A New Tool for New Times? Using Geographic Information Systems in Foundations and Other Nonprofit Organizations

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Introduction

The use of geographic information systems (GIS) is relatively new to nonprofit organizations. Ward and Never (2012) describe the nonprofit sector as the "last frontier" for the adoption and use of GIS, following government (where GIS was first deployed) and, later, private business. Sieber (2000) concurs: "Increasingly nonprofits are following the lead of public agencies and private industry by implementing a GIS" (p. 15). Research on GIS displays the same time lag in regard to nonprofits. According to Bishop (2010), "diffusion and acceptance of geographic information systems (GIS) technology is not fully understood in public or private organizations, and even less is known about the role of GIS in the nonprofit sector" (p. 991). Al-Kodmany (2012) is more direct:

> There has been a wealth of articles and books on GIS in nonprofit organizations produced during mid-1990s and early 2000s. However, we find that there is a literature gap afterward. There are fewer articles and books on this topic since 2005 onwards. Recent research asserts that there has been little attention on utilizing GIS by the nonprofit sector (p. 279).

The stimulus to our research is Al-Kodmany's further admonition that "funders of foundations and governments have been reluctant to pay for GIS activities and there is a need for research that investigates the value of using GIS in these organizations" (2012, p. 279). Although we disagree in part because we find substantial research on GIS

Key Points

- The literature on nonprofit organizations exhorts them to understand and develop their communities' strengths and capacities. Yet, identifying those communities, appreciating the conditions that affect them, and integrating organizational stakeholders can pose difficulties for any nonprofit, including foundations.

- This article examines how a tool relatively new to nonprofits — geographic information systems — can be used to support community building by bringing together different stakeholders. A geographic information system is designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data, thus allowing an organization to map its community and share that visualization with its stakeholders.

- This article also shows how geographic information systems can assist foundations and other nonprofits in identifying and strengthening their communities by mobilizing the resources dedicated to core issues and improving relations and knowledge-sharing between nonprofit administrators and their various stakeholders. It discusses how geographic information systems tools can help to build community while illustrating the challenges involved with implementing, using, and sustaining it in the nonprofit sector.

use in government, our search of the literature could find no such treatment dedicated to foundations. Our purpose here is to begin to address this gap.

This article demonstrates how GIS can assist foundations and other nonprofit organizations. We begin with a description of GIS technology, and next consider its value to these entities. We then turn to questions of access to GIS and discuss the movement toward Public Participation Geographic Information Systems. We illustrate the challenges involved with adopting and implementing GIS and conclude by considering its sustainability as a tool for foundations and other nonprofit organizations.

Geographic Information Systems

"GIS is a computer technology that enables storage, analysis, and mapping of a wide range of geographic information, including demographic, socio-economic, housing, crime, environmental, and land-use data" (Elwood & Leitner, 2003, p. 140). GIS can be used to associate conditions and other phenomena (e.g., employment, volunteer activity, school performance) with their spatial locations. Users, policymakers, funders, lay citizens, and other audiences can view, manipulate, and query geographic phenomena through GIS technology to address questions ranging from the most particular — such as the locations of the nearest day care centers, job training facilities, or food pantries — to the most profound, such as the effectiveness of local funders, including foundations, in ameliorating social problems or preparing for natural or human-originated disasters.

Among the primary reasons for the growing popularity and use of GIS technology in nonprofit and other organizations are the great range and variety of data that these systems can accommodate, and their ability to display and query this information seamlessly in arresting visual maps that capture important neighborhood or other geographic conditions simultaneously. Consider, for example, a government agency or a nonprofit that might well want to know where police, fire, and emergency medical service units are located so as

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to meet the needs of all areas encompassing a jurisdiction, particularly those at high risk of health hazards and criminal victimization, and the recommended traffic routes and estimated times to provide assistance to them. Only a few years ago, to appreciate such complex and essential questions of the "geography" of public (and nonprofit) policy might have required, at best, several bulky overlays of different information or dense statistical indicators, or, at worst, mere speculation. By contrast, a few keystrokes in a well-appointed GIS can be used to visualize and address such problems on a high-resolution computer monitor at whatever density and detail and with whatever additional factors desired by the user.

The lacuna in our knowledge with regard to GIS use and potential for foundations and other nonprofits is unfortunate (Al-Kodmany, 2012). Extant research suggests that GIS can assist nonprofits in several important aspects, such as mapping, decision-making, planning, productivity, reports and proposals, asset identification,

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advocacy, and efficiency (Ward & Never, 2012; Al-Kodmany, 2012; Bishop, 2010). Moreover, Brudney, Russell, and Fischer (2017) show that GIS can help nonprofit organizations in their crucial challenge to identify and build their communities. According to Sieber (2000), "benefits range from operational efficiencies, such as increased cartographic capacity; operational effectiveness, such as improved information access; program effectiveness, such as augmented decision making; and contribution to well-being, such as the delivery of social justice" (p. 18). Given the high demands placed on nonprofits and the limited resources typically available to them, they can ill afford to overlook the potential advantages of GIS technology.

Advantages of GIS for Foundations

Our review of the literature failed to uncover treatments of GIS with primary reference to foundations. Although several articles allude to the possible relevance of GIS for public and private funding agencies such as foundations, they do not devote sustained attention to the topic (e.g., Elwood & Leitner, 2003; Al-Kodmany, 2012; Bishop, 2010). Despite this neglect, we show that GIS has substantial advantages that foundations should consider.

Perhaps the major advantage for foundations in adopting and sustaining GIS is better knowledge and grasp of the community they seek to serve as these organizations define it. Brudney et al. (2017) explain that GIS applications allow, if not require, host organizations to identify their target communities for visual display and related purposes. Accordingly, foundations must make several crucial decisions that ultimately influence, and likely dictate, the features of their GIS: They must first determine the spatial boundaries of the area or "community" to be included in the GIS mapping; the type of community characteristics, conditions, and organizations to be represented in the mapping; and the information to be collected and displayed when users perform queries. This information is typically specified and included as different "layers" in the GIS mapping — for example, the location of job training centers, air quality measures across different parts of the community, or areas designated as food deserts by the U.S. Department of Agriculture.

As Kretzmann and McKnight (1993) recommend, foundations can use GIS technology to comprehend visually the needs and assets of their community of interest. From this assessment the foundation can readily identify the prime target areas for the types of resources and initiatives it has the capability and motivation to deliver — whether the goal is to ameliorate weaknesses or increase strengths. In Kretzmann and McKnight's memorable phrase (and book title), GIS can help foundations in *Building Communities From the Inside Out.*

Second, and closely related, with the target community identified GIS can specify where foundation initiatives may have made a difference and/or where greatest challenges remain. Whether the goal of the foundation is to sustain greater recreational opportunities for residents, support services for single-parent families, job training for unemployed teenagers, accessibility of recycling or renewal facilities, preservation of historic sites and buildings, or cleaner air or water, once the critical conditions to be affected have been specified, the relevant information can be stored, retrieved, analyzed, and displayed through GIS technology. Thus, foundations can depict visually the locations and progress of their

initiatives, the number of people and groups who take advantage of the opportunities presented by these initiatives as well as the rates of utilization in different geographic areas, and the extent to which the initiatives meet foundation benchmarks.

Equally important, these GIS data can be displayed and analyzed at different points in time, such as before and after an intervention supported by the foundation, to evaluate the progress potentially attributable to the foundation made toward the designated goals. Alternatively, areas served by foundation initiatives can be displayed and compared against other areas not as fortunate to be served to provide a comparison or control group to approximate the progress registered. Such longitudinal and geographic comparison can help to approximate the difficult challenge of demonstrating the effects of an initiative ("moving the needle"), which can prove very persuasive in attracting other funders from business, the nonprofit sector, and government (Bishop, 2010; Nedovic-Budic, 1999). As Elwood & Leitner (2003) observe:

> Finally, many organizations disseminate GIS-based knowledge to funding agencies to illustrate neighborhood needs and to show organizational effectiveness in solving them. … These changing demands include an increasing emphasis on direct service provision tasks and increasingly competitive funding process[es] that require documentation of measurable outcomes (p. 149).

Third, as suggested by these observations, foundations and other nonprofits could benefit from GIS technology to make a professional and convincing case to their own boards of directors as well as other funders. Several researchers discuss the need and expectation of these organizations to collect and present spatial data in coherent and convincing ways to demonstrate not only their accomplishments but also their professionalism (Elwood & Leitner, 2003; Lin & Ghose, 2008; Al-Kodmany, 2012).

In Al-Kodmany's (2012) study of planners and GIS experts in key nonprofit organizations in Chicago, for example:

> Interviewees indicated that GIS makes small nonprofit organizations look far more legitimate on the larger political stage. It has helped to highlight the needs of underserved populations. … In the same vein, visuals are useful for projects' sponsors and funders (p. 292–293).

One respondent in the study stated, "GIS also helps to create a more professional and concise document when reporting to a grant funder or a board of directors," and another asserted that the visualization aspect of GIS is essential: "Without GIS, there would be no easy way to convey such overwhelming information at the macro and micro scales" (Al-Kodmany, 2012, p. 293).

In their research on neighborhood organizations in the cities of Milwaukee, Wisconsin, and in Minneapolis and St. Paul, Minnesota, Elwood and Leitner (2003) similarly observed:

> State funding programs for neighborhood revitalizations, as well as those provided by private philanthropic organizations, increasingly emphasize outcome-based assessment in which tangible outputs must be demonstrated and measured. Nearly every one of the 19 organizations in our study has used GIS to demonstrate to funders the efficacy of their revitalization programs in improving neighborhood conditions. This is not only because of the data management and analysis capabilities of GIS but also because it is seen as a legitimate tool by the public and private institutions to which community organizations are accountable. … The organizations perceive GIS use to be an important strategy for communicating organizational expertise and sophistication, to show funders that the organization "knows what it is doing" (p. 151).

Foundations and other funders have shown increasing interest in pursuing their missions through arranging and supporting the collaborative efforts of nonprofit and community organizations, and even public agencies and private businesses (Brudney, Prentice, & Harris, 2018; Prentice & Brudney, 2016, 2018). A fourth advantage of GIS for foundations is that it can

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Once relevant information on nonprofits has been entered into the GIS, including spatial location, National Taxonomy of Exempt Entities classification, mission statement, IRS classification, and financial information, foundations can easily identify organizations (by mission or geographic location, size or assets, etc.) to include in requests for proposals or other initiatives.

facilitate the work of forming and sustaining collaborations with nonprofits and other organizations intended to advance foundation goals. For example, the National Neighborhood Indicators Partnership (NNIP) is a collaboration involving the Urban Institute and local partners across the United States to "further the development and use of neighborhood information systems in local policymaking and community building" (NNIP, 2018). Once relevant information on nonprofits has been entered into the GIS, including spatial location, National Taxonomy of Exempt Entities classification, mission statement, IRS classification, and financial information, foundations can easily identify organizations (by mission or geographic location, size or assets, etc.) to include in requests for proposals or other initiatives. For example, if the foundation wanted to structure a collaborative project to stimulate economic development in a particular geographical area, it could use GIS to identify all potentially interested organizations in the area, such as religious institutions, nonprofits, high schools and colleges, private businesses, and government agencies. With the population of organizations specified, the foundation could

evaluate the response to its outreach efforts and determine whether further actions were necessary to motivate greater participation by selected groups. GIS also offers the benefit of displaying visually the locations of participants and other stakeholders who might take an interest in the initiative. These features of GIS would facilitate the formation, operation, and maintenance of collaborations sought by foundations.

Access to GIS: Public Participation Geographic Information Systems

These potential benefits of GIS for foundations notwithstanding, the literature regarding GIS in nonprofits allude to a dark side: Several articles raise the specter that the public — and nonprofit organizations — will be shut out of use of the technology, and that GIS-related data, analysis, and interpretation will revert to the state, thus depriving nonprofits of independent voice in policy discussions and debates. Lin and Ghose (2008) sketch the basis for this view:

> GIS has been criticized as an elitist technology, out of reach for traditionally marginalized citizens, because of its cost and technical complexity.... [I]t is difficult for community organizations to build their own in-house GIS because of the high costs of hardware, software, and GIS training, and drastic budget reductions necessitated by deep cutbacks in federal funding in recent years (p. 32).

Al-Kodmany (2012) agrees that "GIS continues to be an expensive technology; and therefore, it is not a fully accessible tool" (p. 293). Talen (2000) likewise observes:

> [C]onventional use of GIS is largely top-down in the sense that GIS data [are] provided, manipulated, and presented by technical experts. Skepticism about the value of top-down GIS focuses on the issue that certain groups and certain types of local knowledge are marginalized by GIS-based decision-making processes (p. 280).

Citizens' groups and nonprofits typically lack the resources — finances, time, and training — to obtain and support GIS. "These organizations have scarce resources for purchasing data, have limited staff and volunteer time to devote to gathering information and building databases,

and rarely have formal agreements with local government institutions regarding data sharing" (Elwood & Leitner, 2003, p. 144). The vice president of the Conservation International organization lamented, "it's been my experience that as soon as we trained someone in the GIS and they because fairly good at it, that person would be offered a salary three times higher by someone in the private sector" (Al-Kodmany, 2012, p. 294). Although this statement may, unfortunately, ring true for foundations as well, given their mission and standing in the community, foundations likely have greater capacity than individual service-delivery nonprofits to implement and sustain GIS technology.

Researchers raise the concern that although GIS use may create possibilities for nonprofit and community organizations to develop alternative knowledge and practices, without some autonomy in this use GIS could serve as a mechanism through which community organizations are incorporated into the state's agenda and priorities, rather than proposing directions, options, and plans of their own (Elwood & Leitner, 2003; Lin & Ghose, 2008). As a result, the prospect arises that "these future plans often reflect the state's predetermined criteria upon which their performance and fundability are evaluated" (Elwood & Leitner, p. 154).

A proposed approach to address the issue of restricted access and use of GIS by local, neighborhood, and community groups is the movement toward Public Participation Geographic Information Systems (PPGIS) (Bishop, 2010). These systems seek the use of GIS "to broaden public involvement in policymaking as well as … to promote the goals of nongovernmental organizations, grassroots groups, and community-based organizations" (Sieber 2006, p. 491). Sieber explains that the PPGIS movement has gained momentum because most information used in policymaking has a spatial component, policy-related information can be analyzed and visualized spatially and can be persuasive in policy debates, and extending the use of spatial information to all relevant stakeholders presumably leads to better policymaking. PPGIS incorporates sharing access to spatial data,

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analysis, technology, and presentation among those participating in public policy decisions as well as those affected by or having a stake in those decisions. Some researchers go farther in describing the benefits derived from broad public participation through GIS. For example, Talen (2000) advocates "Bottom-Up GIS" or BUGIS, "an approach in which residents use GIS to communicate how they perceive their neighborhood or community, via their description, evaluation, or prescription for their local environment" (p. 279).

Lin and Ghose (2008) conclude that "sustainable provision of GIS in PPGIS remains a difficult but key issue in the effort to democratize an elitist, complex, and expensive technology among disenfranchised citizen groups, given the increasing use of spatial data in planning and policymaking tasks" (p. 42). Foundations could assist in addressing this issue and promoting broader use of GIS by both funding the adoption and maintenance of GIS in nonprofit organizations and by establishing PPGIS of their own for proprietary use as well as by grantees, if not the larger community. Not only would this capability advantage the foundation, it would also allow it to register community progress made by its grantees and other parties by integrating all initiatives, outputs, and outcomes, in the same GIS database and map. That is, rather than receiving a variety of reports from grantees based on a diversity of metrics and geographic scales, access to a common GIS supported by the foundation would allow it to receive and integrate consistent reporting of results. Indeed, Foster-Fishman and Long (2009) use GIS to geo-code the physical location of

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minigrant projects and other community-building activities to assess and discern community progress, such as level of resident involvement, organizational engagement in decision-making processes, and strength of neighborhood associations. If, as Sieber (2006) claims, "PPGIS provides a unique approach for engaging the public in decision making through its goal to incorporate local knowledge, integrate and contextualize complex spatial information, allow participants to dynamically interact with input, analyze alternatives, and empower individuals and groups" (p. 503), foundations should give serious attention to adopting and sustaining the technology.

Sustaining GIS and Foundations

Research by Brudney et al. (2017) demonstrates that establishing a GIS is difficult; gaining the support and buy-in of stakeholders is crucial. Sustaining GIS may impose even more obstacles for foundations. Ogilvie, Brudney, and Prentice (2017) examined whether the population of nonprofit organizations that had adopted one type of GIS, Community Platform (CP), a GIS product developed by the Urban Institute in Washington, D.C., had been able to sustain this GIS application. CP is intended to encourage community engagement, support community research, strengthen nonprofit collaboration and effectiveness, and build a distributed community information system. Various community foundations have adopted CP (Ogilvie et al., 2017).

Ogilvie et al.'s (2017) study used semistructured interviews and surveys with representatives of all of the organizations that had adopted CP (n = 21), and is unique and instructive because it reports on the experience of the entire population of nonprofit adopters in sustaining a GIS application. Their results offer a realistic outlook on the prospects for the sustainability of GIS in nonprofits. Of the 21 CP sites, fewer than half (10 sites) were active and could be classified as PPGIS: available to the agency, the public, and other stakeholders to view, access, and use. By contrast, six CP sites had launched but became inactive over a period ranging from one to three years of service. Some of these sites still held static, time-bound data, but since no new information had been added or updated, the authors rightly classified the sites as inactive.

Of the five remaining CP sites, two that had attempted to achieve an active CP site (i.e., a PPGIS), ended up using the software mainly for internal purposes within the organization (i.e., a GIS). One site did not attempt a public launch following the beta-test stage of adoption, and the other attempted to launch an active CP site unsuccessfully for approximately two years prior to the current use, mostly as an internal tool. Another CP site continued in the beta-test stage, in which the CP site is not easily accessible to the general public. The last two organizations attempted to implement CP but were not successful on their own. One site had intended to adopt CP but did not launch it after the organization began deliberations on the CP software and determined that it was not the right tool. The second site chose to consolidate with another site that had launched CP within the same state.

The research by Ogilvie et al. (2017) suggests that the sustainability of a PPGIS is not out of reach, but that it does require a concerted and continuing effort on the part of nonprofit and foundation sponsors. Notably, they found that resources (including funding) and resource diversification, training for organizational staff and external stakeholders, and the commitment of diverse stakeholders to the project increase the probability of sustainability of the PPGIS.

Graddy and Morgan (2006) argue that community foundations must expand their role to survive, shifting their focus from their own institution to the community. Fine, Raynor, Mowles, and Sood (2017) suggest that foundations must maintain a dual focus on their own institution and the community, given the interplay between the two. They contend that environmental learning, wherein a foundation "stays abreast of needs, opportunities, and shifts in relevant environments through connecting to peer funders, the community, and other relevant actors," is key to strengthening the organization's internal adaptive capacity and will result in higher levels of effectiveness and change for the community (Fine et al., 2017, p. 91).

With its outward focus and ability to capture and display important information about the community and the critical institutions, stakeholders, and evolving conditions within it, GIS thus seems a valuable tool for foundations. As we have elaborated, the advantages of GIS include:

1. generating better knowledge and grasp of the community the foundation seeks to serve;

2. specifying where foundation initiatives may have made a difference and where greatest challenges remain;

3. enabling more convincing and professional presentations to make the case for various policies and programs; and

4. facilitating the work of foundations in forming and sustaining collaborations with nonprofit and other organizations.

Moreover, foundation support would provide the basis for PPGIS, which can help to engage the public, community organizations, and nonprofits in decision-making and policy formulation. Research suggests that sustaining GIS presents a challenge to foundations and other nonprofits. In our view, ignoring its potential carries even greater risk.

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The Future of GIS in Foundations and Other Nonprofits

Several recent and convergent trends have set the stage for foundations to attain the many benefits of GIS and overcome the associated challenges of sustaining the technology. First, nonprofit staff and directors are more inclined and pressured to use GIS than ever before; second, the costs to obtain, augment for individualized use, and maintain GIS are decreasing; and third, the technical expertise necessary to use GIS is proliferating.

Public- and private-sector organizations utilize GIS for purposes ranging from crime mapping, sustainable development, and public health to landscape architecture, real estate, and civil engineering. Additionally, with the increased accessibility and customization of GIS software to suit particular needs, various for-profit organizations use the technology to support marketing operations. The proliferation of GIS across public and private industries makes technology transfer to the nonprofit sector, and especially to foundations, more likely. Ward and Never (2012) maintain that technology transfers to the nonprofit sector from the private and public sectors via three primary modes: competition with for-profit organizations, collaboration with government, and stakeholder influence. In the first instance, technology transfer occurs in service markets where nonprofits vie with for-profit organizations for resources and clients to remain competitive (e.g., hospitals, higher

education, day care). Where for-profit organizations adopt and use GIS to obtain a competitive advantage, nonprofits will surely follow in their effort to remain relevant and viable. Second, in service markets where nonprofits and government tend to collaborate (e.g., social services), nonprofits are more likely to adopt technologies used by their governmental counterparts to improve information sharing and promote mutual understanding.

Finally, stakeholders facilitate technology transfer from the public and private sectors to the nonprofit sector in two primary ways. First, in service markets where the public sector is the primary funder of nonprofit activity (e.g., human service and health organizations), government has significant leverage to push nonprofits to adopt certain technologies (Cortés & Rafter, 2007). Second, nonprofit board members and foundation trustees, many of whom are selected for service given their professional expertise and access to public and for-profit organizations, use their governance role to influence the transfer of technology as a means to increase the professionalization of nonprofit operations (Ward & Never, 2012).

The second trend that renders future adoption and sustainability of GIS technology in nonprofits more likely is the decreasing costs associated with obtaining GIS software, customizing and updating the software to meet organization- or issue-specific needs, and accessing relevant and valid data. The development of more and better open source GIS software makes the acquisition and customization of these tools for specific applications increasingly possible. GRASS, QGIS, OpenJump, gvSIG, among others, constitute worthy alternatives to proprietary commercial software like ArcGIS. Many of these free and open source software systems offer greater flexibility (e.g., more options and tools) and accessibility (e.g., compatibility with various operating systems and web applications). Likewise, data are easier to access than ever before. Government agencies (e.g., the U.S. Census Bureau, IRS) and nonprofit organizations (e.g., the Urban Institute, ProPublica) are facilitating greater access to useful data.

Even for-profit companies (e.g., Google, Nielsen Holdings) are engaging in "data philanthropy" by gifting certain proprietary data to nonprofit entities to support public goals (McKeever, Greene, MacDonald, Tatian, & Jones, 2018).

Finally, the trend of graduate public affairs programs toward offering more GIS coursework means that the technical expertise necessary to use GIS is proliferating among the cadre of public servants moving into nonprofit and foundation careers. In a recent survey of public affairs programs, Obermeyer, Ramasubramanian, and Warnecke (2016) found that nearly 89 percent of public affairs program representatives rated education in GIS as important for their students; additionally, they found that just over 38 percent of respondents said that their programs offer GIS coursework. These figures represent a notable increase from a 2005 survey that found only 26 percent of public affairs programs offered GIS courses (Haque, 2005). Even more significant is the finding that the vast majority of public affairs programs, whether they currently have GIS coursework or not, plan to add or expand their GIS graduate course offerings in the next two to three years. Some scholars even contend, given GIS's extensive use "throughout the fields that typically comprise a public affairs education" (Obermeyer et al., p. 529), that graduate public affairs curricula should reflect a holistic programmatic approach to GIS inclusion that fully integrates GIS within and between courses to prepare students with "21st-century competencies" (Ferrandino, 2014, p. 542). This trend toward increasing and integrating GIS coursework in public affairs programs will yield more skilled practitioners educated and prepared to go beyond using GIS solely to create colorful maps. Rather, these experts will also be trained to use GIS tools to perform spatial analyses (e.g., spatial regression) to understand the relationships between community characteristics and the factors behind observed geographic patterns.

Taken together, these three trends — rising use of GIS overall and potential for technology transfer to nonprofit organizations, the decreased cost of GIS software and relevant data,

and the increased number of public servants trained in GIS — present a convincing case that nonprofits, and particularly foundations, will be able to make greater use of this valuable technology to increase public participation, incorporate diverse stakeholders, improve organizational operations, increase market efficiencies, and build stronger communities.

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