Open Data and Data Visualization in Arts Organizations

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INTRODUCTION

Many arts managers perceive that data collection is an essential factor for becoming a successful organization. However, many arts organizations are not using this valuable data effectively because of a lack, or perceived lack, of resources including budget, staff, or knowledge. Yet, simple, low to no cost initiatives to utilize both internal data and open data, would help them understand their unique communities in greater detail. Open data is particularly useful but often ignored. One resource, Data.gov, currently includes 50 open data portal sites.[1] When the U.S. federal government launched the data portal in 2009, there were only 47 datasets, but more than 200,000 datasets are available today.[2] Furthermore, most communities maintain their own open data sources through local governments, or universities. Although the content of open data resources might not be explicitly related to the arts, arts managers can use these data sets to learn the trends and characteristics of their communities from demographic changes to industry shifts that will affect organization operation.

While accessing the data connects arts managers to necessary information, that information needs to be visualized to be used more persuasively. Data visualization is just as important as collecting the data because it enables arts managers to maximize the impact of the data. The Aberdeen report reveals that organizations which use data visualization tools are 28% more likely to find timely information than ones who do not.[3] Data visualization is useful for arts organizations to present their goals and accomplishments to donors, board members, and internal and external communities. This promotes collaboration, and motivates individuals to be more actively engaged with arts organizations' projects. In this sense, arts managers should consider various ways of visualization to increase the accessibility of data.

The following report will provide both methods and tools for those interested in accessing data and visualizing it for clearer

1. "Open Government," *DATA.GOV*, accessed April 28, 2018, https://www.data.gov/open-gov/.
2. Meta S. Brown, "States Offer Information Resources: 50+ Open Data Portals," *Forbes*, accessed April 27, 2018, https://www.forbes.com/sites/metabrown/2018/04/30/us-states-offer-information-resources-50-open-data-portals/#358e51295225.
3. David White, "Visualization: Set Your Analytics Users Free," *Tableau*, accessed April 24, 2018, https://www.tableau.com/sites/default/files/media/8604-ra-business-intelligence-analytics.pdf.

more effective communication. Data can be an extremely powerful institutional asset, but it is only as useful as the users' ability to interpret and understand it.

EXTERNAL DATA SOURCES

Arts organizations can learn about current trends and characteristics of their communities through open data. Open data, also defined as external data, can be used, re-used, and redistributed by anyone to create positive impacts on society. There are numerous open data resources available for arts managers to understand their communities more deeply. For example, comparing the characteristics of current and potential audiences provides a framework for designing arts programs, and developing relationships with under-reached audiences. Using open data sources, arts managers can learn more about their communities in terms of individuals' hobbies, characteristics of the community, and generational social behaviors. The following are potential external data sources that can be used by arts managers.

American Time Use Survey

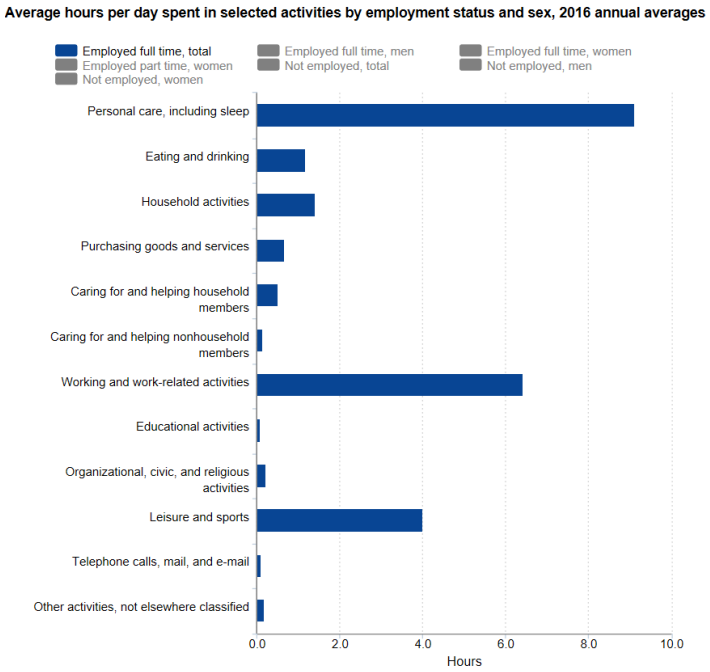

Figure 1. American Time Use Survey shows average hours per day spent in selected activities by employment status and sex. Source. PC screenshots of [Bureau of Labor Statistics]

The American Time Use Survey (ATUS), conducted by the Bureau of Labor Statistics, shows patterns and facets of specific communities by using variables such as age, sex, education, and disability. It shows the amount of time people spend doing a variety of activities including learning, volunteering, and socializing. With this data, arts managers would be able to identify how a certain group of people enjoy spending their time when not consuming the arts. While designing arts programs, this information can inform either the program or communicating the program to reach those most interested to the programs. This will eventually increase the number of participants and expand an arts organization's reach. Hence, an arts manager's better understanding of the audience will help them to build a connection with the audiences.

American Community Survey

Subject	United States			
	Total population			
	Estimate	Margin of Error	Percent	Percent Margin of Error
SCHOOL ENROLLMENT				
Population 3 years and over enrolled in school	82,528,567	+/-84,711	82,528,567	(X)
Nursery school, preschool	4,988,186	+/-26,460	6.0%	+/-0.1
Kindergarten	4,201,597	+/-14,044	5.1%	+/-0.1
Elementary school (grades 1-8)	32,845,163	+/-26,282	39.8%	+/-0.1
High school (grades 9-12)	17,016,693	+/-20,209	20.6%	+/-0.1
College or graduate school	23,476,928	+/-63,362	28.4%	+/-0.1
EDUCATIONAL ATTAINMENT				
Population 25 years and over	211,462,522	+/-16,135	211,462,522	(X)
Less than 9th grade	12,093,869	+/-57,253	5.7%	+/-0.1
9th to 12th grade, no diploma	16,135,225	+/-65,476	7.6%	+/-0.1
High school graduate (includes equivalency)	58,722,528	+/-173,641	27.8%	+/-0.1
Some college, no degree	44,529,161	+/-49,403	21.1%	+/-0.1
Associate's degree	17,029,467	+/-40,247	8.1%	+/-0.1
Bachelor's degree	39,166,047	+/-136,480	18.5%	+/-0.1
Graduate or professional degree	23,786,225	+/-147,082	11.2%	+/-0.1
Percent high school graduate or higher	(X)	(X)	86.7%	+/-0.1
Percent bachelor's degree or higher	(X)	(X)	29.8%	+/-0.1
VETERAN STATUS				
Civilian population 18 years and over	241,816,698	+/-6,429	241,816,698	(X)
Civilian veterans	20,108,332	+/-29,699	8.3%	+/-0.1
DISABILITY STATUS OF THE CIVILIAN NONINSTITUTIONALIZED POPULATION				
Total Civilian Noninstitutionalized Population	311,516,332	+/-9,197	311,516,332	(X)
With a disability	38,601,898	+/-64,653	12.4%	+/-0.1
Under 18 years	73,546,970	+/-7,472	73,546,970	(X)
With a disability	3,013,318	+/-10,605	4.1%	+/-0.1
18 to 64 years	194,655,748	+/-9,389	194,655,748	(X)
With a disability	19,985,588	+/-48,215	10.3%	+/-0.1
65 years and over	43,313,614	+/-5,767	43,313,614	(X)
With a disability	15,602,992	+/-25,643	36.0%	+/-0.1

Figure 2. American Community Survey shows characteristics of a specific community including disability, education level, and veteran status. Source. PC screenshots of American FactFinder

The American Community Survey (ACS), conducted by United States Census Bureau, shows the current trends at a national and individual community level. This helps arts organizations plan specific investments or services for their communities. The study uses three different categories of variables: demographic, social characteristics, and economic characteristics. Each category has a wide range of variables such as spoken language, special needs, school enrollment, and ancestry. Since these are the factors that reflect a community's identity, arts managers can learn about various cultures that exist in their community. When arts managers understand the community, they will be able to come up with better approaches for encouraging community engagement, and to create a more participatory culture.

Office of Planning, Research & Evaluation

The Office of Planning, Research & Evaluation (OPRE) evaluates children and families programs, and depicts characteristics of different generations. Specifically, OPRE Head Start Projects shows the benefits of various children's education programs and activities, which offer a blueprint for designing arts-based programs. In addition, the Health and Retirement Study provides over 20 years of data on the health and economic well-being of adults over age 50 in the United States. It addresses social behaviors of this older population in terms of decision making, expectations, and meaningful work. An arts managers' understanding of the difference in social behaviors among different age groups will enable tailored programs for each generation.

Open data contains large amounts of valuable information for arts mangers. It helps arts managers find the trend in current society, and the similarity or differences between different groups of people. As arts managers know more about their current and potential audiences, they will be able to customize the programs and communications to meets their community's needs. When a community recognizes that an arts organization is dedicated to serving the community, it will be willing to support the organization more actively.

EFFECTIVE DATA VISUALIZATION PRACTICES

Even if arts organizations have collected multiple valuable data sets from internal and external sources, that data is meaningless unless they connect it to their practice. Data visualization is one method that allows organizations to use and share data more effectively. Significantly, 65% of the population are visual learners who comprehend and absorb visual information quickly.[4] Thus, data visualization will help people understand key points quickly and broaden their perspectives.

For many, data visualization seems expensive or confusing. But there are many data visualization tools that have free, user-friendly interfaces. Arts professionals can use these data visualization tools for board meetings, annual reports, strategic planning, and program evaluation etc. Appropriate data

4. Rebecca Ezekiel, "Visual Learners," *Studying Style,* accessedMarch 1, 2018. https://www.studyingstyle.com/visual-learners/.

visualization will improve the efficiency and productivity of arts organizations. Here are 5 steps that arts managers can follow to create an effective data visualization.

STEP 1: KNOW YOUR TARGET AUDIENCE

When planning a data visualization, arts managers start with identifying their audiences. In general, the audiences would be divided in two different types; external and internal audiences. Each type would have a different level of knowledge regarding data and the arts institution. Arts managers should consider this difference to make their visualizations audience-centric. Internal audiences, such as board members and staff, would be more familiar with the goals and ongoing projects at their organization. In this case, arts managers can create data visualizations which summarize the internal monthly performance of the organization. One example could be reporting on the monthly performance of different departments through bar or line charts, which are easily comparable. If arts organizations are publishing the report for the public, they should be focused on creating a story that their target community can relate to. For example, last year the Greater Pittsburgh Arts Council (GPAC) published the Arts and Economic Prosperity Report which presents the economic impacts of the arts in Allegheny County. The audience for the report was external, and the goal was to help the public or public policy makers understand the current situation. To demonstrate one mode of impact, GPAC wanted to relay how much the arts contribute to the local economy in terms of local salaries. To show this the report shared a large aggregate number: that the arts and culture industry generated $641 million in salaries in Allegheny County alone. To further communicate this to wider audiences, the number was put in other terms that resonate with the local market. Figure 3 presents the numbers of pointe shoes, pianos, phone bills, and pierogis that could be bought with that amount of money. This technique helps to illustrate how expansive this sum is through many relevant examples instead of merely the dollar amounts. Arts managers should consider their audiences in advance, and decide how to tell their story in the most effective way.

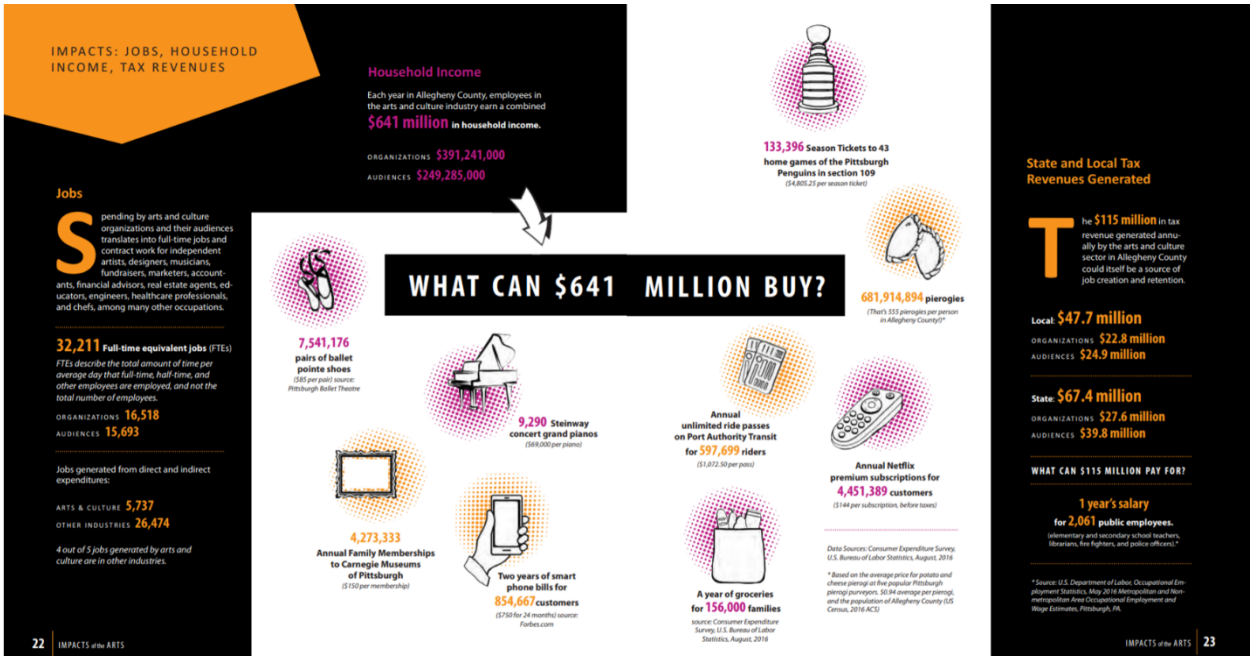

Figure 3. GPAC presents economic impacts of the arts in Allegheny County by comparing with different objects' values. Source. [Arts and Economic Prosperity in Allegheny County Report]

STEP 2: IDENTIFY THE PRIMARY PURPOSE

Although a common goal of visualization is to present data accurately and easily for readers to understand, metrics serve different purposes and messages that arts managers want to convey to readers. Before visualizing the data, arts managers should write down a list of the key facts and insights from the data. With this list, the manager can find the best type of charts serving their primary purpose. Figure 4 presents a Chart Type Hierarchy that addresses the relationship between charts and given data.[5] Different types of charts are grouped in four main categories: comparison, relationship, distribution, and composition.

5. Andrem Abela "Choosing a good chart," *The Extreme Presentation Method*, accessed April 30, 2018, http://extremepresentation.typepad.com/blog/2006/09/choosing_a_good.html.

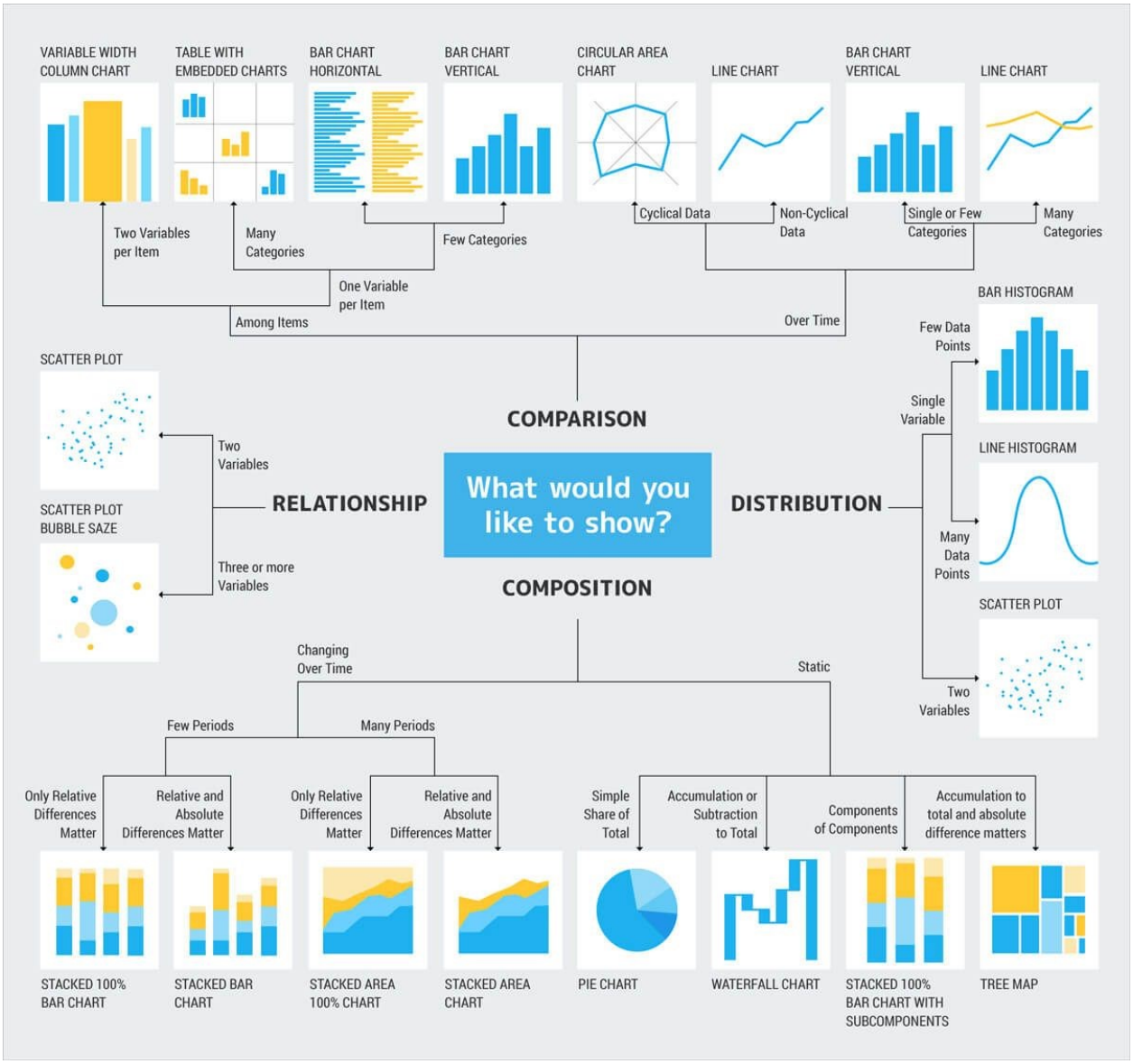

Figure 4. Chart Type Hierarchy guides users to find the most suitable chart with their data. Source. Infographic from [online-behavior]

Understanding the characteristics of charts makes it arts managers easier to visualize data.

Figures 5 and 6 show the number of jobs generated by arts and culture in different cities as part of the GPAC report. Since comparing the impacts of arts in different cities is the main purpose of this data, a symbol map is ideal to describe the pattern or trends of data. By utilizing the most

appropriate chart for their data, arts managers will find the best path to increasing audiences' engagement with their visualizations.

State	City	Number of Jobs
Illinois	Chicago	85,248
Washington D.C	Greater Washington, D.C.	59,423
Texas	Dallas	52,848
Massachusetts	Boston	45,889
Florida	Miami-Dade County	40,944
California	San Francisco	39,699
Pennsylvania	Philadelphia	37,590
California	San Diego	35,914
Pennsylvania	Pittsburgh	32,211
Texas	Greater Houston	25,817
Missouri	St. Louis	19,129
Minnesota	Minneapolis	15,264
Maryland	Baltimore	15,052
Ohio	Columbus	14,980
Indiana	Indianapolis	14,729
Tennessee	Nashville	14,277
Oregon	Portland	11,505
North Carolina	Charlotte	10,340
Missouri	Kansas City	8,970

Figure 5. Spreadsheet is difficult to make a comparison between different cities. Source. GPAC's Arts and Economic Prosperity in Allegheny County Report

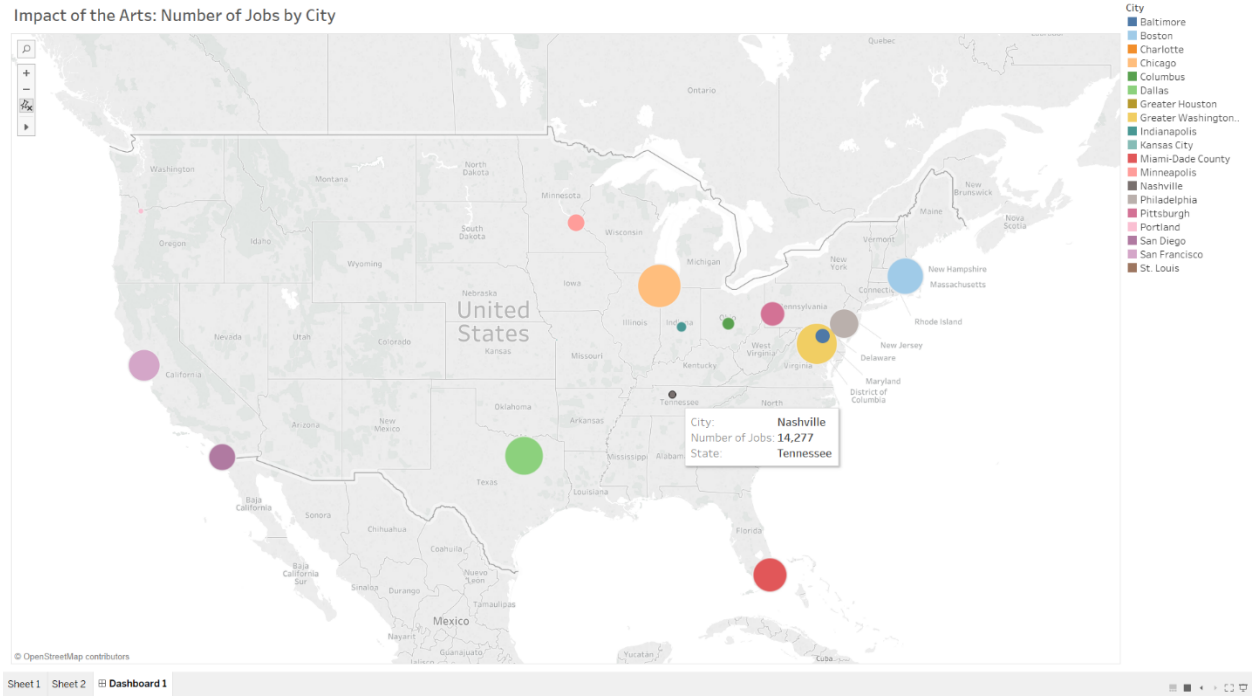

Figure 6. Converting the spreadsheet to Symbol map makes easier to understand the differences between cities. Source. Created by the author using the Arts and Economic Prosperity in Allegheny County Report

STEP 3: CHOOSE THE RIGHT TOOL

After identifying the purpose of data, arts managers need to choose the right tool that will successfully carry out their goals. There are a number of data visualization tools available for free. However, each one has different strengths and weaknesses, and requires a different level of knowledge. In order to choose the right tool, arts managers need to reconsider their primary purpose of data visualizations, and the eventual audience. Additionally, compatibility with current technologies is another component that arts managers should consider because it will accelerate the process of communicating the data visualization. The following four data visualization tools that have free options and are easy to moderate to use. A comparison table follows

Tableau Public

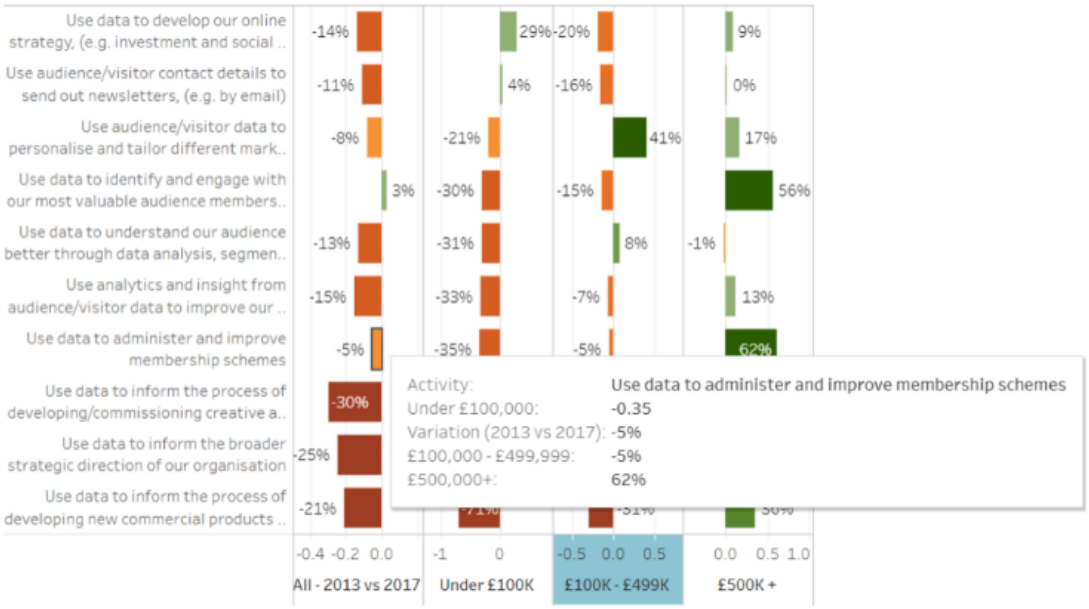

Figure 7. In Tableau Public interactive chart, users can hover over a bar to find out more details about the data. Source. PC screenshot of arts & metrics

Tableau Public is a free online program that allows users to create visuals for storytelling with.

The primary goal of Tableau Public is to make sharing data on the internet as easy as uploading videos. Tableau Public users can create various types of visualizations such as interactive charts, stunning maps, and live dashboards.

Tableau Public has the capacity to handle huge and fast changing datasets like those used in Big Data. Arts managers can put different datasets, such as ticket revenue, demographics, and donor records, into one dash board to understand the bigger picture of their organization.

Palladio

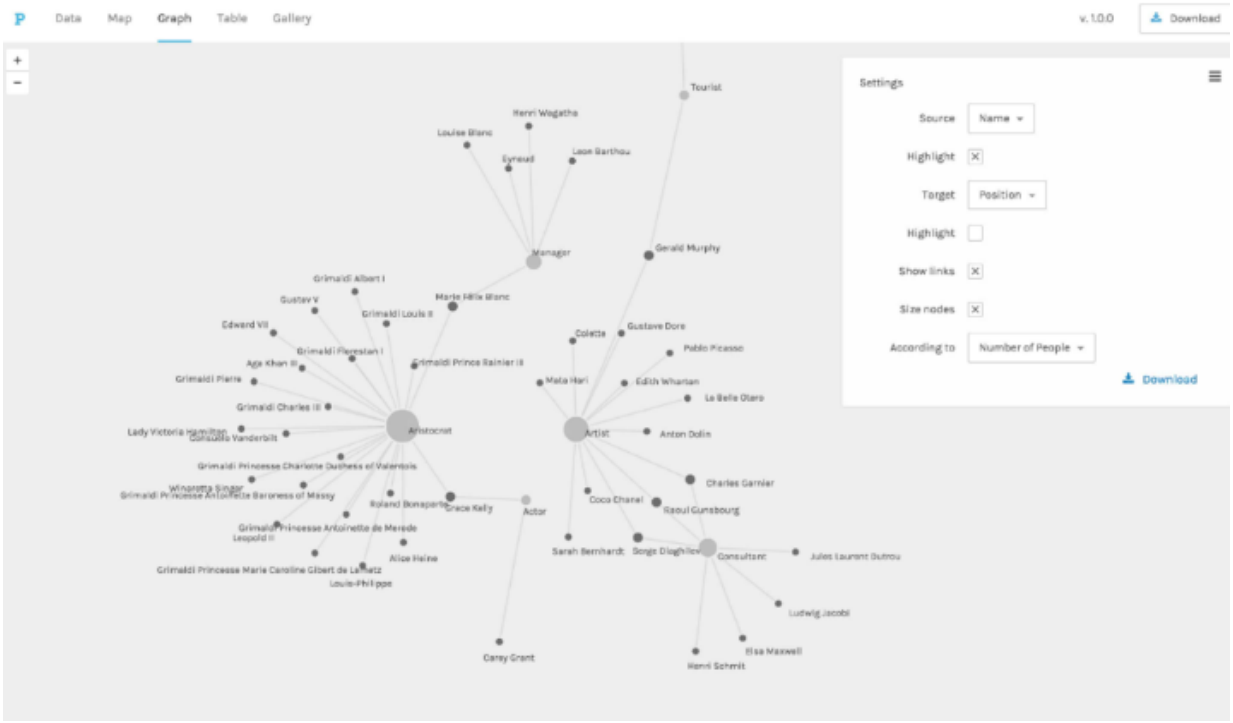

Figure 8. Palladio Graph view shows the relationships between different variables. Source. PC screenshot of [Stanford Website]

Palladio is a program that makes it easy to upload and investigate data. Since developers want to make it possible to visualize data without any barriers, users do not need to create an account, and Palladio does not store the data to protect the users' security. This tool is useful for tracking cash-flow and donor data, and for showing the relationship between different variables. Also, it has a feature called Gallery View that displays the data in a grid setting for quick reference. This would be a useful function to organize art collections and prop

RAWGraphs

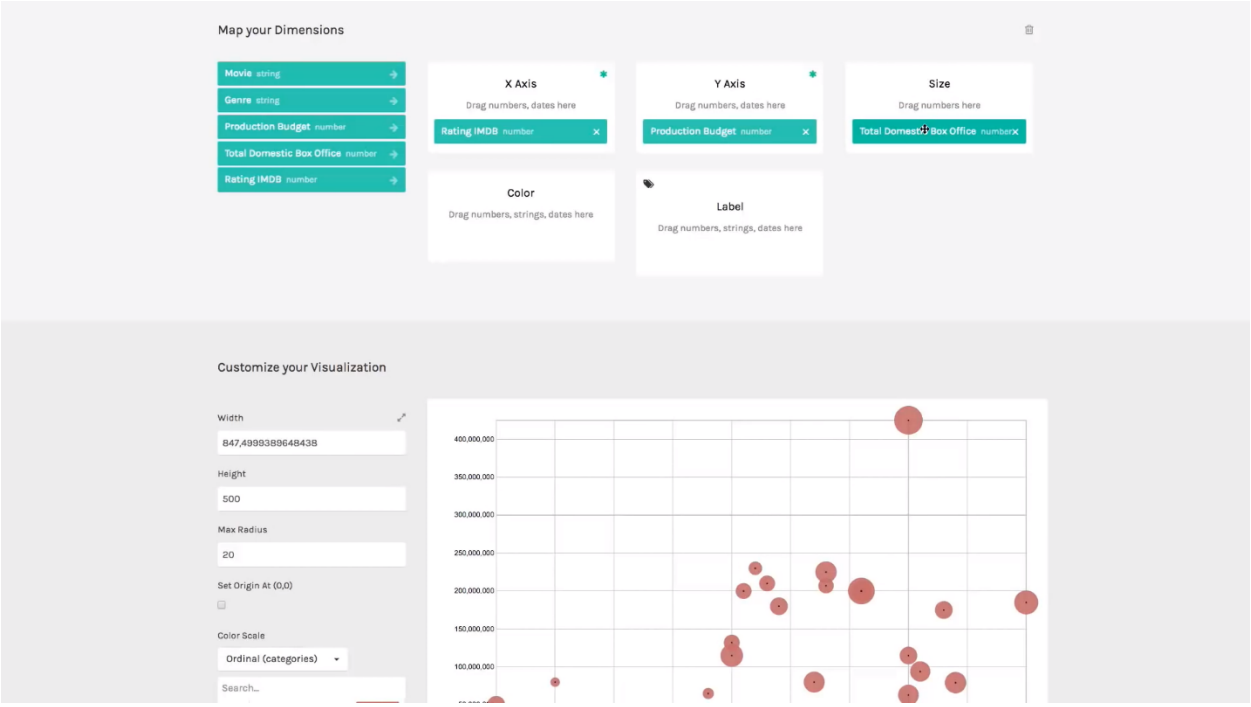

Figure 9. RAWGraphs users can simply drag and drop datasets to customize visualizations. Source. PC screenshot of YouTube Video

RAW works as a link between spreadsheets and vector graphs. It has an intuitive interface that anyone can use it easily. Users upload their spreadsheets to create vector graphics. There is no registration required, and it only takes four simple steps to visualize the data: input data, choose a chart, customize, and export. There are 16 professional charts that users can choose from, or users can create own chart. It is a drag-n-drop style so that users can easily move and arrange the data and see the result in real-time. This tool would be appropriate for analyzing audience profiles and evaluating an organization's performance.

Carto

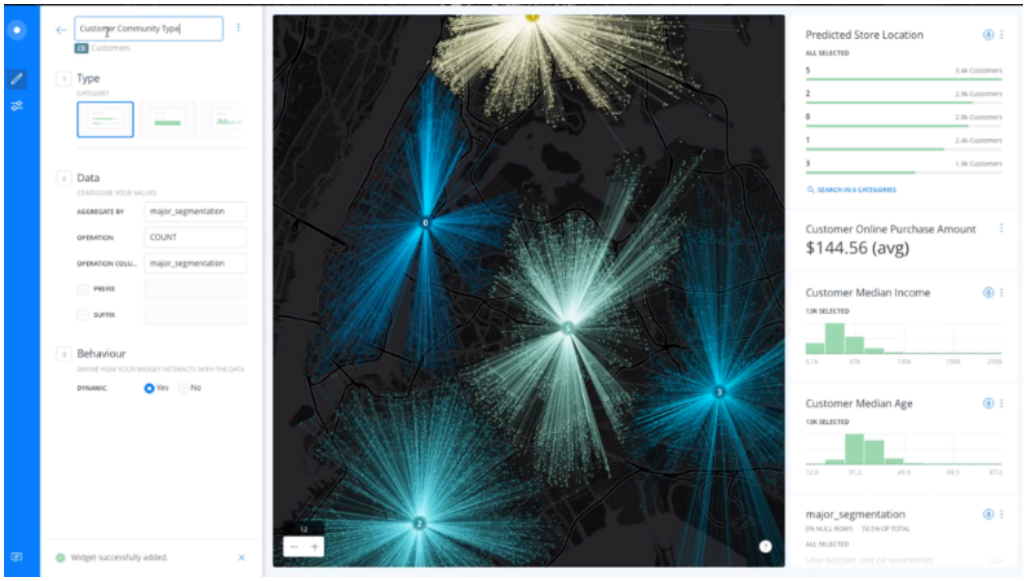

Figure 10. Carto Builder helps users to analyze regional differences and patterns. Source. PC screenshot of [Carto Website]

Carto is a web-based location software that discovers and predicts the insights from spatial data. It has the capability to visualize the data in order to identify and analyze the relationship between different regions. As such, it can enable arts managers to do in-depth analysis of behaviors and influences in a community. This tool would be useful for arts managers to understand the difference between neighborhoods and to observe the organization's impact in different communities.

Table 1. Data Visualization Tools Comparison

	Program Type	Primary Functions	Compatibility	Usage	Level of Difficulties
Tableau Public	Interactive data visualization	- Visual storytelling - Interactive charts - Map - Live dashboard	Excel, multiple text file formats, statistical files, Google sheets, and web data connectors	Overall trends in ticket sales and audience demographics	Intermediate
Palladio	Data Visualization toolset for multi-dimensional data	- Mapping - Gallery view - Timeline - Table	Any data you can enter into a spreadsheet (table format)	- Cashflow - Donor record - Museum collections	Easy
RAW Graphs	Data visualization framework	Vector graphics	Data from spreadsheet applications and vector graphics editors	- Evaluate overall performances - Manage audience profiles	Easy
Carto	Web-based location intelligence	Location data analysis	Shapefile, KML, KMZ, GeoJSON, CSV, MapInfo Spreadsheets, GPX, and OSM etc.	Analysis of behaviors and influences in a community	Intermediate

Knowing their main goal, audiences, and story for data visualization will guide arts managers to select an appropriate tool. There are many data visualization tools that have easy and user-friendly interfaces. Prospective users can explore free trials and use educational video examples to find the most compatible data visualization tool with their system. These tools will enable arts organizations to communicate with their staff and convey messages to their audiences more effectively.

STEP 4: EMPLOY COMMON SENSE DESIGN PRINCIPLES

To increase readers' engagement with the data, arts managers can apply common design principles into their data visualizations. There are certain readers' habits shaped by their culture and experience that arts managers can use to design elements to tell a story. The

following summarizes easy design principles to use for data visualization.

- **Font size & color**: Most of the time, readers' eyes go to bold texts or bigger font sizes. Different font sizes and styles are good ways to highlight key points of the data. Font color is ideal for showing the relationship between different variables. Since complementing colors stand out from each other, they are effective tools to show comparison. And, of course, colors need to accommodate any potential visual disability of the visualization's audience.
- **Color associations**: Readers might have preconceptions with certain colors, for instance green might mean right and red could mean wrong. These associations can influence a reader's interpretation of the data.
- **Location on the page**: In Western culture, readers will read from left to right, not right to left. Arts managers need to be aware of that the locations of individual design element can affect the flow of the story. The upper left-hand corner is the first place a viewer looks.
- **Cultural Influence**: Societal trends can impact reading habits. Current reports indicate that people are increasingly willing and able to read large amounts of text on their mobile devices. Pew Research Center addresses that about one-in-five Americans under the age of 50 have used a cellphone to read digital books.[6] When sharing data to the public via a web interface, arts managers should check that data visualizations are compatible on different mobile devices, and they need to select an individual design element wisely to convey their messages in a more effective way.

STEP 5: BE CLEAR AND PERSUASIVE

Simple steps can make data visualizations readable, while omitting them can cause confusion. All charts should contain basic elements such as title, subtitle, visual field (axes, labels, captions, legend etc.), and source line. By using these elements clearly, charts will become more portable, reusable,

6. Andrew Perrin, Book Reading 2016, *Pew Research Center,* accessed April 22, 2018, www.pewinternet.org/2016/09/01/book-reading-2016/.

and sharable. For instance, if readers are trying to use other organization's data in their presentation, clear explanations of the elements will make them more confident in sharing the data with others. Moreover, a descriptive title can increase persuasiveness because it directs the readers to the significant information in the chart. As an example, the title "Relationship between the number of attendances and their age" does not tell the key message directly rather than the title "The number of attendances under the age of 40 has increased over the last three years." Therefore, the description boosts the readers' understanding of the content, and allows them to see the data in broader perspectives. If arts managers have difficulty coming up with descriptive titles, completing this sentence: I need to convince them that. . . [fill in the blank], may help. This exercise helps the arts mangers find the main idea, which is the first step in creating the best descriptive title. By making data visualizations more self-explanatory, arts managers will improve the distribution and comprehension of their data.

Data visualization will enhance the communication between art managers, institutions, and their internal and external communities. It enables readers to consume a large amount of data quickly, and to expand the discussion about the data with others. It is important to not only choose the right data visualization tool, but also to use it in the right way to achieve data goals.

CONCLUSION

Arts managers now have a number of pathways to understand their both external and internal communities. Through open data sites, arts managers can learn about the patterns and characteristics of their communities. Consolidating internal and external data will provide arts managers with more information about their current and potential audiences. With this data, arts managers will be able to find various approaches to building relationship with their communities and cultivating new donors. While collecting valuable data, it is also important for arts managers to share the data with stakeholders. Data visualization is one of the best methods to booster the process of distributing the data. Clear visualizations will make readers more engaged with the data and motivate them to share the data with others. Arts managers should take the initiative in adopting new technologies to communicate with their communities more effectively and

efficiently.

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