized around knowledge formation, not directed query. By clicking on an early outlier, as seen in Image 8, a 1932 purchase of a painting for $175,000, the user sees that the work is

Lady with a Fan by Sir Anthony van Duck, sold by Count Contini. Continuing to browse, one can isolate works sold by Contini on the scatter plot using the "Seller" widget, and find that this price is matched in the 1948 sale of Titian's *Rancid Farnese*. Though this piece is another outlier among Contini sales, due to the higher prices paid by the Kress Foundation during the 1940s and 1950s, the Titian does not stand out as a particularly expensive piece among other purchases of its time.

SCREENCAP SHOWING THE TWO OBJECTS

Taken together, these tools and views provide a method of interacting with the Kress collection that unearths new and unforeseen contextual detail about the relationships between items, their provenance, and the collection's origins and evolution. Viewshare allowed Lauren to quickly build views which define and combine very granular information -- such as items within a specific price, date of purchase, sold by a single seller, and held by a single institution -- and then see the results in a variety of interfaces, including charts, image galleries, and catalog records. Lauren's knowledge of the collection was essential to creating the views and Viewshare amplified and refined that knowledge while creating new methods to explore the Kress collection.

What the Implementation of Viewshare Accomplishes and Communicates

The final results, the views themselves, are invaluable in exploring and understanding the Kress Collection. But Viewshare as a tool and a process ended up having additional benefit both for this dataset and for the National Gallery of Art itself.. Viewshare can be used for "poking around" in data and uncovering its hidden potential and contexts. Data becomes relational in entirely new ways, both as an iterative process of discovery and as a visualized set of connections and dependencies. Viewshare thus creates a product but also frames a workflow for metadata management. The exploratory process of building views reveals the inconsistencies and limitation within datasets while at the same time showing new ways that it can be used. In addition to creating new access points and perspectives on the data, Viewshare served the Kress Project as a testbed for development of web requirements, as the database is likely destined for public accessibility through a web portal. Viewshare allowed staff a free and easy way to play with web features and presentation, to reveal new themes and patterns around which descriptive metadata can be improved, and to help imagine how future web display and content management systems would handle existing collection information. Viewshare became a piece of the larger workflow around managing collection data, testing its possible augmentation, management, and exhibition, and interactivity.

The Kress collection also demonstrates the collaborative possibilities emphasized in the Viewshare interface. Post-custodial, distributed collections are dependent upon the work and

contributions of multiple institutions and not all of them will have a single archivist or collection manager dedicated to sanitizing and administering collection-wide data. In this sense, unifying distributed collections in Viewshare prompts institutions to ensure that collection information is transferable and standardized. Once the NGA started using Viewshare to explore their data, ideas for potentially linking other distributed collections held partially at NGA became evident. Other Viewshare users have similarly explored building views that serve as a collection of collections or a unified point of entry to disparate, but related, groups of materials. [8] In these cases, the implementation of Viewshare has not only created a dynamic, interactive way for users to visualize and explore digital collections, but also it has allowed institutions and content managers themselves to discover more about their own institutional workflows and processes. The platform can serve as both a gateway and a testbed, a dynamic interface to a collection and a proof of concept or proving ground for what is possible when exhibiting digital collections. Using Viewshare empowers creators to better understand their collections and to better refine their existing practices around digital collection management, description, and display.

Conclusion

The use case explicated in this article shows both the external and the internal benefits possible through data visualization and procedural testing using Viewshare. The views created in Viewshare give external users an interactive interface that can be employed for generative interpretation and investigation of online digital collections. At the same time it provides the collection managers building those views a free, easy-to-use tool to probe the strengths and limitations of collection metadata. It also aids them in prototyping new workflows for digital collection management, generating new ideas for providing single points of entry to distributed collections, and exploring the possibilities for linking and uniting collections. The affordances of using Viewshare are manifold, helping institutions better serve their users, better understand their collections, and better plan and test new methods of exhibition and access.

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