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Small and Smart: Why and How Smart City Solutions Can and Should be Adapted to the Unique Needs of Smaller Cities

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Abstract: Research and development on smart cities has been growing rapidly. Smart cities promise a new era of living efficiently, sustainably, and safely. The tools and technologies deployed aim to drive better public decision-making on everything from where we live to how we work. While the world is rapidly urbanizing, a substantial percentage of the population still lives in smaller and rural communities. Smart city solutions as they are defined here are process driven and not constrained by population or geographic metrics; they are the application of technology and data to improve the quality of life. Smaller communities can also be smart, and excluding or ignoring them widens inequality, limits use cases, and restrains innovation. Using South Bend, Indiana as an example, the authors examine the power and potential of smaller smart cities. They then transfer this thinking to Georgia and Georgia Tech's initiative working with local governments across the state on smart community development. This article is one of the first of its kinds in examining smaller smart communities as models for smart living.

Keywords: smart cities, South Bend, Georgia Tech, urbanization, city planning

First used in the 1990s, the term smart cities has become increasingly popular among both practitioners and scholars. In academic circles, a growing literature clearly demonstrates a rapid increase in the spread and adoption of the term.¹

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¹ Leonidas G. Anthopoulos, Marijn Janssen, and Vishanth Weerakkody, "Comparing Smart Cities with Different Modeling Approaches," in *Proceedings of the 24th International Conference on World Wide Web*, WWW '15 Companion (New York, NY: ACM, 2015), 525–28, https://doi.org/10.1145/2740908.2743920.

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In the public and private sectors, expanding budgets and market potential signal the increasing importance of smart cities. This is transmitted to the general public through reporting on astronomical figures for the size of the smart cities market² and breathless articles about how rapidly smart cities are transforming our lives.³ But, the rush to make cities smarter is leaving behind both individuals and communities. As with many efforts at improving the quality of life and governance, low-income individuals, neighborhoods, and countries are the least likely to benefit from smart city advances. Making city services available online, for example, is useless to low-income individuals and communities with no internet access. While this is both unfortunate and unsurprising, the problem has been widely recognized. Indeed, serious efforts, such as tech for good and the civic tech movement are seeking to spread the benefits of smart city solutions to lower income communities.⁴ This paper considers a lesser known group that is being left behind by smart city innovations. A group that overlaps with, but is conceptually distinct from low income communities, small cities. Additionally, we show that sub-national governments are a vital part of advancing smart city solutions, especially for smaller communities which are generally too small to attract the attention of nation governments.

In this issue, Sascha Haselmayer argues that proven smart city solutions take at least two generations to trickle down from the top echelon of global cities. This means that unless meaningful action is taken, smaller communities will continue to trail their larger colleagues by a matter of decades. This paper is a first attempt at examining why and how smart city solutions can and should be adapted to the unique needs of smaller cities.

Background

Smart cities are, first and foremost, cities. True to this issue's theme, the world is increasingly decentralized, globalized, and urban. A slim majority of people

² Sarwant Singh, "Smart Cities – A \$1.5 Trillion Market Opportunity," *Forbes*, June 19, 2014, https://www.forbes.com/sites/sarwantsingh/2014/06/19/smart-cities-a-1-5-trillion-market-opportunity/.

³ Michael Totty, "The Rise of the Smart City," *Wall Street Journal*, April 17, 2017, sec. Business, https://www.wsj.com/articles/the-rise-of-the-smart-city-1492395120.

⁴ Peter Madden, "Will Smart Cities Inevitably Worsen Social Inequality?" *HuffPost UK*, January 26, 2018, http://www.huffingtonpost.co.uk/entry/will-smart-cities-inevitably-worsen-social-inequality_uk_5a689271e4b06bd14be506e4.

today live in cities and by 2050 over 60 % will.⁵ This concentration of people also means a concentration of resources, in terms of talent, infrastructure, and capital. Simultaneously, a vacuum of national leadership in many countries and an underdeveloped global leadership means that cities are at the forefront of trying to address many of today's most pressing challenges. National government muscle can help, as in the case of India, but executive mandates can happen at lower levels of local government, especially in our increasingly decentralized world. While too many have yet to realize it, if mayors were to join forces they can 'rule the world.'⁶ Even when Mayors do not fully control necessary infrastructure or lack the funding to operate it, they subsume ownership in making major decisions on technology purchases and information and communication technology (ICT) upgrades. Additionally, non-metropolitan subnational governments, such as states, counties, or provinces are increasingly viable and important allies for cities in pursuing smart solutions.

With cities taking the lead, technology companies found a new business model and natural ally. Most of their technologies had been proven in pilots or other implementations, but have not been fully integrated with other smart city solutions. Smart cities leveraged a new business market of interconnectivity and interoperability. They benefited from improvements in enabling platforms like data applications, cyber-physical domains, and powerful and large cloud computing.⁷ Many vendors developed a smart cities business aimed to push smart city solutions to cities, creating an arms race of procurement and purchasing. Corporations restructured units to offer smart technology to cities and actively sought smart city partnerships or responded to related Requests for Proposals (RfPs). Talent has moved freely between technology vendors and cities creating a close relationship between public and private sectors. The market research and analysis firm Frost & Sullivan predicts that the smart cities market will be over \$1.5 trillion by 2020. New smart developments are cropping up daily and moving beyond initial concentrations in North America and Europe.⁸

Unsurprisingly, smart city business is focused primarily on large cities and larger cities are better able to push markets to pay attention to them. The causation runs both ways. Most research grants, challenges, awards, and programs are

⁵ *World Urbanization Prospects: The 2014 Revision* (New York, NY: United Nations Department of Economics and Social Affairs, Population Division, 2014).

⁶ Benjamin R. Barber, *If Mayors Ruled the World: Dysfunctional Nations, Rising Cities* (New Haven, CT: Yale University Press, 2013).

⁷ Eduardo Felipe Zambom Santana et al., "Software Platforms for Smart Cities: Concepts, Requirements, Challenges, and a Unified Reference Architecture," *ACM Computing Surveys* 50, no. 6 (November 2017): 78: 1–78: 37, https://doi.org/10.1145/3124391.

⁸ Singh, "Smart Cities."

for larger cities. Large cities aggressively pursue opportunities to advance their development, with the biggest cities, like New York, San Francisco, and Chicago having traditionally taken the lead. Some mid-sized cities like Austin and Kansas City have hosted major smart cities conferences based on their success and leadership in the field. Besting 77 other mid-size US cities, Columbus, OH won the most recent US Department of Transportation (DoT) Smart City Challenge.⁹ Other finalists in the DoT Challenge, like Pittsburgh¹⁰ and Denver¹¹ continue to pursue ambitious smart city visions. Many of the newest and best publicized smart city projects are notable for their large-scale development, tremendous resources, locations in or near large urban areas, and efforts to build smart cities from scratch. Nevertheless, doubts have been cast on the smartness of large-scale projects as diverse as Alphabet's Sidewalk Labs winning proposal for Toronto's Waterfront,¹² Bill Gates' investment group's plans in the exurbs of Phoenix,¹³ Abu Dabi's Masdar, and Saudi Arabia's Neom.¹⁴

Defining Smart Cities

There are nearly as many definitions of smart cities as there are scholars studying them or businesses marketing to them.¹⁵ Existing definitions of

⁹ Aarian Marshall, "Columbus Just Won \$50 Million to Become the City of the Future Wired," *Wired*, June 23, 2016, https://www.wired.com/2016/06/columbus-wins-50-million-become-city-future/.

¹⁰ Teena Maddox, "Pittsburgh's Smart City Efforts Include Autonomous Driving, Open Data, and Renewable Energy," *TechRepublic*, November 18, 2016, https://www.techrepublic.com/article/ pittsburghs-smart-city-efforts-include-autonomous-driving-open-data-and-renewable-energy/.

¹¹ Tamara Chuang, "A Glimpse into What Is Coming for Denver's Future Smart City, Pena Station Next," *The Denver Post* (blog), January 22, 2017, https://www.denverpost.com/2017/01/22/denvers-panasonic-smart-city/.

¹² Henry Grabar, "Building Googletown," *Slate*, October 25, 2017, http://www.slate.com/arti cles/technology/metropolis/2017/10/sidewalk_labs_quayside_development_in_toronto_is_goo gle_s_first_shot_at.html.

¹³ Henry Grabar, "Bill Gates' Smart City in Arizona Is Not Smart, Not a City, and Has Little to Do With Bill Gates," *Slate Magazine*, November 15, 2017, https://slate.com/business/2017/11/bill-gates-smart-city-in-arizona-is-not-smart-not-a-city-and-has-almost-nothing-to-do-with-bill-gates.html.

¹⁴ "Saudi Arabia Launches a Futuristic Economic Zone," *The Economist*, October 26, 2017, https://www.economist.com/news/middle-east-and-africa/21730665-crown-princes-plans-get-ever-grander-saudi-arabia-launches-futuristic.

¹⁵ Vito Albino, Umberto Berardi, and Rosa Maria Dangelico, "Smart Cities: Definitions, Dimensions, Performance, and Initiatives," *Journal of Urban Technology* 22, no. 1 (January 2015), https://trid.trb.org/view/1351039.

smart cities vary widely in breadth and focus depending on the interests of those producing the definition. Technology companies such as IBM and Cisco tend to focus on the technology they sell and the positive outcomes it can produce. Scholarly and public sector definitions, by contrast, may focus more on the role of governance in implementing these technologies and how communities interact with them.¹⁶

For our purposes here, we define smart cities as the "application of technology, data, and supporting tools and techniques to improve the quality of life." There are three main areas to this: components, function, and vision. The components includes technology, both hardware, and software, as well as data. Sometimes cities wrongly assume that simply obtaining the newest gadgets and accumulating reams of data will automatically make them smart. Driven by technology vendors' sales pitches or inter-city competitiveness, a technology arms race is formed as cities compete to procure the most and shiniest smart cities technology. Technology is not the solution to every problem, however, and by itself will not make a difference. Technology has to be carefully chosen and artfully applied in accordance with a clear overarching vision.¹⁷ Do cities have the right tools, skill sets, and resources to apply the technology? What is the business model? How does it fit into their overall vision or goal? What is driving cities to pursue smart? The three sides of the smart cities framework ensures a holistic take on smart cities development (Figure 1).



Figure 1: Smart Communities Framework

¹⁶ Jarmo Eskelinen, "Smart City Strategies: A Global Preview" (ARUP, 2017).

¹⁷ For more on this see: David Edgerton, *Shock Of The Old: Technology and Global History since 1900* (Profile Books, 2011).

Smart city development is an iterative process in which cities are constantly improving efforts to apply suitable technologies and data. This fits nicely into other outcome-oriented city frameworks like sustainable development or resilience. For example, the UN's Brundtland Report defines sustainability in terms of meeting the needs of current generations without jeopardizing future generations. Smart cities can be the means to achieve sustainable development, providing the technology to achieve targets and the data to measure whether they have been met.

Can Small Cities Be Smart?

While little attention has been paid to the potential for small cities to become smarter, definitions of smart cities do not preclude the possibility. Indeed, notably lacking from nearly all definitions of smart cities are minimum populations, sizes, densities, or urbanities. In fact, these definitions allow for smart solutions at any scale, from individuals being empowered with tech and data to improve their day-to-day decision-making, to neighbors coming together through their community associations in clean-ups or watch blocks, to regional networks including large numbers of metro areas and even stretching across national borders.

Universities, similar in size and scale to many small cities, have become natural testing grounds for smart solutions. They have ownership and operational control over many city-like functions, from transportation to infrastructure. They also have substantial advantages over most small cities, including resources, expertise, and streamlined governance. To meet sustainability and energy goals, some universities have developed high performance buildings¹⁸ and created the space to welcome autonomous vehicle development, like University of Michigan's MCity.¹⁹ The success of these initiatives demonstrates the potential of smart solutions on smaller scales, but also the challenges that most small cities will face, as they lag far behind universities, especially in terms of resources, initiative, and expertise.

¹⁸ E. De Angelis et al., "The Brescia Smart Campus Demonstrator. Renovation toward a Zero Energy Classroom Building," *Procedia Engineering* 118 (January 1, 2015): 735–43, https://doi.org/10.1016/j.proeng.2015.08.508.

¹⁹ Neal E. Boudette, "Michigan's New Motor City: Ann Arbor as a Driverless-Car Hub," *New York Times*, July 9, 2017, sec. Business Day, https://www.nytimes.com/2017/07/09/business/driverless-car-autonomous-university-michigan.html.

Why We Cannot Leave Smaller Communities Behind

While the smart cities framework can benefit all types of local governments, the emphasis on larger cities leaves out many counties, improvement districts, smaller cities, and even rural communities. There are some exceptions. Snohomish County in Washington State is aggressively pursuing its goal of being America's first smart county.²⁰ Cary, North Carolina has demonstrated some success in the implementation of their Town Hall Campus.²¹ But these examples are exceptional, both in terms of being rare and because they are situated within easy reach of international hubs of innovation and technology. Snohomish County lies just north of Microsoft's headquarters in suburban Seattle and Cary is at the heart of North Carolina's Research Triangle. These examples pale in comparison to the volume of press, studies, and pilots that are targeted at larger cities. Small communities are, therefore, often oblivious to smart city solutions or think that they cannot be applied within their respective municipalities. This is unfortunate for a number of reasons, a few of which we outline below.

Exacerbates Inequality

Technology is seen as a great leveler and this trend accelerates as more people are able to afford it, have sustainable access to it, and learn how to use it. As people can increasingly work remotely they becomes less location dependent and smaller more affordable communities should become more competitive relative to large expensive cities. The accompanying release of open data also means that citizens of all stripes have access to information that could improve their day-to-day decision-making and enable them to check on government performance. All of this should point to technology as a force for narrowing inequality on the individual and community level. In reality, however, a widening gap is clearly evident between areas that have smart city opportunities and supporting infrastructure and those that do not.

²⁰ Colin Wood, "Washington-State County Hunts down Partners for Smart County Initiative," *StateScoop*, May 24, 2017, http://statescoop.com/washington-state-county-hunts-down-part ners-for-smart-county-initiative.

²¹ Allyson Sutton, "Is Cary, NC the Next Smart City? How the Town Tackles Community Challenges with IoT," *DIG SOUTH* (blog), October 25, 2017, http://digsouth.com/2017/10/25/is-cary-nc-the-next-smart-city-iot/.

Although a federal court has ruled that high-speed internet services can be treated as a public utility,²² many smaller communities still lag far behind in terms of availability and speed. This impacts education and workforce competitiveness as well as the smaller communities' ability to access social services like healthcare and government benefits.²³ While technology companies tout 5G's potential for rapid speed, connectivity, and intelligent automation, there are many communities that lack even basic networks. According to the US Census 2015 American Community Survey, a quarter of the households in Georgia do not have broadband access. Across the country, around 8% of residents in small metro areas do not have access to 25-megabits-per-second download speed, the minimum technical parameter of broadband, compared to 0.6% of residents in cities.²⁴ The rural/urban digital divide is a complex subject and great disparities in access also exist within cities and between urban neighborhoods. However, those disparities are often the result of socio-economic factors at the household and individual level. The digital divide between smaller communities and larger cities is defined by a more general lack of infrastructure.

This gap is especially problematic when smaller communities are the ones that could benefit the most from smart city tools and technologies for their socioeconomic development and have the least knowledge of it or access to it. Online provision of government services and the monitoring of remote infrastructure through the Internet of Things (IoT) should be of even greater value in rural communities where traveling to a government office or to check on remote infrastructure could take hours. Yet, without sufficient connectivity these opportunities may be squandered.

Moreover, the concern is not simply that the biggest cities stay one step ahead of their smaller counterparts, but that the gap continues to widen as the pace of technological innovation leaves smaller cities further and further behind. A recent example of the problem can be seen in the restrictive expansion of fiber optic internet provision in the US. While broadband speeds in less dense areas have long lagged behind those in denser ones, Google Fiber now

²² Cecilia Kang, "Court Backs Rules Treating Internet as Utility, Not Luxury," *New York Times*, June 14, 2016, sec. Technology, https://www.nytimes.com/2016/06/15/technology/net-neutral ity-fcc-appeals-court-ruling.html.

²³ Darrell M. West and Jack Karsten, "Rural and Urban America Divided by Broadband Access," *Brookings* (blog), July 18, 2016, https://www.brookings.edu/blog/techtank/2016/07/18/rural-and-urban-america-divided-by-broadband-access/.

²⁴ Adie Tomer, Elizabeth Kneebone, and Ranjitha Shivaram, "Signs of Digital Distress: Mapping Broadband Availability and Subscription in American Neighborhoods," *Brookings* (blog), September 12, 2017, https://www.brookings.edu/research/signs-of-digital-distress-map ping-broadband-availability/.

provides dramatically faster upload and download speeds. But, these are only in the core urban areas of the handful of cities in which it operates. Further, plans for expansion have been scaled back, now exacerbating the digital divide it was once hoped that Google would help bridge.²⁵

Limits Smart Technology Applications

Many smart city solutions have not been adapted to smaller and less dense areas. Probably the most important areas of smart city development has been in the field of intelligent transportation systems, yet traffic management techniques or strategies for maximizing the performance of public transit systems will be of little use to communities that lack public transit infrastructure and do not face serious traffic congestion. Sensors to count pedestrians are not as useful or cost effective in less busy main streets or town squares. With most smart city initiatives continuing to emphasize such technology, one can understand why smaller community government officials might not think that smart city solutions have anything to offer them.

However, the same technology that has been framed with large city use cases can also be useful in a smaller community setting. A myopic focus on dense and populous cities means we limit the potential of technology application, data analytics, and other innovations. Because the smart cities framework is processoriented, we need to start with understanding local context and challenges first, including the existing resources and processes, before driving a particular technology solution. This approach allows us to take stock of available smart cities tools and technologies and adapt or localize it for particular communities' needs, regardless of their size. For example, the design and technology behind intelligent transportation systems can be utilized to connect remote communities with critical services and goods. Shared and autonomous vehicles are usually seen as helping large cities solve the problem of limited parking, but could enable additional transportation options for smaller communities without public transit. Autonomous vehicles could make it cost effective to operate smaller public transit options more frequently, or at all, in remote areas and riders could use smart phones to signal when they are at seldom used rural bus stops.²⁶

²⁵ Libby Watson, "What Happened to Google Fiber?" *Gizmodo*, February 16, 2017, https://gizmodo.com/what-happened-to-google-fiber-1792440779.

²⁶ Nagendra R. Velaga et al., "Transport Poverty Meets the Digital Divide: Accessibility and Connectivity in Rural Communities," *Journal of Transport Geography*, Social Impacts and Equity Issues in Transport 21 (March 1, 2012): 102–12, https://doi.org/10.1016/j.jtrangeo.2011.12.005.

Smaller communities need to be in this space to offer additional use cases and feedback on smart city solutions and developments. Such additional and diverse viewpoints could spur technological improvements and creativity in areas that otherwise might be more homogenous and limited. The limited resources of smaller communities means there is a greater need for collaboration both between communities and with other levels of government. It also creates wider partnerships, including more diverse stakeholders such as: neighborhood units, community improvements districts, municipal associations, counties, provinces, utility districts, and states.

Restrains Small to Big Technology Transfer Potential

It is not a surprise if small cities like South Bend look to bigger cities like Los Angeles for open data platforms or other smart cities ideas and processes.²⁷ Often, the larger cities have the resources to hire outside experts or engage with larger community populations. They also have more resources to mitigate a failure and adjust their plans. Additionally, their greater visibility makes it easier for other cities to follow their models and guidance. However, smart city development should not be a one-way street where the innovations of large cities only trickle down to smaller communities. In fact, such assumptions can inadvertently delay the advent of smart cities deployment.

Smaller communities would be much better off localizing smart city developments themselves. There is no time to waste, especially given the previously noted problem of widening inequality and the growing homogeneity of tech applications. There is much for smaller communities to contribute to the space and their experiences and innovations might ultimately benefit larger cities. Smaller communities are often less complex in terms of bureaucracy and decision-making. You might be able to get the key decision-makers in a room and move quickly to implement a pilot or scale up to the rest of the community. When referring to the city's new smart sewer system, South Bend Mayor Pete Buttigieg noted that "It's a lot easier to take a shot at this when the system is our size, rather than as big as L.A."²⁸

²⁷ Danielle Fulmer, "Paving a Path from Open Data to Open Government in South Bend," *Data-Smart City Solutions* (blog), May 8, 2017, http://datasmart.ash.harvard.edu/news/article/paving-a-path-from-open-data-to-open-government-in-south-bend-1039.

²⁸ David Morris, "Smart Cities Think Big with \$160 Million White House Program," *Fortune*, September 16, 2015, http://fortune.com/2015/09/16/smart-cities-160-million-white-house-program/.

Example of a Successful Small Smart City: South Bend

With a population of a little over 100,000, the City of South Bend, Indiana was known more for its university, Notre Dame than as a city. For decades, South Bend, like many other rustbelt cities, saw massive economic and population declines following the shuttering of its principal employer, the Studebaker car plant. Left in the plant's wake were dated and aging infrastructure and abandoned buildings. A diminished population meant that the city was short on revenue and talent to help correct this downward spiral. The city also lacked a base of local foundations that helped support other industrial cities like Pittsburgh, Detroit, or Cleveland. Its conditions were similar to many small towns throughout America, and its smart city renaissance is something other small towns should be able to emulate.

Instead of seeing it as a branding competitor, South Bend started forming a closer connection with its neighbor, the University of Notre Dame. For the university to attract top faculty, researchers, and students, its administration was anxious to improve the quality of life and amenities available in South Bend. In turn, the talented and motivated people that Notre Dame brought to the area began to see South Bend as their home and wanted to improve it. This is a model of a successful, if unremarkable, town-gown relationship.

However, the election of Mayor Pete Buttigieg in 2012 and his embrace of smart cities took this city-university relationship to another level. Mayor Buttigieg was a Harvard graduate, Rhodes Scholar, and Afghan war veteran. He was also a South Bend native who returned to live in his old neighborhood and help revive his hometown.²⁹ Mayor Buttigieg quickly came to understand what smart city solutions could mean for South Bend and what would be necessary to bring them to the city. He then proceeded to aggressively position South Bend to be become a leader in smart cities.

First, he opened up the city and its data as a sandbox for the University of Notre Dame. Their researchers began tackling city issues normally reserved for private companies and consultants. The relationship quickly proved beneficial as researchers were able to use the city as a platform to advance smart cities technology and development and the City received innovative research and expertise that they otherwise would not have been able to afford, attract, or

²⁹ Zack Quaintance, "South Bend, Ind., Could Be a Glimpse at the Future of Mid-Sized Cities," *Government Technology*, January 8, 2018, http://www.govtech.com/civic/South-Bend-Ind-Could-be-a-Glimpse-of-the-Future-for-Mid-Sized-Cities.html.

have the capacity or skill set to enact. South Bend and Notre Dame became one of the founding members of the larger MetroLab Network. Launched at the White House's 2015 Smart Cities Initiative, the MetroLab Network includes more than 35 city-university partnerships to leverage technology, research, and analytics onto the urban platform.

One of the most notable achievements of the smart city relationship that South Bend formed with Notre Dame was a smart sewer system. Instead of a costly replacement, the city worked with researchers "to install wireless sensors under manhole covers to monitor water levels in sewer pipes. The sensors can open and close valves in the system, enabling flow to be directed into pipes where capacity is available and thus prevent pollution from ending up in waterways or backing up into basements."³⁰ This meant that the city could more effectively monitor the flows, clean the sewers, and optimize the existing sewer infrastructure.

South Bend's enthusiastic embrace of innovative lower-cost smart solutions and close partnership with the university is demonstrated by the city's open data platform and its contribution to government performance accountability. But, the data collected from smart technology would be meaningless if the city did not manage, securely store, and utilize it in their decision making. The City hired people who understood how to use the data to achieve the performance targets set by the Mayor. Enabling technologies allowed the public to monitor and keep track of government performance, sometimes pointing out problems or improvements that were quickly addressed by the city.³¹ Smart city solutions allowed South Bend to do more and better with less.

South Bend proves that smart city development can happen in smaller cities. The University of Notre Dame is undeniably a critical ingredient to this success, but a smaller city can still achieve smart community development without a large R1 university in its backyard. At the keynote speech at the MetroLab Annual Summit this year, Mayor Buttigieg was quick to point out the contributions of community and technical colleges and schools to South Bend's smart city ecosystem. Often more sensitive to the needs of the local community, oriented towards the development of technical skills, and more focused on practical applications, these schools create curriculum to attract and train the

³⁰ Greg Swiercz, "Sensors Help Combat Sewer Problems in South Bend, Ind.," *Government Technology*, February 15, 2017, http://www.govtech.com/fs/Sensors-Help-Combat-Sewer-Problems-in-South-Bend-Ind.html.

³¹ Stephen Goldsmith, "Achieving Accountability in South Bend Through Strategic Goals," *Data-Smart City Solutions*, April 4, 2017, https://datasmart.ash.harvard.edu/news/article/achieving-accountability-in-south-bend-through-strategic-goals-1012.

next generation of workforce to develop and support the smart community. Such talent often stays in the communities. At the same time, universities are not beholden to their home city. Universities and their various campuses often span multiple local governments and state universities usually have a mandate to serve the state more widely. Researchers in general are hungry for testbeds and data, and open to partnerships with willing communities regardless of size. But these resources are underutilized; a recent report by Black & Veatch contained a survey on smart city partnerships which found that only 23% of cities selected academia as one of their top two collaborators.

Similarly, South Bend had a hard time attracting larger technology companies who were used to doing business in bigger markets. They had more success reaching out to smaller, local technology companies, startups, community groups, and other entrepreneurs who were more willing to collaborate with the city and with each other. With lower initial investment requirements, South Bend was attractive especially for fledgling start-ups. For example, building a spatial-visual platform for Chicago's 234 square miles versus South Bend's 48, combined with the willingness of its top leadership to provide feedback and support, made South Bend an attractive proposition.

Next Steps and Conclusion

What small communities need is local government leadership, like that of Mayor Buttigieg, with a vision for their community and a willingness to push for smart city strategies. Unfortunately, not every community is likely to be as lucky as South Bend when it comes to their local leadership or academic resources. So how can universities and others institutions interested in extending smart city solutions to smaller and more remote communities begin to reach out?

One emerging model for how this could be done comes from the Georgia Institute of Technology (Georgia Tech). As part of their university-wide smart cities strategy, Georgia Tech is in the early stages of working with smaller communities throughout the state of Georgia to develop smart cities. Early on in the Initiative, Georgia Tech, like most smart city partners, focused on larger cities, specifically their neighbor the City of Atlanta, signing a strategic Memorandum of Understanding with the City. While Georgia Tech has worked with the City of Atlanta in the past, applying for grants, creating student internships, and conducting faculty-lead research, this strategic agreement aims to institutionalize R&D into city operations. By understanding local context, city needs, and priorities, Georgia Tech was able to push research projects in the areas of public safety and transportation, the top two priorities in Atlanta's smart city development. As a state university, however, Georgia Tech's obligations and remit extends far beyond the borders of Atlanta. It quickly became clear that collaboration with sprawling Atlanta would be an inappropriate model for most other communities in Georgia. The studies needed to be scaled for multiple cases and extended for comparisons with different models and applications. Working with the rest of Georgia means serving cities and communities of varying size throughout the state. Unlike many states, "Georgia law makes no distinction between cities, towns, and municipalities."³² Local governments of all sizes have degrees of autonomy and independence to pursue their smart community development, but their needs and priorities are very different from those of an urban metropolis.

The Georgia Tech strategy for smaller smart cities focuses on local government leadership and bringing together smaller communities to pool information, resources, and market potential to mobilize smart community development across the state of Georgia. While the City of Atlanta has made significant progress in its development as a smart city, almost half of Georgia's 10 million people live outside the Atlanta metro area, in over 500 cities and towns. A similar pattern is repeated in the vast majority of states, whose populations are roughly split between a small number of large metro areas and a large number of smaller cities, towns, and counties scattered across the state. Separately, it is difficult for these smaller communities to find models and information or attract technology vendors and expertise. Combined, however, smaller communities represent tremendous market and research opportunities.

Georgia Tech's strategy for small cities is to start by bringing mayors together to acquire knowledge and tools to build their own smart community vision and lead their own development. With the Georgia Municipal Association and Atlanta Regional Commission, the University hosted a series of local government workshops on smart cities. In these workshops, Georgia Tech provided examples from smaller communities that had successfully deployed smart city strategies and encouraged them to think about their priorities and challenges for smart community development. It introduced various lower cost tools like crowdsourcing that could enhance citizen engagements, help provide feedback, and develop applications. It brought together panels of experts, from Georgia Tech researchers, to community leaders, to smart city practitioners, to introduce the methods and processes of smart cities. Each of the panels introduced concrete case studies that cities could apply and discuss further in their facilitated

³² Peter Hiott, "Georgia's City Governments," *New Georgia Encyclopedia*, August 9, 2002, http://www.georgiaencyclopedia.org/articles/counties-cities-neighborhoods/georgias-city-governments.

breakout sessions. Local government officials were encouraged to think about their vision for their city, how smart technology could facilitate that vision, and about their local context. Fruitful discussions emerged when they shared their ideas with each other and looked for common themes in priorities or tools. Post survey results showed a remarkable increase in understandings of smart city concepts.

From the workshops, Georgia Tech discovered there was a real need and interest for smart community development, and leaders needed guidance. Georgia Tech went on to create the first Mayor's Leadership Forum on Smart Cities with the Georgia Municipal Association. Mayors and other senior government leaders from Albany, Augusta-Richmond County, Brunswick, Columbus, Dalton, Gainesville, Macon-Bibb County, Rome, Savannah, and Valdosta gathered to start their smart community journey. At the beginning, most of these mayors had little idea of what smart community development meant, especially for their city. Yet they understood the need to innovate and were more effective doing it together. Taken together, these 10 cities represented 23 % of Georgia's population and 18 % of the state's gross domestic product (GDP). At Georgia Tech's Inaugural Mayors' Leadership Forum on Smart Cities and Inclusive Innovation held in 2017, the Mayor of Columbus, GA, Teresa Tomlinson noted: "anytime we can come together and talk about how cities can utilize technology to improve services to citizens, to coordinate partners, that is a very good day."

Over the course of the year, Georgia Tech will continue to work with these smaller cities and local government leadership as they plan their smart community strategy collectively. At 30,000 people, Rome, GA has few models to follow of smart city development at its scale. But, this is why Georgia Tech's strategy of bringing together a large group of local government leaders is so important. In Rome's case, repeatedly meeting and then staying in contact with other smaller Georgia cities gives it a network with which to share experiences and ideas. At the forum, Mayor Cornell Harvey of tiny Brunswick, GA comment that: "we are not Atlanta, we are not a big city, we are a small city. But together we can become one and siphon ideas from each other and put things together."

Georgia Tech was also able to attract the attention of larger technology companies and federal agencies, something the smaller communities had difficulty with in the past. Garnering this attention is the first step towards multi-sector collaboration in smart community development. This also helps reduce misunderstandings among the stakeholders. Black & Veatch's late 2017 survey of local governments, utilities, and smart service providers demonstrated the prevalence of this type of disconnect. Just over 40 % of smart cities providers thought that tech availability was a top hurdle for smart cities development, while only 20 % of cities thought that. Meanwhile, almost 54 % of smart

solutions providers believed that lack of resources or expertise was a top hurdle versus 35 % for local governments.³³ Providing an ongoing forum on the types of technology available and use case applications from top researchers helped promote dialogue between Mayors, tech solution providers, and other stakeholders.

Georgia Tech hopes to expand its program to engage more communities with smart technology. This includes challenging technology vendors to think about how their technology can be applied at a smaller scale or think about problems to be solved with technology and data at a smaller scale. Smaller communities have shown that they are willing to collaborate and be creative in their pursuit of smart communities. In turn, they can be models for other communities, small or large, and help address growing inequalities.

It is not too late. Large-scale smart city plans in global cities or new smart cities built from scratch may be slow to fully materialize. Small cities can still be competitive in this space because they are hungry for innovation, can move quickly, and scale up. Local governments can step in and promote smart city solutions in smaller communities. While the resources of local governments might be limited, the funds necessary for smart projects in smaller communities can be modest. Smaller communities can also band together with each other and other non-city sub-national governments, like states, counties, and provinces. This can increase their bargaining power with vendors and facilitate the sharing of data and best practices. In countries where national leadership on smart cities is lacking, these sub-national governments could be vital for promoting smart city solutions.

At the end of the day, there is no such thing as a smart city, only communities working towards becoming smarter. The path will not be entirely smooth, but programs like the one at Georgia Tech could show the way by changing how smaller communities perceive and use smart city solutions.

³³ John Chevrette, Fred Ellermeier, and John Janchar, "Strategic Directions: Smart City / Smart Utility Report" (Black & Veatch, 2018), https://pages.bv.com/SDR-Smart-City-Smart-Utility-DL. html.

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