The Heart of Smart Cities:
A case for the relevance of art in data driven cities

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Smart. The word used to be a simple adjective applied to intelligent people or well-dressed Brits. Today we have smart everything, from watches to thermostats, and even smart toothbrushes. While individual items make it easier for one to "lifehack," the incremental improvements these connected items provide pale in comparison to the digital disruption that smart cities will illicit. Around the globe cities are grappling with the idea of what makes a city "smart." Even though arts and culture are paramount to the livability and economic vitality of a city, they are often not intuitively brought into the conversations directing the "smart" future of our urban landscape. As arts managers, we must ask ourselves, where do the arts and arts institutions fit into the smart city conversation? To answer this vital question, we must first understand what makes a city qualify as "smart." From there we can examine how the arts contribute to smart city development, and what roles individual arts institutions play. Many of the auxiliary benefits of the arts and arts institutions, such as developing creative skills, increasing city livability, and strengthening municipal branding, are poised to increase in importance as Smart Cities place their stamp on modern urban life.

What Are Smart Cities?

There is no one concrete definition of a smart city. Despite this, key themes of urban planning, big data, the internet of things (IoT), and information and communication technology (ICT) are emerging to form its conceptual framing.

In its narrowest definition, Smart Cities are focused on the ways that technology can improve municipal functions. Typically, this involves automating street lights, using data to coordinate utility plans, technology driven transport systems, and even specialized trash collection. In this vein, "the EU defines smart cities as 'a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefit of its inhabitants and businesses.'"[1]

While technology is omnipresent in smart city conversations, more nuanced discussions take these core ideas and combine them with elements of health care, the environment, and population development to create a more holistic view of what makes a city smart. The Centre of Regional Science at the Vienna University of Technology outlines 6 pillars that define a smart city. They are:

1. **"Smart Economy"**: The entrepreneurial and innovative spirit of a productive city, with a flexible labour market, international scope, capacity for transformation, and a solid economic reputation—a city, in short, in which companies want to do business.

2. **"Smart Living"**: Investment in cultural and educational facilities, optimal health and hygiene conditions, measures to ensure public safety, quality of housing, tourist attractions, and social cohesion.

3. **"Smart Environment"**: Protection of the environment, attractive natural settings, low levels of pollution, and consistently sustainable management of resources and waste.

4. **"Smart People"**: Improving the skills of citizens, placing a high value on learning, sensitivity to social and ethnic differences, and encouragement of flexibility, creativity, cultural diversity, and participation in public life.

5. **"Smart Mobility"**: A city that is physically accessible—locally, nationally, and internationally, that places ICT infrastructures at the disposal of all of its citizens, and that utilizes sustainable, innovative, and secure data-transport systems.

6. **"Smart Governance"**: Citizen participation in the decision-making process, in ensuring the quality of public and social services, and in

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1 "Urban Europe - Statistics on Cities, Towns and Suburbs - Smart Cities." Urban Europe - Statistics on Cities, Towns and Suburbs - Smart Cities - Statistics Explained. Accessed March 26, 2017. http://ec.europa.eu/eurostat/statistics-explained/index.php/Urban_Europe_—_statistics_on_cities,_towns_and_suburbs_—_smart_cities.

promoting governmental transparency.[2]

This six pillar framework is frequently quoted in development conferences across Europe and the Middle East. Although it is widely employed, it is not the only working definition. Researchers in system sciences have created a view of smart cities that centers around technology, organization, and municipal policy. Branching off these three core ideas there is a second layer if smart impact and development comprised of governance, people communities, economy, natural environment, and build infrastructure (See Figure 1).[3]
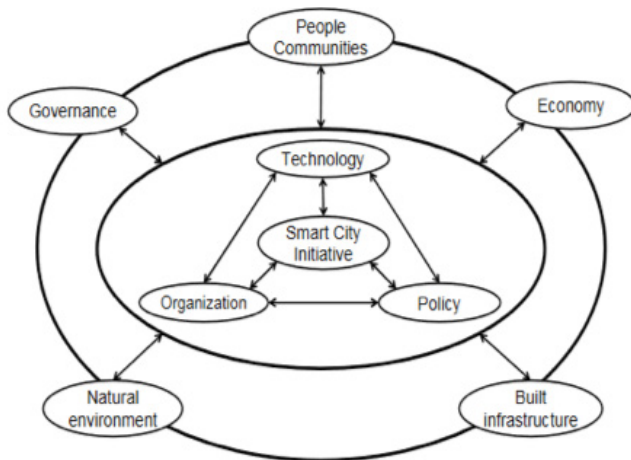

Figure 1. A holistic view of a smart city initiative. While technology is omnipresent in smart city conversations, more nuanced discussions take these core ideas and combine them with elements of health care, the environment, and population development to create a more holistic view of what makes a city smart. Source: "Understanding Smart Cities: An Integrative Framework." HICSS (2012).

While the role of the arts and arts organizations is often not explicitly emphasized, smart cities cannot achieve their holistic vision without embracing the creative arts. The creative arts support most of these pillars either directly or indirectly. Amitabh Kant, CEO of NITI Aayog, states, "technology for smart

cities without art and culture component will create lop-sided development only. Therefore, you need to take efforts to design, attract, retain and nurture the creative workforce of our cities. Technology and art and culture must embrace each other. We cannot have smart cities without art and culture."[4]

> "Technology for smart cities without art and culture component will create lop-sided development only. Therefore, you need to take efforts to design, attract, retain and nurture the creative workforce of our cities. Technology and art and culture must embrace each other. We cannot have smart cities without art and culture."
>
> - Amitabh Kant

When Smart Cities Develop with a Place for Arts

Chicago's failed bid for the 2016 Olympics left them with a large swath of lakefront land, previously earmarked for an Olympic Village, open for development. The Image Project aims to create a mini smart city from the ground up.[5] The city is designed to have full IoT smart capabilities and accelerator labs to help push ideas forward from this technological holistic base. Included in the plans are buildings dedicated to both arts performance, and artistic development. Leaders in the project have included not only architects and city planners, but faculty from the School of the Art Institute of Chicago, as well as two specific arts and culture advisors.

The city was designed to capitalize on Chicago's three strengths – Arts and culture, Technology, and Academia. It stands as an example of how the arts help develop a sustainable workforce, increase urban livability, and increase city, or in this case, sub city branding.[6]

2 Rodríguez-Núñez, E., and I. Periáñez-Cañadillas. "Intellectual Capital as the Fostering Factor for Sustainable Smart Urban Development in the Basque Autonomous Community." Innovation, Technology, and Knowledge Management Sustainable Smart Cities, 10, 2016, 31-47. doi:10.1007/978-3-319-40895-8_3.

3 Chourabi, Hafedh, Taewoo Nam, Shawn Walker, José Ramón Gil-García, Sehl Mellouli, Karine Nahon, Theresa A. Pardo and Hans Jochen Scholl. "Understanding Smart Cities: An Integrative Framework." HICSS (2012).

4 "Smart Cities Project Need Inclusion of Art and Culture." Media India Group. January 02, 2017. Accessed March 26, 2017. *http://mediaindia.eu/art-culture/smart-cities-project-need-inclusion-of-art-and-culture/.*

5 The Image Project is one of many proposals being considered for the Bronzeville Development. While it has gained a lot of press, a final project proposal for the location has not been accepted.

6 "Home." The Imagine Project Bronzeville. Accessed April 10, 2017. *https://warner-rodda.squarespace.com/.*

While examples such as the image project are encouraging, they are not the status quo. When examining demographics of smart cities conference presenters, it is evident that there are few hands shaping the incoming world of smart cities. Most of the presenters come from the tech world, and are comprised overwhelmingly of white males.[7] My brief, and admittedly limited survey of smart city conferences has turned up only one arts professional who presented at a smart city conference. If we want to help create a sustainable balance between the arts and technology in smart cities, the time to engage and advocate for our industry is now. Understanding and communicating exactly how the arts support smart cities is critical to if you want to have the arts formally included in any smart city planning your municipality is conducting.

Facility Options

G. Traditional and Applied Arts Center	30% of Facility	
Artist Studios		
Gallery Space		
Ceramic Arts Facility		
Printmaking Facility and Studios		
Arts Education Space		
Woodshop and Digital Fabrication Lab		1 Building
H. BronzeWorx Center for the Performing Arts	70% of Facility	
Recording Studios		
Performing Arts Spaces		
Musician Practice Spaces		
Vinyl Record Short Run Production		
Fine Art Gallery Space	20% of Facility	
J. Advanced Fabrication & Industrial Design Center	100% of Facility	
Building wide user fabrication labs for electronics, plastic fabrication, textiles, rapid prototyping	20% of Facility	
Metal and Glass Fabrication Facility for industrial 3D printing, CNC facilities, woodshop, machine shop, microfactory	20% of Facility	
Leasable Large Project Assembly Spaces: 3K, 5K, 7K, sq feet	10% of Facility	1 Building
Multi-Tenant Office Space for design firms, furniture, product design, architecture, assorted media	30% of Facility	
Chicago Design and Manufacturing Museum	10% of Facility	
Cafe/Restaurant	5% of Facility	

Figure 2. Proposed art center for "The Image Project", which aims to create a mini smart city from the ground up. Source: https://warner-rodda. squarespace.com/.

7 A survey conducted of over 300 international Smart Cites conferences found that less than 20% of the speakers were female. When considering keynote speakers, the percentage of female speakers drops to 12% "Smart City Research." Smart City Research. Accessed March 26, 2017. http://www.smartcityresearch.com/.

What Role do the Arts Play in Smart City Development?

The seismic shift smart cities will elicit cannot be understated. However, unless man is fully replaced by machine in some Asimov type scenario[8], smart cities will still need operators, engineers, designers. Technology is a tool not a magic wand. It is in this realm that the arts can prove a catalysis for sustainability in smart city development. Specifically, the arts are central in workforce sustainability, urban livability, and city branding.

Developing a Smart Workforce

Despite years of educational focus on STEM enrichment, 49% of employers reported having difficulty filling science, technology, engineering and mathematics (STEM) jobs.[9] At the same time, unemployment among recent graduates in computers and mathematics has reached 8.4%.[10] Somewhere, there is a disconnect between the skills people are learning, and the tools they will need to succeed in the smart city of the future. In a recent report on the top seven skills needed for an engineer, creative thinking was listed as number one. Also presented on the list were attention to detail, communication skills, and the ability to work in teams. In fact, only two of the seven skills, computer modeling and higher mathematics, could be considered technical.[11]

In today's creative economy, the tools that were formerly confined to artistic spheres are now entering the mainstream workplace. Per Elliot Eisner's definition of artistry, "artistry consists in having an ideas worth expressing, the imaginative ability needed to conceive of how, the technical

8 Isaac Asimov was a popular writer of hard science fiction during the 20th century. His most notable works include I, Robot, The Bicentennial Man, and Foundation. He is also popularly believed to have coined the term "robotics."

9 "Universal: Page 2 of 26." Readiness Guide. Accessed March 26, 2017. http://readinessguide.smartcitiescouncil.com/article/universal?page=0,1.

10 Teitelbaum, Michael S. "The Myth of the Science and Engineering Shortage." The Atlantic. March 19, 2014. Accessed April 04, 2017. https://www.theatlantic.com/education/archive/2014/03/the-myth-of-the-science-and-engineering-shortage/284359/.

11 https://www.thebalance.com/list-of-engineering-skills-2063751

skills needed to work effectively with some material, and the sensibilities needed to make the delicate adjustments that will give the forms the moving qualities that the best of them possess."[12] Recognizing this, many leading Universities are reevaluating how the arts fit into their core curriculum. MIT now requires students to take 8 classes, nearly 25% of their full undergraduate curriculum in the Humanities, Arts, and Social Sciences[13].

Approaching scientific challenges from an artistic perspective can allow for larger ethical and humanistic questions to come to the surface. While a scientist may look at a municipal problem and ask "how can I fix this with technology?", their artistic side may say "what impact will utilizing this technology have on people?" Martin Kemp states "perception is deeply embedded in the brain by the end of formal schooling, yet researchers must embrace other ways of thinking and visualizing, and can do so through making or viewing art[14]." Arts and artistic training make scientists better scientists.

Urban Livability and Public Art in the Smart City

While big data and IoT/ICT can greatly increase municipal functionality, they do very little to increase city livability. In fact, too much information at our fingertips can have the opposite effect. Researchers from Stanford and Princeton proved that having or seeking out too much information can lead to poorer decision making.[15] By 2050,

an estimated 70% of the world population will be living in cities,[16] which may have real economic consequences. A 2010 report estimated that information overload leads to an economic loss of over $900 billion per year.[17] It is in this space that art, especially public art, provides a "data lite" experience for people to mentally recharge. When Sydney, Australia began planning its smart city conversion, part of their solution was to create 16 new public art installations.[18] These multifaceted public arts displays ranged from sculpture, to performance art and include forthcoming installations featuring public comments gathered through the artist's city walks (see Figure 3).

Figure 3. When Sydney, Australia began planning its smart city conversion, part of their solution was to create 16 new public art installations, ranging from sculpture, to performance art and include forthcoming installations featuring public comments gathered through the artist's city walks. Source: Boland, Brooke. "Why Smart Cities Should Invest in the Arts." ArtsHub Australia. June 28, 2016. Accessed June 11, 2017. http://visual.artshub.com.au/news-article/sponsored-content/visual-arts/brooke-boland/why-smart-cities-should-invest-in-the-arts-251613.

The importance of public art is not only true for large mega cities, but also for more modest urban environments. A 2016 EPA report on creating smart growth for small cities highlighted the importance

12 Eisner, Elliot W. (2002) The Arts and the Creative of Mind, New Haven: Yale University Press, p. 81

13 "The Power of the Humanities, Arts, and Social Sciences at MIT ." MIT SHASS: News - 2014 - The Power of the Humanities, Arts, and Social Sciences at MIT. Accessed June 17, 2017. https://shass.mit.edu/news/news-2014-power-of-humanities-arts-social-sciences-at-mit.

14 http://www.nature.com/nature/journal/v537/n7618/full/nj7618-125a.html

15 In the 1998 study, researchers found that having the ability to gather more information, or believing that more information was available to had, lead participants to delay decision making. When a decision was taken, it was often a poorer choice than was made by the control group who had all the information without needing to seek it out piece by piece. Bastardi, Anthony, and Eldar Shafir. "On the Pursuit and Misuse of Useless Information." Journal of Personality and Social Psychology 75, no. 1 (1998): 19-32. doi:10.1037//0022-3514.75.1.19

16 "Smart City Research." Smart City Research. Accessed March 26, 2017. http://www.smartcityresearch.com/.

17 Writer, Ned Smith BusinessNewsDaily Senior. "Digital Overload: Too Much Technology Takes a Toll." Business News Daily. November 08, 2010. Accessed May 03, 2017. http://www.businessnewsdaily.com/379-digital-overload-too-much-data-costs-businesses-billions.html.

18 "Sydney's Smart City Transformation Invests in Public Art." ReadWrite. July 04, 2016. Accessed February 12,

2017. http://readwrite.com/2016/07/02/sydneys-smart-city-transformation-invests-public-art-cl4/.

of "maintaining character and distinctive community assets."[19] Museums and public art are by definition distinctive community assets, and they in turn supports city livability.

Public art in smart cities does not have to be digitally disconnected. In fact, this new urban digital landscape creates a new canvas for artists to explore. In "Shadowing", artists Johnathan Chomko and Mathew Rosier used an interactive street lamp type device with infrared tracking, and triggered projections to capture the shadow of a person passing by, and then re-project it when the next pedestrian passes.[20] Leveraging public art's impact on livability to increase urban branding is the logical next step.

Municipal Branding

Technology is standardizing cities. While that may be a positive from a functionality perspective, from a tourism and city branding perspective, it is overwhelmingly negative. Why visit Paris when you can have the same functional experience in Minneapolis, and top it off with a VR trip to the Louvre? As cities standardize, they must at the same time differentiate.

Increasing functionality of a city does not inherently increase its value. Per consultants at Umbriellum, "Value is both an immediate and a long-term notion, one based on sustainable, affirmative experience. Cities have a story and, like any brand, it is the immersive experience/ storytelling aspect that determines its success."[21] The arts play a substantial role in helping a city tell its story and thus aid in this urban branding.

In 2016 Canadian researchers uncovered just how strong a role arts and culture play in city branding to attract high skill employees. Over half of those surveyed reported that a city's vibrant arts and

culture community influenced their decision regarding whether they would want to live and work in in that urban area. In fact, skilled workers placed high enough value on the arts that 32% either donated to, volunteered for, or were regular subscribers to their community arts organizations. From an employer perspective, 60% of employers reported that there are usually more qualified and attractive potential employees in cities with strong arts communities.[22]

The power of an urban arts brand is not just limited to attracting highly skilled employees. A strong urban brand will generate tourist income that can lift the economic platform of a region. In the 1990s, the Basque Capital was experiencing a rise in tourism despite its political and economic challenges. When researchers examined tourism patterns, they found that 80% of visitors were spending time and money at the museums.[23]

It is in the realm of tourism that smart cities and arts organizations can most organically develop a symbiotic relationship. The modern traveler demands smart capabilities when they travel. Today's holidaymaker wants to have a fully connected experience from hotel check-in, to GPS around town and immediate access to the things they want to see during their limited time in the area. Smart city technology launched in conjunction with museums and other arts groups offers urban planners the ability to better monitor tourist transportation and economic patterns. By analyzing tourist walking patterns, cities can alter street lighting and police deployment accordingly.[24] These capabilities not only make smarter tourist centers, but safer ones as well.

19 https://www.epa.gov/sites/production/files/2016-01/documents/small_town_econ_dev_tool_010516.pdf

20 Collabcubed. "Shadowing: Jonathan Chomko & Matthew Rosier." CollabCubed. June 30, 2014. Accessed February 12, 2017. https://collabcubed.com/2014/06/30/shadowing-jonathan-chomko-matthew-rosier/.

21 "Art in the Smart City | Read." Art in the Smart City | Read - Marine Tanguy Art. Accessed March 26, 2017. https://www.marinetanguyart.com/read/art-in-the-smart-city/.

22 "Business for the Arts — New Study Reveals Businesses Attract More Skilled Workers by Engaging in Arts and Culture ." Business for the Arts New Study Reveals Businesses Attract More Skilled Workers by Engaging in Arts and Culture Comments. Accessed May 03, 2017. http://www.businessforthearts.org/2016/06/22/new-study-reveals-businesses-attract-more-skilled-workers-by-engaging-in-arts-and-culture/.

23 "Smart Cities Built on Culture." Artworks Smart Cities Built on Culture Comments. Accessed March 26, 2017. https://artworksapp.com/articles/smart-cities-built-on-culture/.

24 Rodríguez-Núñez, E., and I. Periáñez-Cañadillas. "Intellectual Capital as the Fostering Factor for Sustainable Smart Urban Development in the Basque Autonomous Community." Innovation, Technology, and Knowledge Management Sustainable Smart Cities, 10, 2016, 31-47. doi:10.1007/978-3-319-40895-8_3.

Interestingly, from the tourist perspective, how connected they want to be depends entirely on their country of origin. 60% of travelers from Eastern Europe agreed that a smart phone was important to them when they travel, compared to only 40% of Americans.[25][26] Smart tourism technology is only as valuable as an individual's willingness to utilize it.

The Role of the Institution in Smart City Development

All this smart city infrastructure hinges on one thing, and it isn't technology. Rather, it is people. Creative people who develop the technology are also curious problem solvers who can approach a challenge from a fresh angle and empathetic souls who will thoughtfully consider the impact this technology will have on the community at large. Arts institutions themselves are central to developing these individuals.

The Creative Economy

If we claim that creative workforce sustainability is vital to a smart city, then we must recognize the educational impact of nearly all arts organizations. Government educational funding for the arts continues to be repeatedly cut, and arts organizations have been filling the void for decades.[27] The importance of arts education in the creative economy cannot be understated. William Yu, an economist at UCLA stated:

> "Robots and foreign labors will never be able to replace creative people in creating sectors making new and desirable products and services.

Therefore, arts education, which is an investment in our future creative workforce, will become a crucial element in our education system. A resilient economic growth and prosperity in the 21st century will depend on our arts education."[28]

To provide quality arts education to public school students, districts often turn to community arts organizations. Per New York's Annual Arts Education Survey, from the 2008-2009 school year onward, over 80% of all responding schools had partnered with at least one community arts organization.[29] In Chicago, community arts groups report their workings to the city, and from that data, we can see that of the schools who have art partnerships work with four different organizations on average.[30]

In 2015, a survey of arts partnerships in L.A. public schools reported that 53% of schools in L.A. county have arts partnerships. Nearly half of these partners provided their services to the schools free of charge (Figure 4).[31] These programs are typically concentrated around the K-8 grade levels, and skewed heavily toward visual art, music/opera, and theatre. A smaller percentage of programs focused on dance, literary art, and media art.[32] Clearly, as education budgets continue to get cut at the federal level, arts organizations are picking up the slack, and often bearing the full cost of the program. It is important to acknowledge the contributions of individual arts organizations in the realm of arts education, and recognize that without them, it would be nearly impossible for a society to develop the creative workforce needed to sustain smart cities.

25 Curiel, Javier De Esteban, María Luisa Delgado Jalón, Beatriz Rodríguez Herráez, and Arta Antonovica. "Smart Tourism Destination in Madrid." Innovation, Technology, and Knowledge Management Sustainable Smart Cities, 10, 2016, 101-14. doi:10.1007/978-3-319-40895-8_8.

26 This statistic does not consider the idea that Americans and other non-European travelers may not have access to a data plan abroad, or if they do they are not willing to pay for international data fees. European travelers may have more leeway in their international data options.

27 Numerous studies have been conduction detailing the arts and educational impact, as well as government cuts to the arts. I will not cover what has been better covered in many publications, but to learn more on the subject consider the resources available through Arts Education Partnership.

28 "How Arts Education Fuels the Creative Economy." KCET. July 05, 2016. Accessed April 10, 2017. https://www.kcet.org/shows/artbound/how-arts-education-fuels-the-creative-economy.

29 New York City Department of Education. (2014). Annual Arts in Schools Report 2012–13. Retrieved from http://schools.nyc.gov/offices/teachlearn/arts/ArtsCount/ArtsSurvey/2012-2013/2012-13%20AIS%20Report.pdf.

30 Ingenuity, Inc. (2014). State of the Arts in Chicago Public Schools: Progress Report 2013–14. Retrieved from http://www.ingenuity-inc.org /filebin/IngenuityProgressReport_FINAL.p

31 https://www.lacountyarts.org/sites/default/files/pdfs/lacac_artspartnersreport_2015.pdf

32 Ibid.

	ARTS ORGS.		ARTISTS	
	NO.	%	NO.	%
Always charge	28	20.1%	16	34.8%
Sometimes charge	36	25.9%	7	15.2%
Never charge	69	49.6%	20	43.5%
Did not report	6	4.3%	3	6.5%
TOTAL	139	100%	46	100%

Figure 4. Incidences of artists and arts organizations charging fees to their L.A. public school partners. Source: https://www.lacounty-arts.org/sites/default/files/pdfs/lacac_artspartnersreport_2015.pdf

Smart City Benefits for Arts Institutions

As cities transition to "big data" heavy smart cites, the sum of this data will likely enter the public record. This provides enormous opportunity for museums to access information about their guests on a level of detail that may have been unimaginable before. Smart cities will expose new patterns of communication, impact, and data visualization that will allow cities and arts organizations within those cites to understand and meet their patrons needs.

In April of 2017, Los Angeles County held their inaugural Arts Datathon. The event brought together data scientists, artists, community members, and civic leaders. In small teams, they broke apart a wide variety of data on the arts and arts availability in their community. Wendy Hsu from L.A.'s Department of Cultural Affairs stressed the usefulness of big data when considering how the arts and city planning intersect:

> "Part of what we're trying to do is to actually look at the data and see if there are gaps in there -- either in the services that we provide, or in the grants that we give, or in the public art that we produce. Are there areas of vibrancy? Are there art deserts?" Hsu said. "If there is a desert, we want to actually be able to redeploy our services in a

meaningful way." [33]

Armed with this data, institutions can then interact with municipal managers to advocate for specific and measurable arts access improvement.

Moving Forward Intelligently

As arts managers, we are often in the position of needing to justify our worthiness for funding, our impact on the community, and even our institution's very reason for existing. Regarding the changes smart cities will bring, the need for the arts to advocate for themselves is no different. The arts and arts institutions have always lent value to the communities they serve. The shift to smart cities amplifies their municipal importance even though most arts organizations are not actively engaged in these conversations.

The time to advocate is now, during the decision-making process, not 10 years from now when the transition has been completed. Find out where your city is at in their smart city transition. Call your municipal office and find out when their next planning meeting are. The sooner you join the conversation, the better you can advocate for your industry in the future of your city. We serve a vital function for our communities, and our existence is more important than ever.

33 Radio, Southern California Public. "Harnessing the Power of Spreadsheets to Expand Arts Access." Southern California Public Radio. April 26, 2017. Accessed May 03, 2017. http://www.scpr.org/news/2017/04/21/70879/a-datathon-for-the-arts-harnessing-the-power-of-sp/.

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