Using GIS to Manage Philadelphia's Archival Photographs

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Abstract

The City of Philadelphia, Pennsylvania, has captured photographs of city building projects and other government activities for more than 140 years. These photographs are now maintained in the City Archives by the Philadelphia Department of Records. Although many of the photographs were originally taken for risk management purposes, the passage of time has made them an invaluable source of reference into the city's rich past. To make these historic photographs more accessible to the general public, the Department of Records implemented the geographically searchable *Philly*History.org website in 2005, thus providing new opportunities for education and access.

A History in Photographs

The City Archives, operated by the City of Philadelphia Department of Records, holds the official historical records of the City of Philadelphia and is used by city officials to determine laws and precedent-making decisions of the past that may affect current city government actions and decisions. In addition to providing historic records to city officials, the archives also makes a variety of records available to the general public including genealogical records, deeds, and a large collection of historic photographs dating back to the mid-nineteenth century.

For more than 140 years, the City of Philadelphia has maintained an active Photography Unit charged with capturing a photographic record of many of the city's activities. As a result, the City Archives has accumulated an estimated one to two million photographs that visually document the city's history dating back to the mid-1800s. Among its activities, the Photography

Unit takes before and after photographs of public works projects, a process that serves as a risk management tool. While originally taken for liability protection, these photographs also provide vivid illustrations of the development of one of America's historically significant cities. Including images ranging from a dockside immigration station to the construction of elevated rail lines to children forced into classrooms as part of compulsory education programs, the photographs held by the Philadelphia City Archives connect viewers with the events and individuals of the past in a way that reading textual descriptions simply cannot. The photographs provide a visual interpretation of the past and an opportunity for viewers to transcend time and place. The Philadelphia Department of Records realized, however, that these photographs were of minimal value if the public could not access and explore them easily.

Over the course of its history, the Photo Unit operated under and took photographs for several different city departments. While each photographic negative was labeled and stored in an envelope, the amount of information cataloged by the original photographer varied widely depending on the year, project, and needs of the department for which the image was taken. All the images were eventually transferred to the City Archives to be stored in a climate-controlled space and processed as resources were available. Before 2005, several photograph record groups had been cataloged using the original metadata noted by the photographers and listed in inventories available to archives staff and visitors. While these inventories provided access to a fraction of the photograph and print collection, many images had not been cataloged and remained inaccessible to the general public. In addition, many of the unprocessed photograph collections included negatives stored in their original acidic envelopes, creating preservation concerns as evidence of chemical deterioration became apparent.

In 2004, the Department of Records began investigating opportunities that would enable them to address their concerns about access, organization, and preservation by making the images available in a digital format. Along with increasing access to the photos, the department sought a solution that would provide a way to manage the metadata associated with each image and include a revenue-generating component through the sale of prints and image licenses. In 2005, the Department of Records launched its solution—*Philly*History.org, a Web-based digital asset management system developed by a software consultant that brings Philadelphia's historic images out of the archived file boxes and into the digital world.[1]

Like many digitization projects, *Philly*History.org provides online access to images from the City Archives, enabling users to view historic photos of

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[1] Azavea served as the software consultant, http://azavea.com/, accessed 26 June 2011. See *Philly*History at http://phillyhistory.org/, accessed 26 June 2011.

F I G U R E   1 .   **The *Philly*History map-based search interface. Users can access a search tool to retrieve results from the database. All images fitting the selected search criteria are returned, along with an overview map of locations. Users can click on the images or the map to learn more.**

the people and places of Philadelphia dating to the 1850s. *Philly*History.org, however, also uses geographic information systems (GIS) technology. Many of the images in the City Archives are of a particular location. When possible, each image has been geocoded (i.e., assigned latitude and longitude coordinates to link it to a location on a map). The geocoding process enables users to search for images by geographic criteria such as street address, intersection, or neighborhood name and to view the mapped location of each image. Users can also click on the map itself to access images associated with a specified place or geographic area, as shown in Figure 1. In addition to geographic criteria, users can also search the images by keyword, collection name, series, topic, timeframe, and other options.

Search results can be displayed as a list of thumbnail images or on a full-page map. Clicking on a thumbnail image or marker on the map opens a detail page that includes a larger view of the image, its associated metadata, and an inset location map. Users can also view the image in Google Earth, access Google Street View for visual comparison of past and present landscapes, purchase an image, leave a comment, submit error reports, or share an image with others, as shown in Figure 2.
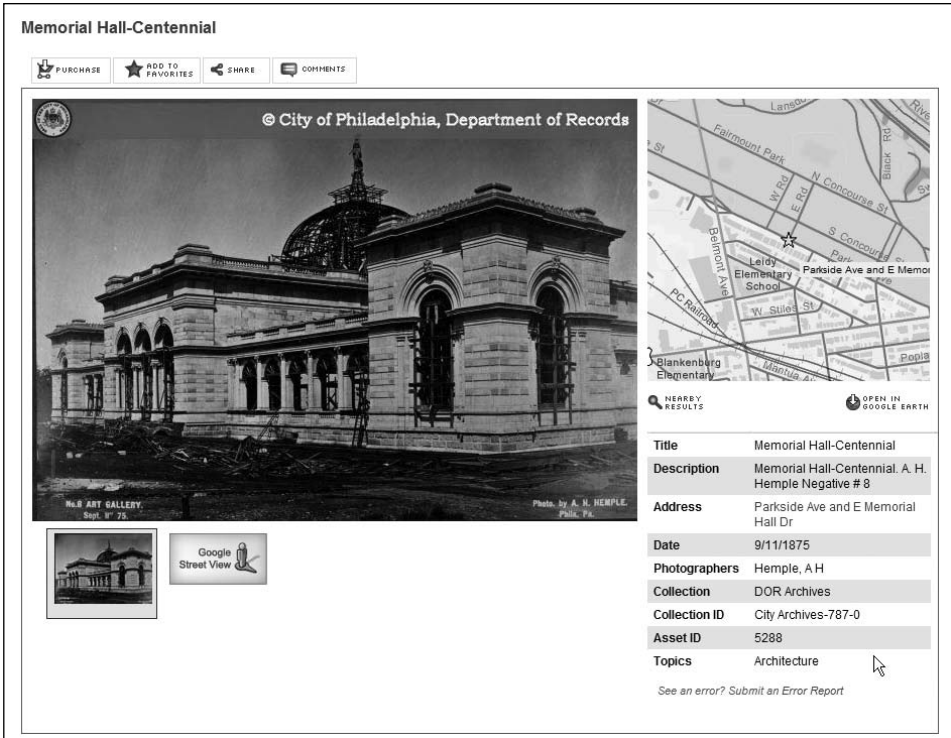
FIGURE 2. Clicking on a thumbnail photo on the search page brings up a detail page that includes the image, a location map, and the descriptive metadata about the image. Users can also access Google Street View to see the location as it appears today.

*Philly*History.org Users

Since its original deployment in 2005, the *Philly*History.org online collection has grown from 90 scanned images to a combined total of more than 96,000 scanned photographs and historic maps from five Philadelphia organizations. Visits to the website have increased from a few thousand a month to an average of 13,000 unique monthly visitors. Specifically, in May 2011, the Google Analytics[2] statistics for *Philly*History.org stated that 13,166 visitors spent an average of 9 minutes and 19 seconds on the site. In 2010, over 2.4 million searches were conducted on the site.

The *Philly*History.org website is freely available to anyone with an Internet connection. *Philly*History.org reaches a broad audience that includes teachers, students, historians, genealogists, librarians, architects, photographers, researchers, and many members of the general public, particularly current and former Philadelphia residents. As of June 2011, *Philly*History.org had 7,451

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[2] See Google Analytics, http://www.google.com/analytics/features.html, accessed 26 June 2011.

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registered users. Although registration is not required, a registered account enables users to access additional features such as saving searches and submitting error reports. Of the currently registered users, 5,539 are from Pennsylvania and 585 are from New Jersey. The website also regularly receives visitors from across the country and around the world as shown by statistics gathered from Google Analytics. Registered administrative users also have role-based access to the management side of the website where they can add, edit, and otherwise maintain the images and metadata.

*Philly*History.org has been recognized by several organizations. In 2007, the site received an Exemplary Systems in Government award from the Urban and Regional Information Systems Association (URISA), as well as a Best of Philly award from *Philadelphia Magazine*. In 2008, the Philadelphia Chapter of the American Institute of Architects (AIA) recognized *Philly*History.org for its contribution to the preservation and documentation of historic architecture. Most recently, the American Association for State and Local History awarded the Department of Records a 2011 Award of Merit for its work on *Philly*History. org. The project has also generated interest from historical organizations and municipal governments across the country.[3]

Digital Standards and Practices

The *Philly*History.org project addresses organization, mass digitization, and preservation of images—topics of concern for many archives. The existing Web application is based on the Sajara software framework, a geographic digital asset and collections management system[4] that enables the Department of Records' distributed workforce to load, manage, search, and maintain thousands of digital assets and related collection information on an ongoing basis from anywhere with Internet access. *Philly*History.org's geographic search and data management tools are based on industry-standard Microsoft, Esri, and open source technologies. For example, Sajara utilizes OpenLayers[5] as its mapping engine because it enables each client organization to select from a variety of base map options or to integrate internally available GIS data sources.

The Department of Records researched and established a digitization methodology for scanning and adding new images to *Philly*History.org. City Archives staff and the *Philly*History.org team select images for scanning based on historical significance, preservation needs, available metadata, ability to geocode, and perceived public and scholarly interest. When processing most

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[3] *Philly*History.org, "About," http://www.phillyhistory.org/PhotoArchive/StaticContent.aspx?page=About, accessed 26 June 2011.

[4] Sajara, http://www.azavea.com/Products/sajara/home.aspx, accessed 26 June 2011.

[5] See OpenLayers, "Free Maps for the Web," http://openlayers.org/, accessed 26 June 2011.

of the record groups, the *Philly*History.org team scans each image and makes it available online rather than selecting a representative number of images from each group. The majority of the photographs are unique shots of specific locations, and users often provide feedback that they would like as many images of different locations as possible. Rather than providing a more curated selection of a set number of images, digitizing and displaying nearly every image gives users a broader collection to search. Some series or record groups, however, may contain duplicate images or photographic proof sheets. Scanning every image in those groups would thus be redundant and an inefficient use of time and budget. Therefore, the Department of Records makes every effort to scan the images that are not duplicative and otherwise meet the prioritization criteria listed above.

The Department of Records uses Epson Expression 10000XL scanners and Epson Scan software. Raw scans are made at a resolution of 600 dpi. Black-and-white negatives and photographs with no color tones are scanned to 16-bit grayscale, and color images are scanned to 24-bit color. After the initial scan, each image is converted to three different resolutions and saved as three separate image files. A 72-dpi Web-resolution copy of each image is uploaded to the *Philly*History.org website; a 400-dpi medium-resolution copy of each image is stored on an off-site server with the department's software consultant and hosting service; and a 600-dpi high-resolution copy of each image is burned to CD and stored at the City Archives. The medium- and high-resolution images are used to fill publication and reproduction requests, and serve as backups of the digitized photographs.

The descriptive metadata for each image is derived from the storage envelope housing the original negative or photograph. Depending on the image, the descriptive information can include the date, title, photographer, and location where the photograph was taken as well as the negative's record group, such as Public Works, Schools, or Department of Streets. The *Philly*History.org team spends some time researching the location of an image to more accurately geocode it for use on *Philly*History.org. Geographic searches account for the most frequently used search criterion on the site with 661,119 address searches conducted from April 2010 to April 2011. The second most frequently used search criterion was time period with 177,933 searches from April 2010 to April 2011. As time permits, the *Philly*History.org interns may also add descriptive terms and tags in a notes field reserved for new metadata.

Once the metadata for each image has been entered into the database, the associated image can be uploaded to the *Philly*History.org website. As the images are uploaded, they are automatically made available for viewing and searching to anyone visiting the website. Once the image is available online, registered *Philly*History.org users may submit error reports about the image.

These reports often include additional information about the location or further description of the event or place depicted. Interns on the *Philly*History. org team, often current or recently graduated students in master's level public history or archives programs, investigate these reports and attempt to verify them using a variety of resources online and at the archives. If an error report is confirmed as accurate, the interns leave a note in the notes field reserved for metadata changes. The error report option is a popular feature, and users have contributed over 1,960 reports.

Once a negative or photograph has been scanned, it exists in three different digital forms stored in three separate locations, to ensure that the image is safely preserved and easily accessible. The physical negatives and photographs are then placed in new archival-quality envelopes that contain all the descriptive information from the old envelopes, and these are stored in archival-quality boxes in a climate-controlled, secure environment. Interns complete the rehousing of the images as part of the digitization process. The images are thus both digitally and physically preserved and protected from further deterioration or destruction.

Revenue Generation

*Philly*History.org is partially self-sustaining through an e-commerce module that enables users to purchase framed prints or photo gifts such as coffee mugs, tote bags, and other merchandise that incorporates their favorite images. Sales are conducted through a photo commerce vendor who manages the payment transactions as well as the printing and shipping of the images and photo gifts in return for a share of the revenue. The remaining portion of the revenue is provided to the organization that holds the original image, with revenue from sales of images from the City Archives being placed into a general fund maintained by the City of Philadelphia.

*Philly*History.org users take advantage of the option to purchase the images as prints and photo gifts. Many users provide feedback on how much they enjoy viewing historic images of locations important to their personal histories, which sometimes translates into sales of those images. More than $65,000 in additional revenue has been raised through the application as of April 2011.

Since 2008, *Philly*History.org has served as a repository for images from organizations other than the Philadelphia City Archives. In addition to images from the archives, the site now contains photographs and maps from the Free Library of Philadelphia, the Philadelphia Water Department, the Philadelphia Office of the City Representative, and the Library Company of Philadelphia. While the first three organizations are city agencies that maintain historic image collections, the Library Company of Philadelphia is an independent research

library specializing in American history and culture from the seventeenth through nineteenth centuries. Each department or organization receives any net revenue from sales of its images and maintains full rights for licensing images. While sales vary widely depending on the time of year—with sales activity increasing dramatically during November and December—the site provides an additional way for organizations to earn a small amount of revenue.

Issues and Challenges

The development of the *Philly*History.org Web application has not been without its challenges, particularly in terms of the website's geographic search capabilities. Urban geography tends to change over time, especially in older cities like Philadelphia. New streets are added as the city grows, and old streets are struck from the city plan as the result of new development initiatives. Although the majority of photographs housed in the City Archives have some type of geographic location associated with them, some of the nineteenth-century photographs reference street names that no longer exist or that are now in different geographic locations.

*Philly*History.org is able to correct for many of these name changes by way of the city's Unified Land Records System (ULRS). The ULRS contains a database of real estate parcels in the city that has been integrated with other important geographic data including addresses, land records, and tax accounts to establish a single, accessible repository for all Philadelphia addresses. Street aliases, which are the different names used for the same street at different times, are among the data available through this system. With this system in place, a search for "Delaware Avenue" and "Oregon Avenue" would return a large collection of photographs at or near the intersection of those streets. However, the website identifies these images as being located at Columbus Boulevard and Oregon Avenue because the database is designed to recognize that Christopher Columbus Boulevard's previous name was Delaware Avenue. On the accompanying map, any photographs found along what was previously Delaware Avenue would be plotted along Christopher Columbus Boulevard for just that reason.

*Philly*History.org also provides access to the Philadelphia Historic Streets Index, a detailed database of street name changes, compiled by a former City Archives employee from the original road records, docket books, jury decisions, and surveys held by the Philadelphia City Archives.[6] Initially available as a spreadsheet, the software company that built *Philly*History.org expanded on this work and created the Philadelphia Historic Streets Index as part of an internal

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6 *Philly*History.org, "Welcome to the Philadelphia Historic Streets Index," http://www.phillyhistory.org/ HistoricStreets/default.aspx, accessed 1 April 2011.

research and development project beginning in 2005. Now available as a Web application on *Philly*History.org, the Historic Streets Index complements the photographic and mapping components on *Philly*History.org and stands on its own as a tool for research on the temporal history of Philadelphia's changing street names.

Intellectual property is a question of major importance when developing any type of public Web application. Who owns the photographs on *Philly*History. org, and what rights and responsibilities are associated with that ownership? On 17 July 2006, the Philadelphia Law Department issued a memo indicating that the City of Philadelphia has the legal right to make available online any photographs currently held in the City Archives, as long as each photo was taken by a City of Philadelphia employee. This work-for-hire arrangement makes the photographs the intellectual property of the City of Philadelphia, and, as such, subject to publication, sale, or disposal as the city sees fit. As previously described, the digitization process includes physical preservation measures for the negatives and prints. The original images are not de-accessioned or destroyed after digitization but are instead maintained for future preservation and use.

Maintaining Interest through Innovation

The Department of Records' ongoing mission is to engage both new and repeat users in Philadelphia's history by expanding and enhancing the existing *Philly*History.org website. The department continues to invest in the project through both the annual operating budget and supplemental grant funding. In conjunction with Azavea, the Department of Records has implemented a variety of features since 2005 including the following:

- A regularly updated blog provides additional contextual information for the images. The entries are contributed by graduate students and local scholars.
- In early 2009, Google Street View was added to the website to provide users with 360-degree street level views of the contemporary city landscape. This popular feature enables users to toggle back and forth between contemporary city views and the historic images to see how the city has changed over time.
- A public profile page provides users with the option of displaying personal information such as their favorite images, bookmarks, or comments from the site. Users can comment on the historical images, respond to other users' comments, or report abusive comments to the site administrator.

- Users can also share their favorite images via email, Facebook, Twitter, Digg, or other social networking services.

The Department of Records continues to investigate funding opportunities to support potential new features on *Philly*History.org, including the creation of walking, biking, and driving tours by local scholars and the addition of images and maps from other Philadelphia organizations.

Mobile Applications and Grant Opportunities

In 2009, to further increase public access and take advantage of the geographic nature of the images, the Department of Records worked with Azavea to develop a smart phone version of *Philly*History.org. Accessible on both iPhone and Android devices, this location-based mobile Web app version of *Philly*History.org provides an opportunity for the public to view historic images of Philadelphia while visiting the location where they were taken.[7]

In spring 2010, the National Endowment for the Humanities Office of Digital Humanities awarded the Department of Records a Digital Humanities Start-Up Grant that provided $49,885 to investigate the use of mobile augmented reality technology in displaying *Philly*History.org images.[8] The resulting research is available in a white paper entitled "Implementing Mobile Augmented Reality Technology for Viewing Historic Images."[9] The Department of Records also released a prototype Augmented Reality by *Philly*History.org application that enables users to view historic images from *Philly*History.org as overlays on the current urban landscape. Users point their smart phone cameras at a location of interest, and the augmented reality data appears as an overlay right on the camera display in the form of the image and accompanying information. As a prototype, this application was available for Android and iPhone devices for a test period during spring and summer 2011.

In its grant application, the Department of Records was able to demonstrate an ongoing commitment to supporting and improving *Philly*History.org, which is an important consideration for potential grantors. The application also outlined an external evaluation process by members of the local academic community; a feasible, well-defined work plan; and a clear and concise overview of project approach and objectives.

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[7] See *Philly*History.org, "Map Your Memories," http://phillyhistory.org/i/, accessed 1 April 2011.

[8] See Philadelphia Department of Records and Azavea, "City of Philadelphia Department of Records Awarded NEH Digital Humanities Start-up Grant…," http://www.phila.gov/records/archives/pdfs/Grants%20Augmented%20Reality.pdf, accessed 26 June 2011.

[9] The white paper can be downloaded at http://azavea.com/augmented-reality, Azavea, "Augmented Reality for Cultural Institutions," accessed 30 June 2011.

While still in its infancy as a technology, augmented reality in cultural institutions has many potential uses, and the opportunity to explore the possibilities using an established project was likely another contributing factor to the grant award. In the case of *Philly*History.org, augmented reality may serve as a means of engaging young people in the study of history, architecture, and photography or providing enhanced access to local history for tourists or other visitors. Accessing information and images about a building while standing in front of that building can be a powerful tool for understanding the intersections between the past and present.

Prior to the Digital Humanities grant, the Department of Records also was awarded an Archives and Records Management Grant by the Pennsylvania Historical and Museum Commission to support digital scanning of photos.[10] The $14,223 was used to support interns in 2007.

Collaborating with Organizations

*Philly*History.org has also become a tool for linking historical image and map collections belonging to different organizations and making them accessible to new audiences. The website now contains ten collections from five organizations: the Philadelphia Water Department, the Free Library of Philadelphia, the Library Company of Philadelphia, the Philadelphia Office of the City Representative, and the Philadelphia City Archives. *Philly*History. org's robust search capabilities search and return results from all collections within the application, making it easier for students, teachers, and researchers to access material that would otherwise require visits to multiple sites. A system of watermarks and customizable metadata fields ensures that the institution that maintains each collection is immediately identifiable, and each detail view includes a link to additional information on the organization's website. Administrative levels of access and site restrictions ensure that individuals can only edit and manage the data belonging to their organization.

The collaboration with the Free Library of Philadelphia was funded by the National Endowment for the Humanities (NEH) and the Institute of Museum and Library Services (IMLS), which awarded the City of Philadelphia Department of Records a grant in August 2008 as part of the Advancing Knowledge: The IMLS/NEH Digital Partnership grant program. In collaboration with the Free Library of Philadelphia, the Department of Records used the $108,882 grant to make historically significant collections from both institutions available on *Philly*History.org and to further develop the website. The Department

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[10] See http://www.phillyhistory.org/PhotoArchive/StaticContent.aspx?page=About, accessed 26 June 2011.

of Records was one of only four recipients nationally to receive this grant in 2008.[11]

The Philadelphia Department of Records continues to look for opportunities to expand the number of collections and organizations contributing to *Philly*History.org. Each organization participating in *Philly*History.org receives access to digital asset management and organizational tools as well as new technologies and e-commerce capabilities that might otherwise be unavailable to them. The organizations also collectively benefit from the increased traffic and access to new audiences that engagement in a collaborative digital project often provides.

Conclusion

Public interest in *Philly*History.org has remained strong throughout the duration of the project. In a January 2010 survey completed by 198 *Philly*History.org users, 37% of respondents stated they used the site once or twice a month, and an additional 36% of respondents accessed the site every few months. Of the 198 respondents, 133 stated they found the site "very useful," and an additional 57 respondents found the site "useful." These statistics, combined with five years of visitor statistics, would appear to indicate an ongoing public engagement with the historic photographs.

Despite public support for the project, users also point out room for improvement and request additional features. The same survey asked users what they see as priorities for future features, and 88% of respondents selected "additional photograph collections from other institutions" as a very useful priority. The Department of Records also receives frequent requests to include public photo contributions on the website. Public additions to *Philly*History.org are currently not possible due to limited administrative resources and intellectual property concerns. Budget and staff resources also hinder the ability to add collections. Users also submit suggestions for design changes and improvements to the user experience. As resources are available, the Department of Records tries to address these concerns.

Over the course of six years, *Philly*History.org has created a new paradigm for how a municipal archives can utilize geography to access historic collections, interact with the general public, and create enthusiasm for historical images and resources while also generating revenue that supports continued operation.

[11] See *Philly*History.org, "About."