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There has been a rapid adoption of Geographic Information Systems (GIS) in the government and commercial sectors over the past several decades, while the social sector (aka “nonprofit sector”) has lagged behind. This study addresses a gap in the literature regarding GIS in the social sector, highlighting unique characteristics and trends in the sector related to GIS utilization, in order to support the development of custom GIS adoption strategies.

An online survey regarding GIS adoption and perception was conducted among nonprofit organizations in Guilford County, North Carolina and then statewide across North Carolina. Analysis of results found some level of in-house familiarity with GIS to be moderately common, but adoption rates are low. Most current GIS use is multi-modal, with in-house being the most common reported mode. A need for GIS training/education from an external source is demonstrated in survey findings. Respondents most commonly were unable to determine the level of usefulness GIS could provide. Cross-tabulations showed that familiarity, adoption and positive perception of GIS increase with total annual budget size. Findings also suggest a relationship between an organization’s investment in key categories (information technology, research, and strategic planning) and GIS adoption. Significantly higher GIS adoption rates were found among nonprofits with partner organizations that also use GIS, while working relationships with government agencies and other nonprofits were prevalent. This finding suggests that a viral approach to GIS adoption in the social sector may be helpful.

GEOGRAPHIC INFORMATION SYSTEMS IN THE SOCIAL SECTOR:  
TRENDS, OPPORTUNITIES, BARRIERS,  
AND BEST PRACTICES

by

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## CHAPTER I

### INTRODUCTION

Over the past several decades, there has been widespread adoption of Geographic Information Systems (GIS) across multiple sectors. The rapid rate of adoption has been largely due to development of a Graphical User Interface (GUI), advances in technology and substantial decreases in implementation costs (Chang, 2008). GIS is not yet considered a household term although the public consumption of end-user products such as Google Maps, Google Earth, and MapQuest are well established and very popular. GIS is widely used by many government agencies and commercial for-profits to develop inventories of spatial databases that are often used in analysis to manage resources more effectively and to improve business and profit strategies.

Unfortunately, the level of GIS use across the social sector has lagged significantly behind most government and commercial sectors. The term “social sector” is used to describe the large and diverse body of organizations that exist to pursue social causes. Social sector is used as a newer alternative to “nonprofit sector” or “nongovernmental sector” because it embraces what the sector is rather than what it is not. All three terms are often used interchangeably. The social sector also includes organizations that exist to serve the public interest without official nonprofit status, such as grassroots organizations, faith communities, social enterprises, neighborhood associations and special interest groups. There are many types and purposes for which

these organizations are created. Several examples include scientific research, fraternal and other clubs with membership, and pursuit of common interests. The largest segment is comprised of organizations working toward achieving a mission in the public interest. These social sector organizations make significant contributions to the economic and community frameworks in which they work, and could greatly benefit from efforts to address unique challenges that have prevented their adoption of technology such as GIS.

This study assesses the role of GIS in the social sector and a lack of attention provided by the GIS community. There is a need to raise awareness regarding the potential to create and adapt solutions that meet the unique challenges of the social sector. This study addresses a gap in the literature by directly discussing current and potential relationships between GIS and the social sector. The core purpose of this study is to identify useful strategies that will help facilitate the widespread adoption and utilization of GIS in the social sector. This research draws on the connections made in the literature to provide a brief overview of the relationships between GIS and the social sector, including the evolution of a closely related GIS sub-discipline called Public Participation GIS. The study also highlights several instances of convergence between GIS implementation and nonprofit management strategies, and then describes the perception and adoption of GIS within the social sector community across a given county and state. The discussion examines key barriers, opportunities, and best practices that are found in present day activity in the field of GIS and the social sector. Finally, it is argued that these two arenas can and should unite strategically in a new sub-discipline which is described as Social Sector GIS. The argument here is to present initial strategies for the

implementation of GIS, with the intent of promoting fruitful actions which will benefit the social sector.

## CHAPTER II

### REVIEW OF THE LITERATURE

A scattered, yet growing, number of articles published in the fields of information technology, nonprofit management, and GIS collectively suggest an increasing identification of cross-disciplinary relevance (Craig and Elwood, 1998; Enders and Brandt, 2007; Hackler and Saxton, 2007; Hume & Hume, 2008; Leitner, 2002). The direct relevance of GIS and subsequent implementation efforts within the social sector has been absent from the academic literature. It is readily apparent that more research is needed to assess the current and potential utilization of GIS in the social sector.

#### **Understanding the Social Sector**

The social sector is a significant, dynamic, and diverse part of the economic and community framework at the local, national, and international level. . The largest segment of organization type in the social sector is the incorporated nonprofit. In January of 2011, there were 1,624,214 active nonprofit organizations filed with the IRS in the United States (Internal Revenue Service, 2011). The nonprofit sector in North Carolina (the study area for this research) had 45,516 tax exempt organizations filed with the IRS as of the beginning of 2011. The largest segment included in this figure is public charities, of which there were 10,338 filing annually in 2008 (the most recent year for

which this total could be obtained) (National Center for Charitable Statistics, 2008). Also in 2008, these North Carolina public charities had total revenues of \$36.8 billion.

The United States Internal Revenue Service (IRS) uses a classification system, called the National Taxonomy of Exempt Entities Core Codes (NTEE-CC). This database groups incorporated nonprofit organizations by purpose. The taxonomy is divided into 26 major categories such as Education, Environment, Health, Employment, Housing, Youth Development, Community Improvement, Religion, Mutual Benefit/Membership, and others. These categories describe industries in the sector (though nonprofits are also classified under the NAICS code system), and there are variations in organization structure within each NTEE-CC group. . The IRS also uses codes to describe legal structures for tax exempt nonprofit organizations since organizations can be incorporated as a nonprofit without having tax-exempt status. The most common and recognized class in this system is the 501(c)3, which is a public charitable nonprofit. Other examples of legal classes of nonprofit include the 501(c)4 (social welfare organizations), the 501(c)5 (labor unions, farm bureaus, etc.), 501(c)7 (social and recreational clubs).

To those working in the social sector, it is painfully obvious that comprehensive strategic management is often a missing piece of the puzzle in the social sector. Since neoliberalism emerged as a prominent economic trend beginning in the 1960's, the United States and a number of other nations have seen a deregulation of social services and a popular movement toward competitive global capitalism (Portes, 1997). In a climate of increasing competition, accountability, market-driven activities, and global interaction, the differences in management requirements between the social sector and the

public/government and private sectors have blurred (Lipsky and Smith, 1993; Hume & Hume, 2008). This brings about some opportunities as well as some significant challenges. Exposing social sector organizations to competitive forces in this way can drive innovation and efficiency, and hold organizations more accountable for producing measurable results. However, nonprofit organizations struggle to meet the same operational standards without the larger profit margin of private companies and with an ever-diminishing pool of government dollars to spend on capacity building. All the while, many of their target populations have boomed as gaps formed in congruence with the privatization of government services, and more recently with a lingering global economic recession beginning in 2008 (International Monetary Fund, 2009). One result of this trend is that in comparison to the for-profit and government sectors, the social sector has significant disparities in terms of the utilization of information technology (Hackler and Saxton, 2007). As a relatively new and quite specialized technology, GIS is less utilized in the social sector than most other areas of IT (Sawicki and Peterman, 2002).

Nonprofit organizations are often characterized by organizational “immaturity”, and are in the early adopter phase in regards to formalizing knowledge management systems and practices (Hume & Hume, 2008) However, this is not due to lack of talent, skill, or knowledge. Nonprofits have been described in cross sector study as information-intensive organizations in general, operating with a wealth of both tacit and explicit knowledge. The reference to organizational immaturity in literature to describe nonprofits is based on measuring and comparing the development stages of

organizational structures and efficiency of processes. Social sector organizations often struggle to allocate resources for processes that formalize their more extensive tacit knowledge into explicit knowledge that can be shared or retained over time. In response to competitive forces and resource constraints, nonprofits have needed (with varying levels of success) to adopt more corporate strategies and practices to maintain viability. One such corporate strategy is called Knowledge Management (KM), which describes the strategic collecting, handling, organizing, analyzing, and distributing of information throughout an organization to support decision-making. KM involves an organization's practices, policies and an information sharing, knowledge fostering culture, as well as a technology infrastructure on which to operate. Here again we find the critical importance and challenge of successfully implementing information technology such as GIS to social sector organizations. GIS can serve as a powerful component or core of KM in some knowledge-based organizations. Hume and Hume's 2008 article proposes a basic framework of approaches to introducing knowledge management in nonprofits based on the distinct strengths and vulnerabilities of small, medium, and large organization sizes.

### **Emergence and Development of GIS**

GIS (as Geographic Information Systems) emerged as a computerized discipline in the late 1960's (Chang, 2008). Since this time, GIS has grown into an integral yet highly specialized area combining the fields of geography, surveying, mathematics, geodesy, computer science, information technology, and others. In the course of this development, the diversity of projects and topics of discourse grew, and gradually themes

began to emerge. The organization of themes has been at times an unwieldy task in a rapidly growing area of work without a single definitive parent discipline. Once a substantial body of technological capabilities and applications had been established, a persistent constituency of geographers found it critical to address the implications of geographic information as a field of study (Goodchild, 1990). For example, what are the unique strengths and weaknesses of GIS, and what is missing? What directions could GIS take to assure that it flourishes as a discipline and best contributes to the scientific community? What obstacles, patterns, and opportunities are found in regard to the full utilization of GIS in various areas such as the social sector? During the 1990's, academic researchers failed to take Goodchild's new set of questions seriously, but through time, a science of geographic information has slowly emerged and gained recognition.

Geographic Information Science (GIScience), as it is known today, includes research *about* Geographic Information Systems and *with* them to build on the capacity of the discipline ("pure science") and optimize the solving of complex problems through informed application ("applied science"). The debate continues among some as to the validity of accepting GIScience as an actual science, just as the same debate was prevalent throughout the 1950's regarding whether or not the field of geography could be considered a science. However, GIScience has proliferated at conferences and in journals (some of which have undergone partial name changes from geographic information systems to science), and has seen the induction of multiple GIScientists into scholarly academies such as the United States' National Academy of Sciences and the Royal Society of the United Kingdom (Goodchild, 2010).



Throughout its history, GIS has maintained a healthy tension between pure and applied science. Often the discipline has been driven by practical necessity such as John Snow's famous 1854 search for the source of a cholera outbreak in London, and Canada's development of the first drum scanner associated with early versions of computerized GIS for land management, while also experiencing bursts of innovation expressly for the purpose of expanding GIS capabilities with new projections, software, algorithms, data models, and methods. Though not everyone has been able to agree whether GIS is primarily a technology in search of applications, or an applications-driven technology at any given time in its history, it seems that these two perspectives are in most recent years finding an increasingly constructive interplay toward progress, and there is certainly no shortage of potential applications. Today GIS is the strongest it has ever been and continues to grow rapidly; a list compiled in 2010 of developments in GIScience over the past 20 years of its existence includes significant work in data visualization, analysis techniques and tools, geographic awareness among "the masses", standardization and interoperability, formalization and use of geographic concepts, and others. Also among such developments, the data visualization and interaction utility of GIS has already broken into the mainstream with the popularity of Google Earth, MapQuest and GPS-navigation for automobiles, and open-source mapping API's are proliferating on organization websites. The question of whether GIS technology would become integrated into daily life has been replaced by one of to what extent it will happen and how quickly. Reminiscent of the early creation and improvements of GIS GUI's, we are seeing the work of other fields such as computer science and graphic

design (3D representation, wiki-style input, animation) being employed in GIScience. As the technology and academic discussion of GIS has developed, patterns of IT and GIS adoption across government and private commercial sectors have been documented over time. For example, an international survey as early as 1999 analyzed the adoption of GIS among large retail organizations across the Netherlands, the United Kingdom, and Canada (Hernandez et al, 1999).

Information technology (IT) is firmly established as an integral component of strategic management, contributing to the success of organizations across multiple sectors and industries. Telecommunications, the internet, and computerized systems such as networked desktop computers, organizational email, digital projectors, printers, software, databases, and servers contribute to the internal and external communication of ideas, efficiency of operations, and capacity building in the organizations where IT is utilized. Also, there is a segment of professionals that recognizes and promotes the value of applied Information Technology among social sector organizations. Some examples include NTEN, NetHope, and NetCorps. These organizations offer experience in the nonprofit sector with a genuine vested interest in technology utilization inclusive of GIS. However, none of these organizations currently have an internal capacity to produce GIS-specific solutions. Outreach efforts from the GIScience community are needed to help these organizations contribute IT solutions that include or pair well with GIS for accessibility, interoperability and distribution. There is strong potential for partnerships and referrals between these IT organizations and members of the GIS community that pursue social sector utilization.

GIS is a specialized hybrid of IT and geography that allows the administrators of an organization to visualize “the big picture” while simultaneously gaining knowledge about the distribution and interaction of specific factors. Though it has distinctive characteristics, GIS is likely to exhibit similar patterns and obstacles to adoption as other information technologies (Goodchild, 1992). Utilization is not fully described by simply whether or not a given technology has been adopted by an organization or discipline, but rather at what level is the technology being integrated into the workflow and what defines its contributing factors. For example, an organization can have a single-page website displaying a list of static information, or it could have a multipage interactive website with secured online transaction functionality and dynamic databases or wiki-based content. Both options involve adopting a technology, but one is at a higher degree of utilization. Similarly, GIS can be adopted and utilized at varying levels. Early on in the history of GIScience, Goodchild writes about two paradigms of GIS: spatial information versus spatial analysis (Goodchild, 1990). The spatial information paradigm involves the use of GIS for the management of large inventories of information about a subject, often that of tangible facilities and assets, and while useful this ultimately represents a lower level of utilization than the spatial analysis paradigm. Given the appropriate context, organizations can benefit from the greater capacities provided by GIS for revealing patterns, investigating and quantifying relationships between variables of interest. While organizations following a spatial information paradigm do not necessarily exclude the use of any basic analysis or query, those adopting a spatial analysis paradigm requires a more complex toolset (including modeling) and a higher degree of technical expertise.

This approach in turn yields more powerful benefits for the organization and more sustainable integration of GIS with organizational processes.

These paradigms and other trends have unfolded differently over time across government, commercial business, and nonprofit sectors. Widespread efforts toward GIS utilization took place first in the government sector, particularly in the areas of land and resource management. The commercial business sector began to direct an increasing amount of attention to utilization of GIS through the first decade of the 21<sup>st</sup> century, with progress building in the latter half of the decade up to the present. There is an assortment of journal articles and even a number of published books dedicated to the subject, including *Bringing Geographic Information Systems into Business* (Grimshaw, 2000), *GIS Means Business* (Boyles, 2002), *Geographic Information Systems in Business* (Pick, 2005), and *Achieving Business Success with GIS* (Douglas, 2008). Such publications cannot yet be found in the social sector literature, which provides one indicator of a sector that lags behind in GIS awareness and utilization. A large amount of literature in the business and government sectors can easily be translated and applied to social sector organizations. For example, considerable work has been done over time to demonstrate and describe the costs and benefits of GIS in the business sector. This includes the exploration of cost-benefit calculation methods for assessments specific to a given organization (Obermeyer, 1999; Tomlinson, 2003; Pick, 2005). Research has found that while there are complexities and challenges, it is possible to compare the costs and benefits of GIS for a business using modified methods based on previously established cost-benefit analyses for non-spatial information technology. Though this work has not

yet taken hold across the social sector in general, it is helpful to learn from the findings of such cost-benefit study and apply recommended methods to the social sector. Table 1 outlines examples of GIS implementation costs that can potentially be expected (for any organization including nonprofits), adapted from studies that discuss techniques for measuring and comparing each of these items.

**Table 1:** Possible Costs of Implementing GIS. Potential costs associated with implementation of GIS in an organization, adapted from Pick, 2005.

Possible Costs of Implementing GIS	
Hardware	Outsourcing services
Software	Consulting
Data collection	Licensing
Database design and construction	Conversion of maps and data to digital format
Hardware and software maintenance	Communication interfaces and networks
Data maintenance	Supplies
Hiring trained staff	Space, site, and utilities
Training existing staff	

Similarly, Table 2 lists potential benefits encountered by organizations upon implementation of GIS, divided into tangible and intangible benefit types and adapted from the same source as Table 1. The intangible benefits are more difficult to measure, but can often be broken down into more specific components in a given organization to capture actual estimated values. The benefits of GIS take more time to accrue than those of non-spatial IT solutions, though this is attributed to a higher prevalence of intangible

benefits associated with GIS (Pick, 2005). These intangible benefits often include higher level, long-term improvements in decision making and resource allocation.

**Table 2:** Possible Benefits of Implementing GIS. Tangible and intangible benefits associated with GIS in an organization, adapted from Pick, 2005.

Possible Benefits of Implementing GIS
<b>Tangible:</b>
Salary/benefits lowered from reducing workforce
Cost reduction from more efficient task completion
Future cost avoidance (projecting higher workload per employee)
Revenue expansion from improved data quality, efficiencies
Improved productivity
Improved performance
Higher value of assets
<b>Intangible:</b>
Improved decision making (dependent on data quality)
Effectiveness of managers and executives
Reaching strategic objectives
Environmental scanning
Speed and timeliness of information
Volume and quality of information
Better capability to sell resulting products (maps, web services, etc.)
Improved collections of money
Identification of missing revenue sources, service area gaps
Better operational efficiency and workflow
Better utilization of assets
Reduced error
Reduced liability
External benefits (to partnering organizations, clients, etc.)

Given the universal nature of these cost and benefit items, one needs only a basic understanding of differences and similarities in operational functions across sectors to understand how the relationships can be translated easily from the commercial businesses sector to social sector organizations. The methods for evaluating and quantifying costs and benefits are also available from the literature for adaptation into the social sector. This knowledge, along with the basic concepts of how GIS works, is needed in the social sector so that more organizations can consider the potential value of GIS. Cost-benefit analysis determines financial feasibility, which should also be examined with technical and institutional feasibilities to best answer the question of whether implementing GIS in an organization is a possible and sustainable decision (Pick, 2005). A technical feasibility factor would include the compatibility of other systems software or hardware whose processes may be affected by the addition of GIS (for example, an organization networked with Mac notebooks would be considered less feasible for enterprise GIS which currently is supported by the Microsoft Windows Operating System only). Institutional feasibility factors involve compatibility of the human component, such as the skill and comfort level that staff has with understanding, using, maintaining, and/or producing visualized spatial information. Organizations need to secure the expertise required to carry out a GIS project, either in-house or through an external source, for the entire duration of GIS utilization in order to ensure institutional feasibility. When evaluating benefits, social sector organizations will be interested in both the tangible and intangible benefits, and are likely to place great importance on certain intangible benefits. In contrast to the commercial sector, and to some degree the governmental sector, the

social sector organizations generally place the highest priority on achieving measurable changes in programmatic outcomes. A lesser priority is placed on monetary returns, which are still important but not necessarily required when administrators and external funders benchmark success in the social sector.

Another aspect of an organization's work that often is underemphasized in the social sector is marketing, which has a considerable connection to GIS. It has long been established that geography is a critical part of marketing work (Huff and Batsell, 1977), based on three cornerstone variables: demographics, geographic space, and time (Viswanathan, 2005). Marketing is not just for sales, and there is far more to marketing than advertisement. True marketing involves research and decisions about placement of facilities, outreach and services, identifying target populations, changes to make products or services more appropriate to those population segments, strategic allocation of resources and pricing strata, and more. The social sector is comprised of organizations with at least some, and often all, of these needs. The application of GIS as a means to address these tasks has revolutionized marketing research for a large and increasing number of private businesses. Though marketing is perceived and often handled somewhat differently in the social sector, it still holds great value that can be better realized with the help of GIS. It is possible that the contribution GIS makes to the understanding of demographics in marketing holds an even higher significance for some social sector organizations than what can be found in the public or commercial sectors, as the core purpose for many of these organizations is to affect the demographics themselves (education, income, mortalities, literacy rates, etc.). Organizations with a



strong interest in communicating and targeting their work through marketing activities may also be more likely to become interested in adopting GIS for its utility in marketing.

It is reasonable to expect that the spatial information paradigm view of GIS is dominant throughout the social sector, mostly due to scarcity of resources and limited exposure to the technology. There is evidence from the nonprofit community to support that theory. For example, organizations in the social sector often have little or no funding designated for Research and Development, an area in which new technology and processes are explored and implemented to the benefit of organizations. This stands in contrast to the commercial sector in particular. It is quite common for social sector staff to take on multiple roles in an effort to achieve objectives with limited resources. Oftentimes, tasks are prioritized based upon the necessity to meet immediate objectives and the implementation of GIS for strengthening strategic analysis or capacity-building is likely to fall by the wayside despite the potential long-term payoffs. This is particularly true of organizations where the multitasking staff members do not have any individuals with background or training in practical research or technology. Without someone of GIS expertise involved, these organizations are not likely to be aware of the more substantial capabilities or benefits of GIS for information analysis. Many social sector organizations that hear about GIS for the first time do so in a coincidental way (such as from unrelated research or a local government agency) in the course of their work, giving them an incomplete understanding of what GIS is and what it has to offer. The multitasking staff members are then left to their own devices to determine what use GIS could have for their organization. Repeated organizational exposure to only basic GIS

functionality (e.g., mapping through local government partners) creates a culture that fails to fully explore more advanced GIS applications.

The perception of GIS as merely a database and mapping tool can be changed by informing and raising awareness among individuals working in the social sector. A common strategy in other sectors, and among some organizations in the social sector, has involved the initial adoption of GIS as an information and database system, with an ultimate goal to leverage the technology in more advanced ways over time. This approach allows organizations to build on experience with the technology while the benefits of GIS accrue over time. Unfortunately, a heavy investment in time, finances, and human resources must still take place on the front end, and many social organizations struggle to justify such investments if the most significant benefits cannot be obtained or estimated in the relatively short term. The initial costs of implementing GIS in an organization are often substantial, and typically much higher than implementation of non-spatial information technology (Pick, 2005). Also, most organizations must seek outside funding for this investment, often from government or foundation grants, for which they are accountable to demonstrate measurable outcomes within a set grant evaluation period. Funding to adopt GIS is not likely to come from charitable donations, as donors have come to expect all (or at least a very high percentage) of their donation dollars to be applied directly to programmatic expenses with the least degree of separation between donor and beneficiary of the organization.

Another challenge is that most organizations in the social sector regularly encounter a great deal of instability in the conditions and issues with which they work.

Some organizations work with transient or vulnerable populations for which demographic information and locations can change rapidly. Similarly, rapid changes often occur in the volatile political and/or social climates, health and environmental crises in which other organizations work. Information affecting and pertaining to this dynamic ecosystem of factors has a short shelf-life, which involves higher data maintenance costs that must be offset and justified with a resulting output of significant value to the organization. There are organizations in the social sector tackling the most challenging of issues across broad geographic scopes and/or in areas experiencing the most acute systemic dysfunction. The issues and associated outcomes of many social sector organizations are influenced by a complexity of interconnected variables that contribute to the challenge of their work. For example, organizations addressing hunger in an area must think about information pertaining to food growing conditions, transportation networks, poverty as it relates to access to food at market rates, political factors causing food system changes, etc. Any number of these influencing factors may in turn be described most accurately by multiple data themes within a spatial database. These complexities can entail the need for more intensive data collection of many data themes to reach a proper approach to analysis. The resource-heavy collection, handling, and analysis of spatial data are less likely to produce a desirable cost-benefit result for nonprofit organizations if used simply for information management without fully leveraging the value of information analysis from the very beginning. An organization may understand that GIS can help them create a map of their service area and manage records kept on their facilities or clients, but if a significant amount of money and change is necessary to put this in place, the solution may not seem

sustainable enough to appeal to an organization. However, if the organization learns about GIS in the context of analysis for their type of work, a greater range of benefits could be recognized. Organizations can also recognize a more substantial business case for funding requests by factoring in the added benefits of analysis in addition to the benefits of data collection and implementation of GIS for information management. By adding analysis to the proposed GIS implementation, the increase in value to the organization exceeds the increase in costs. This is received particularly well by organizations if expected efficiencies and resource savings can be estimated for a given GIS application. Estimations of this kind are best made on a case by case basis for any given organization (using actual cost-benefit assessment), but general information about benefit and cost-recovery would be helpful in presenting GIS analysis to social sector organizations for the first time.

The survivability of GIS in any organization also requires the successful management, retention, and growth of institutional knowledge over time. The present-day economy is increasingly global and knowledge-based, where success is determined by the strategic management of information and intellectual capital (Maurer, Lee & Mitchell, 2003; Hume & Hume, 2008). Industry analysis in every sector is currently characterized by the concept that learning organizations are the more successful organizations. Typically at the core of knowledge management implementation activities is the technical professional, whose role involves a thorough understanding of information needs in the organization and of the technologies and methods necessary to fill those needs.

GISystems Analysts and GIScientists are technical professionals which are considered a specific type of knowledge worker (Maurer, Lee & Mitchell, 2003).

All sectors and industries have experienced a heightened degree of mobility (i.e. turnover) among technical professionals which has been on the increase over the past decade even in times of economic downturn, and this causes concern across sectors about retaining organizational knowledge as a major competency in today's economy. Social sector organizations experience turnover just as other sectors do, but at much higher rates since many workers are volunteers. Nonprofits are often minimally staffed which can increase the difficulty of retaining technical expertise. One successful GIS-using organization with which the author has a direct working relationship is called the e-NC Authority. The e-NC Authority has been utilizing GIS since 2001, shortly after its inception. The e-NC Authority (e-NC) is a hybrid organization, formed and recognized as a state authority and housed in the North Carolina Rural Economic Development Center, a nonprofit 501(c)3 organization which serves as e-NC's fiscal agent. Their mission is to identify and advocate solutions to make broadband (high-speed) internet accessible, affordable, and fully utilized by all citizens and businesses of North Carolina, with a focus on rural areas. The vision is that this access and use of broadband will improve the economy, innovation potential, and quality of life for North Carolinians. Progressive in their understanding of the benefits of GIS for analysis and strategic decision-making, e-NC utilizes in-house GIS for spatial analysis to compare multiple sources of information about broadband availability, to identify gaps in broadband access, and to target strategic programs and infrastructure projects with partnering

agencies. Statewide data collection and mapping of broadband availability is currently being funded by a 5-year federal grant and matching funds from e-NC, foundations, and other partnering organizations in North Carolina. Though e-NC's advanced GIS uses exemplify a successful spatial analysis approach and serve well as an example for others in the social sector, a challenge to the future of GIS utilization even in this organization is a vulnerability to turnover. This is because in a very busy staff of only 10, technical knowledge of GIS operation and analysis is held by a single person, and the organization does not have the immediate capacity to add additional GIS analysis staff. In the event that this single GIS analysis position was to be suddenly vacated, a considerable organizational knowledge base from experience actually using the technology would be lost. It is difficult for anyone without both a technical background in GIS and a thorough understanding of the organization's work to evaluate whether candidates to fill the vacant position would have the knowledge and skills necessary to fill e-NC's GIS analysis needs.

There is a large amount of available literature on knowledge worker turnover that focuses on the causes of and HR strategies for minimizing turnover, such as longevity incentive programs and hiring for best fit. This supports the general consensus that vulnerability to turnover has a negative effect on organizational retention of technical knowledge and expertise, but less is said about strategies for mitigating the effects of turnover when it does occur. There are several mitigation strategies for turnover that e-NC employs to support retention of their in-house knowledge. These include involvement of the current GIS staff person in the hiring process for their replacement,

overlap in the end date of the vacating GIS staff person and the incoming new GIS staff person in order for one-on-one training to take place, and technical documentation on the part of the current GIS staff person which could be used whether or not circumstances allow for use of the other two strategies.

An ideal strategy for the problem of turnover is to eventually employ two or more fully-trained and experienced GIS staff people at any given time. But organizations in the social sector are often minimally staffed and likely to experience the same challenges as e-NC. Organizations that do not have any in-house capacity usually depend on contracted or volunteered GIS services, which inhibits the development of institutional knowledge and staff who can internally advocate for the use of GIS. If the resources are available, this vulnerability to the effects of turnover can be greatly minimized in an organization that has fully integrated GIS into their workflow, achieved at least a basic understanding of the benefits and capabilities of GIS, is staffed with two or more GIS personnel, and well prepared for knowledge transfer when turnover does occur. This approach can become more feasible sector-wide if GIS takes hold in the future as more of an organizational standard, similar to the way fewer single advocates of creating a web presence (website, e-commerce, email newsletters, etc.) have been needed over time.

### **Convergence of GIScience and Social Sector Strategy**

#### ***Public Participation GIS***

Public Participation GIS is one area that has achieved at least some frequent (though still generally incomplete) contact between GIS and the social sector. Public

Participation GIS (PPGIS) is a term coined at a 1996 National Center for Geographic Information Analysis (NCGIA) conference, and was originally defined as “a variety of approaches to make GIS and other spatial decision-making tools available and accessible to all those with a stake in official decisions” (Schroeder, 1996). This definition illustrates a focus on finding a way to use GIS to enhance democratic decision-making for neighborhoods or larger communities. The term “official decisions” refers to those decisions ultimately made by government officials that affect their constituents.

The PPGIS effort connects with the social sector in several ways. One way is that neighborhood/community organizations are sometimes established as independent tax-exempt nonprofits, under statute 501(c)3 of the Internal Revenue Service (IRS) Code. Sometimes community efforts are funded by nonprofit foundations, which have a vested interest in project outcomes. On occasion, a government agency seeking to serve a given community or region will create a separate nonprofit organization, or partner with a nonprofit that serves the same area, to help address a specific issue such as disaster recovery, disease prevention, or poverty, and sometimes this includes the use or collection of local-level GIS data. The most common PPGIS examples found in the literature involve a government entity or university providing a trained GIS professional who works with and receives input from community stakeholders surrounding an issue. Input is collected with the help of GIS (often in the form of paper maps that citizens mark up), and citizen input is presented to decision makers by the GIS-trained liaison.

Though PPGIS has brought GIS haphazardly into the social sector, this is largely a byproduct of efforts to better democratize GIS in the public sector, through lending the



utility of GIS to communities of citizens for participation in decision-making processes. Some forward-thinking organizations or partnerships have also contributed to an interaction between GIS and nonprofit communities on an incidental basis. Journal articles that discuss topics involving the application of GIS to nonprofit work are often in the form of PPGIS case studies, which cast the nonprofit in a peripheral role such as being the source of local non-spatial data or funding a neighborhood group; the central purpose of the articles does not give significance to how and why the GIS and nonprofit spheres intersect. Despite this, these studies still support the expectation that GIS improves efficiency and effectiveness in social sector projects just as it does in the private and government sectors. One PPGIS study offers six potential models for making GIS available for community/neighborhood organizations, which could be applied to the social sector with very little modification. The models are based on existing literature and empirical knowledge from PPGIS in the Twin Cities (Minneapolis-St. Paul, Minnesota). The six models presented include: in-house GIS, community-university partnerships, public access GIS facilities in universities or public libraries, “map rooms” housed by local government, internet map servers, and neighborhood map centers housed by multiple community organizations (Leitner et al., 2002). This is valuable information that can be used to its full potential by those who make the connection between GIS and unmet needs in nonprofit management.

Since the appearance of PPGIS as an emerging field within GIS, there is still plenty of room for questions and reassessment of what is and what is not accurately represented by the term. The Open Forum on Participatory Geographic Information

Systems and Technologies is an online international network of over 1100 professionals with an interest in PPGIS and related work. The forum is located at PPGIS.net on the internet, and states: “While many changes have occurred both in terms of available GI systems, technologies, and processes, the term [PPGIS] has rolled over without action being taken to find a more appropriate one, better embodying the thrust and extent of the practice” (PPGIS.net, 2004). This continuing discussion allows room for directions to be taken that further the GIS utilization of some nonprofit organizations as it facilitates the empowerment of stakeholders at all levels, and the democratization of spatial data for those stakeholders in decision-making processes. Among those at work in PPGIS, a general spirit of interest in making GIS available and accessible to a larger diversity of citizens and interest groups is encouraging to the prospect of fostering outreach from the GIS community to the social sector. By distinguishing an identity for efforts applied toward GIS in the social sector, this connection can be seen more clearly, so that more organizations can be reached and more problems solved regardless of whether they relate to the Public Participation process.

### ***Social Sector GIS***

Generally there has not been a GIS community-wide focus on the accessibility of GIS for nonprofits or the direct application of GIS toward the diverse spectrum of social causes which could be propelled with this technology. Relatively few articles can be found discussing the connection between the GIS and the work of nonprofits. This is why a new and distinctly recognized sub-discipline in the GIS field centered on

application in the social sector, perhaps even termed Social Sector GIS, might be a timely concept. Though academics may be tempted to perceive its focus as very narrow, the actual strength and scope of Social Sector GIS is large and can best be fully realized with a concerted and focused effort from within the GIS community. The social sector is a diverse and significant segment of economies, communities, and cultures in every region of the world, with almost limitless potential for the application of GIS. The organizations have in common a distinctive set of priorities, challenges, trends, and opportunities.

### *Barriers and Challenges*

In May 2010, a survey of businesses and organizations in North Carolina regarding utilization of high speed internet was conducted by international economist consultants Strategic Networks Group, Inc. (Strategic Networks Group, 2010). The study captured 3,502 complete survey responses, 6,622 including partial responses, from commercial, government, and nonprofit organizations, to better understand internet technology use within and across sectors. Surveyors found that two of the top barriers to nonprofit use of internet technology were cost and lack of internal expertise, in order of significance. Thirty-seven percent of nonprofit survey respondents listed cost as a very important barrier, in comparison to 33% of government agencies and 28% of businesses. Nonprofits were also more affected by lack of internal expertise than either of the other sectors, with 30% citing this as a very important barrier versus 23% of governments and 21% of businesses. A significant number of nonprofit organizations and grassroots community groups do not have the financial resources to support in-house GIS at market

value, nor can they afford the consulting rates of for-profit GIS professionals which can easily exceed \$100 per hour (Huber, 2001).

Through observation of GIS in multiple sectors, it can easily be argued that actions to increase the practical application of GIS in the social sector are needed, and the question that needs more careful consideration is whether those actions are strategic and viable. Due to the unique needs and characteristics of organizations comprising the social sector, alternative approaches are necessary to ensure viability for the social sector.

### *Potentials and Best Practices*

Despite having a limited history and volume of specific mention in established academic literature, recent work that applies GIS in the social sector yields a surprising amount of information about best practices. The challenge of fiscal constraints can be and is being addressed by resourceful efforts to reduce cost at the GIS production level. Open source GIS software and API's are a valuable resource used in some cases, with potential for further development.

The recent arrival of cloud computing on the GIS technology scene holds considerable potential for a new model of resource sharing among nonprofit organizations who wish to collaborate on common goals, minimize redundancy, and reduce costs. There is already discussion among NGO's regarding the emerging opportunities surrounding cloud computing and cloud GIS technologies and the potential for removing cost barriers associated with building of spatial data infrastructures (Palmer, 2010). Cloud computing is rapidly emerging across many sectors and industries, with

significant implications to systemic technology infrastructure, and important benefits to consider (“The New Age”, 2010). Since all hardware and software in a cloud based system is owned by a central vendor providing the cloud services, all maintenance costs and responsibilities are taken on by the vendor which reduces burden on organizations using the cloud services. Consumer organizations also see a significant reduction in upfront expenses by purchasing only the access to needed software, hardware, and infrastructure (such as data storage) rather than all components of a system in-house. This readily-accessible centralization of the cloud also lowers up-front technology costs by reducing the redundancy, or fragmented infrastructure needed to operate from multiple locations. Successful cloud computing allows for scalability and flexibility for organizations by providing large capacity, state-of-the art systems and allowing payment for services in advance or on a per-use basis; this eliminates the impact of traffic fluctuations on the system and reduces the financial commitment for organizations just beginning implementation of a cloud based technology. Another benefit related to flexibility is the 24-hour access from any browser, any authorized device, and/or any geographic location where Internet is available. This facilitates advanced connectivity between users across multiple locations, which is important for the many social sector organizations that use a decentralized office structure and/or need the mobility to work remotely on issues across political boundaries (for example, disaster recovery or human trafficking prevention). Models of deployment and standards regarding interoperability between cloud providers are still being developed for this new technology, and vendors are working to minimize data security risks in response to the concerns of potential

customers. In early 2010, ESRI announced an ongoing effort to provide full ArcGIS capabilities (including authoring, data management, analysis, applications, and hosted web services) in a cloud based system called ArcGIS Online (“ArcGIS in the Cloud”, 2010). Social sector organizations could benefit from the data sharing and collaboration capabilities found in ESRI’s new cloud system. In ArcGIS Online, users can join groups based on common interests, share maps and data with one another, and collaborate on projects, while still being able to control levels of access for their own data to maintain the security of any sensitive information.

The social sector is often a collaborative environment without the same emphasis on competition found among for-profit companies and government agencies. With this pervading ethos of collaboration, the social sector is better positioned to benefit from the data sharing and collective/collaborative analysis capabilities of GIS. Cost-sharing agreements among organizations with similar goals can be very helpful to reduce cost barriers, and are more likely to occur in the social sector than in the private sector. Nonprofits still do retain similar security and privacy concerns that businesses and governments do when keeping records with sensitive data or personal information about clients (SNG, 2010), but mutual benefits are often found in partnerships and collaboration. Great potential lies in developing these collaborative climates toward sharing technology resources in an effort to overcome the challenges of cost constraints. Among the SNG survey respondents, 29% of nonprofits reported existing collaboration and/or cost-sharing with other organizations in regards to e-solution services. Other nonprofits (12%) reported that they were actively considering opportunities to leverage

and share resources. Motivations to adopt internet-based technology cited by the majority of nonprofits included, in order of popularity: improved services, reduced demands on administration, cost savings in service delivery, and cost savings through shared development. Over half (51%) had not yet considered collaboration for shared e-resolution services, while only 9% had considered the option but had chosen not to do so. This indicates a sector largely open to the facilitation of collaborating to acquire valuable technology, including GIS, for the purpose of sharing costs, resources, and information. Organizational immaturity, staffing resource limitations, and the difficulty of converting tacit knowledge to explicit, sharable knowledge likely prevents many social sector organizations from collaborating to the degree that they would like. Solutions that address these obstacles are greatly needed and are considered valuable in the social sector.

ESRI, which originally was founded as a nonprofit in 1969 prior to switching to a commercial model, has actually striven for a supportive role for nonprofits throughout its history as an organization. In 1989, ESRI launched the ESRI Conservation Program, which still exists today at [www.conservationgis.org](http://www.conservationgis.org). The conservation program is described on this website as “the nonprofit support arm of ESRI” whose donations have “helped to create and develop spatial analysis, computer mapping and geographic information systems (GIS) capability among thousands of non-profit organizations and individual projects of all sizes and types worldwide” (ESRI, 2010). Nonprofits in general are mentioned frequently on ESRI’s conservation program website, and are included in some references to software help files and some useful resource programs

available to all nonprofits. However, topic-specific grants and assistance information is listed only for nonprofits working in conservation, consistent with the programs purpose. Most recently, ESRI has announced the launch of a Nonprofit Program offering free ArcGIS software licenses and data to qualifying nonprofits. This program is designed to assist incorporated NGO's involved in conservation or humanitarian work, and beneficiaries of the program are approved on a case by case basis.

Partly as a result of a knowledge-based economy, recent years have seen a rapid proliferation of data being produced and made available as a resource online. In May 2009, Data.gov was launched as an interagency initiative of the United States Federal government for the expressed purpose of increasing transparency in government projects, democratizing public sector data, and empowering people to make use of information generated by federal executive branch agencies. Developed components of the site include geospatial data, data mining and analysis tools, an open government data online community, and a dynamic overall structure driven by agency-uploaded data content and input from the public. At the close of 2010 there were 305,803 datasets on this site alone. Endeavors such as this at various scales and localities of government or other organizations, propelled by a public emphasis on increasing digital availability and accessibility of information, creates the significant potential of open data resources that could be incorporated into social sector GIS. National Geographic has recently launched a moderated, crowd-sourced online interactive map, called the Global Action Atlas, that showcases projects around the world that are for public good (National Geographic, 2011). The National Geographic Action Atlas team is still seeking input from users of



the web application beta version for furthering its development, and the interactive map featured a total of 489 nonprofit projects as of early 2011. It is important that the need for such a tool was recognized, invested in, and executed by a highly-visible member of the nonprofit community. Projects like these exemplify a movement toward centralization and transparency of information may help to address the fragmentation that has been one of the persistent barriers of the social sector. Connectivity is created among social sector organizations when they can visualize geographic or topical similarities in their projects with a high-level overview. This also promotes transparency, which is increasingly expected by potential volunteers, donors, or other supporters of social sector organizations. Current members, donors, and other stakeholders can base their interactions on a more complete understanding of organizations that provide open access to relevant information in a simple, visual, and interactive format.

Some nonprofit activity has occurred to support an internal fostering of GIS utilization. This has included the formation of nonprofit organizations with the expressed intent of making GIS an accessible resource for the social sector. Just as nonprofit organizations are formed on the basis of fulfilling a social mission and not financial gain, their operational solutions must also be driven by mission-fulfillment over profit. This is important because the social sector is the most logical source for a solution less influenced by the fiscal bottom line. However, nonprofits working to promote sector-wide GIS utilization face a challenging frontier, and successful examples are isolated. A Seattle-based nonprofit called CommEnSpace existed for a number of years to provide GIS services to conservation groups in the Pacific Northwest. Unfortunately,

CommEnSpace ceased to exist in 2007, citing an inability to grow with demand due to problems inherent in their business model (CommEnSpace, 2008). No documentation was published on this nonprofit, which would have allowed others to learn from CommEnSpace's mistakes and best practices.

Fortunately, there is some noteworthy foundational success and recent activity in the area of Social Sector GIS. One successful example of a nonprofit GIS intermediary organization is GreenInfo Network, which has been operating since 1996. Originally created with the intent of empowering environmental conservation nonprofits with in-house GIS capabilities, experience in this social sector work prompted GreenInfo Network to adjust its business model in two ways. First, it changed its primary service to conducting GIS projects as a contractor for nonprofits, which was simpler and more effective than attempting to set up in-house GIS's in nonprofit offices. Secondly, GreenInfo Network decided to offer its GIS assistance not only to conservation organizations, but to all nonprofits and other public interest organizations. Currently, a staff of nine GIS professionals provides a range of services which include mapping and cartography, database design, spatial data creation, spatial analysis, interactive and web map programming, GIS training, and setup of in-house GIS. GreenInfo Network has worked with approximately 300 client groups, many of whom are conservation nonprofits and are located in proximity to California, where GreenInfo Network is based. GreenInfo Network eagerly seeks out partnerships in both the social sector and GIS arena, and also has stated on its website an interest in helping new GIS nonprofit organizations form in other parts of the country (GreenInfo Network, 2007a). In 2006, GreenInfo Network

director Larry Orman wrote a fifteen-page guide as a resource for anyone interested in providing GIS support for nonprofit organizations. The guide is titled “Starting a Non-Profit GIS Service Center: A Guide to Design and Implementation”. Key points in the guide are based on learning experiences gained through the work GreenInfo Network has done serving hundreds of nonprofit organizations and managing grants that have funded some of the projects.

Perhaps the highest profile organization purposefully converging GIS and the social sector is a British nonprofit called MapAction. Founded in 1997, this NGO specializes in emergency mapping in disaster situations around the world (MapAction, 2011). In the event of a crisis, MapAction quickly deploys a volunteer team of GIS professionals who are trained in disaster response work, to collect field information with GPS and on-the-ground research, combining with satellite imagery and any available mapping layers of pre-disaster infrastructure, to support analysis and strategic planning in partnership with relief and government agencies. On its organization website, MapAction cites the United Nations Office for the Coordination of Humanitarian Affairs, UNOSAT, and the UK Government Department for International Development among its strategic partners, and the following quote is offered as a testament to the impact of MapAction’s role providing GIS expertise:

Mapping support during the early phases of a response is critical, as responders and donors try to more clearly understand the situation on the ground. Without MapAction, the capacity to provide what is needed often simply doesn't exist.

- UN disaster coordination manager  
Pakistan flood emergency, 2010

Since first beginning its program of mapping team deployment in 2004, MapAction has provided emergency GIS services in 25 large-scale disasters, including March 2011's political upheaval in Libya and destructive earthquake/tsunami in Japan. In addition to emergency mapping deployments, MapAction's other major activities include GIS training for disaster management organizations around the world, and capacity building for mapping in countries identified as most vulnerable to natural disasters or other crisis situations.

Ushahidi is an excellent example of an organization that has integrated social sector work with advanced information technology and GIS. Ushahidi is a nonprofit organization that exists to develop tools for and promote information technology for the social sector, specializing in the development of free and open source software for the collection, visualization, and interactive mapping of information (Ushahidi, 2011). The name is a Swahili word that means "testimony", reflecting a vision that the organization's work will help other organizations and individuals to tell their stories. Based primarily in Africa, this organization started in 2008 as a website for interactively mapping reports of political violence following an election in Kenya. Information was crowd-sourced using computers and mobile devices (even mobile phones via SMS where internet is not available) across the country. The volunteer-run project has since grown into a staffed organization with additional volunteer software developers in South America, Europe, and the United States. The website itself evolved into the Ushahidi Platform, which can be downloaded and used on any organization's website for the collection and mapping of data (often from members of organizations on the ground regarding events in a crisis).

Ultimately, the data can be enhanced using notes, photos, and video associated with uploaded locations. A timeline is also created by the software from the uploaded events. The timeline can be filtered by attribute and locations on the map to provide a useful way to conduct temporal analysis. The platform does not feature any spatial analytic functions, but it is open source to allow for the addition of functions by anyone. , The platform also provides the capacity to export data which can be subsequently explored using spatial and statistical analyses in other software. The Ushahidi Platform has been deployed to track unrest in the DRC (Democratic Republic of the Congo), mobile phone companies in the Philippines, and medicine stockouts (emergencies caused when medical facilities run out of medicines) in Zambia, as well as elections in Afghanistan, India, Lebanon, and Mexico. In a sense, the Ushahidi Platform is a PPGIS nonprofit project, though the term may not be used by Ushahidi to describe it. The technology continues to develop, and a recent change in February 2011 has allowed users to add polygon or polyline features instead of only point features. Ushahidi's novel, research-driven approach that supports the growth of spatial and non-spatial analysis has been recognized by MIT's Technology Review publication as one of 2011's 50 Most Innovative Companies. Other related Ushahidi projects include the SwiftRiver Platform, which is a free and open source application that monitors real-time data streams such as SMS, Twitter, and RSS feeds. This software collects and sorts data by topic using semantic analysis of key words, and allows subsequent analysis in a database format. This is helpful for organizations interested in monitoring news and events in a crisis area, or even public opinion regarding recent events on issues of interest. Ushahidi also conducts

pilot projects and strives to document case studies from the use of their work, which is helpful for evaluating outcomes and illustrating the potential impact for other organizations and citizen groups. The unique aspects of Ushahidi's mapping platforms hold great appeal for social sector organizations that have the need for mobile, real-time, and/or multi-sourced collection of spatial information.

Such examples of deliberate GIS provision to the social sector are currently rare and not widely known, but it is possible that more will form as a co-requisite with demand to allow collaboration toward sector-wide awareness (and subsequent utilization) of GIS. The observation of efforts like these are quite valuable to nonprofits in the social sector as well as the to the GIS field in terms of planning market expansion. To successfully reach the social sector, a concerted effort is needed between GIS professionals, nonprofit administrators, and financial contributors such as foundations. This means that a great deal of education and understanding of GIS must be fostered to create a common vested interest.

Some very recent social sector educational efforts that have emerged to promote GIS utilization are cross-disciplinary and active online. For example, NonprofitMapping.org is a Chicago-based grassroots online network started in May of 2009 (NonprofitMapping.org, 2010). This team of volunteer professionals (from nonprofits, GIS organizations, media groups, and foundations) share information about other social sector mapping projects on their website, and work collectively on their own major projects to produce geospatial information resources with free and open access. The network's website states that NonprofitMapping.org's main objective is to "create

the first interactive, open-source map of the nonprofit community as it rides out the economic downturn”. Major projects of NonprofitMapping.org include production of a mapped, interactive “Data Scorecard” which ranks each state in the US based on various criteria related to availability of government data about the nonprofit sector.

MapTogether is a social enterprise (a new organization type working as a hybrid between private company and public charity structures) started in 2009 which shares free map-related tools and resources with nonprofit and community organizations (MapTogether, 2011). This includes GIS training online and in person throughout the United States and Canada. The MapTogether website features a number of helpful nonprofit GIS case studies highlighting the opportunities and benefits of GIS implementation projects. In February 2010, MapTogether published a 46-page document online titled *The Illustrated Guide to Nonprofit GIS and Online Mapping*, which contains a brief introduction to basic GIS concepts, information about free or low-cost mapping resources, and explanations of benefits that GIS offers nonprofits (MapTogether, 2010). Endeavors of this kind indicate a new emerging recognition of the critical need for GIS education and adoption in the social sector. The growth and connectivity of these efforts with the broader social sector community is important to the success of sector-wide integration of GIS as a strategic management tool.

### Benefits

In the SNG survey of North Carolina organizations on the utilization of high speed internet, it is relevant to note that the three top benefits of incorporating such

technology cited by nonprofits were (in order of perceived importance): improvement of resource efficiency, increasing the ease of daily operations, and improvement of customer/client service (SNG, 2010). Also rated as priority benefits among nonprofits were the reaching of more customers/clients and lower operating costs, rated most important by 66.5% and 56.8% of nonprofit organizations respectively. It may be inferred that the proven utility GIS has for impacting these organizational aspects, known widely among GI scientists, would be of particular interest to a nonprofit sector that ranks them in such high priority. There are also likely to be unanticipated benefits to organizations that base their expectations on the benefits of GIS for information and asset management as early adopters, but then grow toward implementation of GIS for analysis and decision-making support.

Case studies have proven tremendously helpful for quantifying and communicating the benefits of a new technology to an organization in an easy to understand story-telling format. Case studies of successful GIS application within social sector organizations can serve this purpose in ways that translate better than case studies from other sectors, in order to facilitate favorable reception and use among social sector decision-makers regardless of their level of experience with the technology. It is important for organizations to see practical examples that demonstrate the benefits of GIS and instances where benefits are clearly reachable, all within the context of the social sector with which these organizations strongly identify. One good example of this is a case study by ESRI published in a Summer 2010 issue of HealthyGIS, a newsletter publication for GIS users in health and human services (Case Study, 2010). A nonprofit



organization in Philadelphia, Pennsylvania called MANNA (Metropolitan Area Neighborhood Nutrition Alliance) used ESRI consulting services and ArcLogistics software to create a dynamic routing tool that calculates and builds efficient delivery routes for food delivery based on real-world conditions each day such as delivery volume, new clients, cancellations, and driver specialty. The improved efficiency and adaptability of these routes are important to MANNA as their small staff and a large number of volunteers deliver over 56,000 meals monthly to area families who are faced with a life-threatening illness. This application also produces printable route maps with driving directions based on the results of the spatial model that day. The takeaway quote from this case study about the benefits of implementing this advanced GIS project comes from a MANNA staff person who explains “Before ArcLogistics, we had seven drivers who spent 30 to 35 hours each week on the road. Today we are doing the same number of deliveries with two fewer drivers in approximately 30 hours.” The article also states that the project has resulted in decreased mileages and lower fuel consumption, as well as added the ability to plan with realistic drive time estimates and provide estimated arrival times for MANNA’s clients. Documented results from successful case studies can demonstrate the value of investing in GIS, and may bridge a gap for organizations that are not ready or able to commit resources to conducting a full cost benefit analysis. A greater number of diverse case studies are needed to communicate relevance to various social sector organizations based on their primary activities and focus areas. It is valuable for organizations to learn from the successes and failures of previous and/or current applications of GIS in the social sector. Case studies can also help by identifying

metrics by which prospective organizations could measure the success and benefits of GIS implementation.

Usable geospatial data created by nonprofit and other social sector organizations for their own purposes can also become a valuable resource for the community at large. ArcNews, a quarterly news magazine for the ESRI software user community, published an article by Jonathan Palmer in summer of 2010. Palmer is the Director of Global Information Communication Technology for Wildlife Conservation Society. In his article, Palmer discusses the contribution of geographic information as a “public good” by BINGO’s (Big International Non-Governmental Organizations). Public good is defined as a free product or service accessible to all that does not create rivalry for its users (Palmer, 2010). A BINGO typically has an annual budget in the hundreds of millions and works across multiple continents on some of the world’s most challenging issues, such as food security, access to clean water, health, poverty, land rights, environmental degradation, war and conflict, education, and natural disasters. Many of these organizations such as World Vision, OxFam International, and Save the Children, are familiar household terms. Much of the BINGO’s work is focused on the world’s politically unstable and less economically developed and regions, which also have the least amount of readily available geographic information. Many BINGO’s have a great deal of spatial and non-spatial information about these regions. These BINGO’s and other social sector organizations are in a unique position to provide valuable geographic information on subject matter and geographic areas which have previously represented gaps in knowledge for all sectors of the community. Currently very few of these have

established a Spatial Data Infrastructure (SDI) needed to improve their geographic data and share externally, or even within their own organizations. However, it is thought that the perceived and material challenges of the past have an opportunity to lessen with the advent of cloud-based GIS services. In the article Palmer states,

Geographic Information has a key role to play not only because the geographic nature of the issues we [BINGO's] are all trying to address but also because geography provides a rapid and meaningful way to aggregate information and place it into a meaningful context. GIS is increasingly underpinning the decision making that takes place in the mashup society in which we now live.

## CHAPTER III

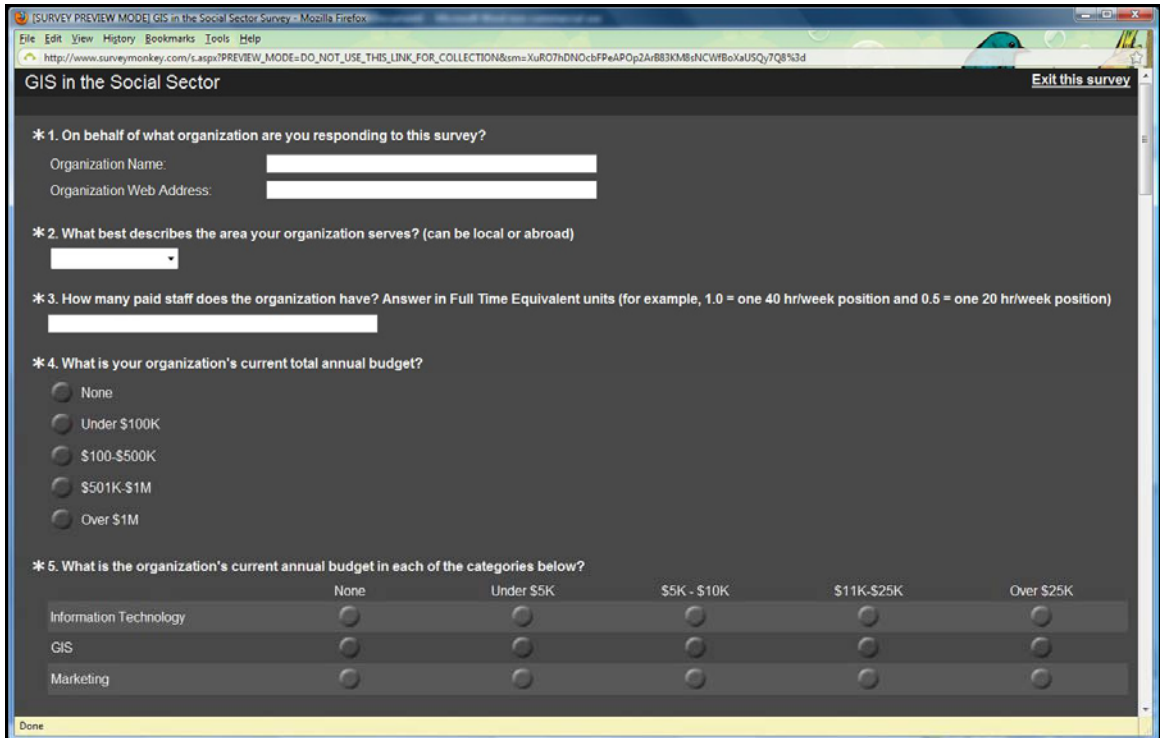
### SURVEY OF NONPROFITS: METHODS

To understand more about the current perception and relationships between GIS and the social sector, an online survey was created and conducted among nonprofit organizations. Nonprofit organizations were used since they are the largest and most representative segment of the social sector, and because contact information was available for nonprofits through connections with key capacity-building organizations operating in the study area. This study employed a survey which explored the awareness and adoption of GIS among nonprofits in Guilford County, North Carolina.

The Guilford County survey project was conducted in October 2009 with partnership and guidance from the Guilford Nonprofits Consortium. The Guilford Nonprofits Consortium is a centralized network of local nonprofits that fosters a sharing of information, resources, and best practices. Started as a project of the Community Foundation of Greater Greensboro, the Consortium has over 100 members whose information is posted on the consortium website by category of purpose. This consortium is a good resource for obtaining information about large numbers of local nonprofits. The consortium has an interest in this type of study and stands to gain a greater understanding of accessibility and adoption of GIS as a technological resource among nonprofits. The consortium and similar organizations are critical to the growth of strategic and impactful nonprofit communities. Their work could also benefit from the

utility of GIS as a visual tool for increasing connectivity, such as an online interactive map of the local nonprofit community.

Using methodology from an IT survey conducted in 2003 by Gifts in Kind International as a framework (Hackler and Saxton, 2007), a survey was developed to gather data from nonprofit organizations regarding their GIS capacity and potential. Twenty questions were crafted into an online survey hosted by SurveyMonkey, a free secure service with basic analysis utility. The responses were collected via a survey link embedded in an email invitation sent out to the member list of the Guilford Nonprofit Consortium to obtain an idea of GIS perception and utilization among the nonprofits of a given community. The email included an explanation of the project and researchers, as well as contact information for any questions. Recipients of the email could click on the survey link for a browser window to open and allow them to respond to the survey questions in an interactive form (see Figure 1).



**Figure 1.** Screenshot of Guilford County Survey. Online “GIS in the Social Sector” survey as seen by nonprofit survey participants.

The twenty basic questions were mostly in multiple-choice format to minimize the time required to complete responses, and for greater ease of analysis. The questions used were as follows:

**1) *On behalf of what organization are you responding to this survey?***

- *Blanks for organization name and website address*

**2) *What best describes the area your organization serves? (can be local or abroad)***

- *Drop-down menu containing: Section of city, City, County, Region, State, Multi-state region, Nation, or World*

- 3) ***How many paid staff does the organization have? (Answer in Full-Time Equivalent units. For example, 1.0 = one 40 hr/week position and 0.5 = one 20 hr/week position.)***
- 4) ***What is your organization's total current annual budget? Choices: None, Under \$100K, \$100-\$500K, \$501K-\$1M, or Over \$1M***
- 5) ***What is the organizations current annual budget in each of the categories below? Matrix format. Categories: Information Technology, GIS, and Marketing. Choices for each category: None, Under \$5k, \$5-10K, \$11-25K, or Over \$25K.***
- 6) ***Prior to this survey, were you or your organization staff familiar with GIS (to your knowledge)? Choices: Yes or No.***
- 7) ***Does your organization currently use GIS? Choices: Yes or No.***
- 8) ***If you answered Yes to #7, how does the GIS get done? Choices: In-house, Government staff assistance, Partner/fellow nonprofit, For-profit consultant, University, Volunteer, and/or other. Blank for Other to be specified.***
- 9) ***If your answer to #7 was No, has your organization ever used GIS in the past? Choices: Yes, No, or I don't know.***
- 10) ***If your answer to #9 was Yes, then how was the GIS work done? Choices: In-house, Government staff assistance, Partner/fellow nonprofit, For-profit consultant, University, Volunteer, I don't know, and/or other. Blank for Other to be specified.***

- 11) Are you aware of any partner organizations that currently use or have used GIS to help them in their work? Choices: Yes or No. Blank labeled "If so, can you provide an example?"**
- 12) Does your organization have a working relationship with any government agencies (other than those related to maintaining tax-exempt status)? Choices: Yes or No.**
- 13) What types of Information Technology besides GIS does your organization use? Check all that apply: Choices: desktop computers, laptops, multiline phone system, email, website, central server network, peer-to-peer network, database, specialized software, video/web/phone conferencing, none of the above, and/or other. Blank to specify "other".**
- 14) What marketing materials does your organization currently employ? Check all that apply: Choices: website, brochure, paid advertising, media PSA's, logo/branding on correspondence, logo/branding on merchandise (shirts, pens, etc.), print newsletter, email listserv/newsletter, none, and/or other. Blank to specify "other".**
- 15) Who primarily does your organization's marketing work? Choices: marketing staff, other staff, outside company, another nonprofit, intern, volunteers, no one, and/or other. Blank to specify other.**
- 16) Does your organization designate time and/or resources to engage in strategic planning? Choices: Yes or No.**



**17) If your answer to #16 was Yes, is there a strategic planning document?**

*Choices: Yes, a current one; Yes, but it needs to be updated; a document/update is in the works; or No.*

**18) To the best of your knowledge, is GIS technology something that is/could be useful to your particular organization? Rate its estimated usefulness, 0**

*being “not at all” and 10 being “extremely so”. Choices: ratings 0-10, or “I really can’t tell.”*

**19) Are you aware of specific projects/efforts of your organization that GIS appears to have the potential to improve? Choices: Yes or No.**

**20) If or when your organization identifies a need for a GIS product or service, does someone on staff have knowledge about where to obtain it? Choices: Yes or No. If yes, where (ex. in-house, a company, government agency, university, fellow nonprofit, etc.)?**

A brief written introduction to the concept of GIS technology and basic examples of its real-world application was developed to include as an attachment with the survey email (Appendix A). This served to increase participant understanding of the survey questions, and to encourage more survey responses. The explanation of GIS was compiled from excerpts written by third-party sources and the content was selected to provide objective and useful information as opposed to a persuasive description. This was done to avoid influencing survey responses or explicitly stating potential nonprofit applications that the respondents may not have considered on their own. The content of

the survey and the GIS introduction page was first reviewed by experienced social surveyors in the field of geography to ensure neutrality and to minimize any influence to the responses (particularly related to questions on perception and awareness of potential applications for GIS). Survey questions were crafted to make it possible to examine connections between the roles of IT, marketing, research, and GIS among organizations as well as similarities and differences between organizations that have the same utilization status. The dollar figure survey choices for the budget range questions were based on consultation with the Guilford Nonprofit Consortium office which has knowledge and experience in nonprofit budgets.

The Institutional Review Board (IRB) of the University of North Carolina at Greensboro was consulted prior to distributing the survey, but the survey and study were determined not to be of a nature warranting IRB oversight. This was attributed to the fact that no personal identifiers were collected in the survey, and all information collected pertained to organizations and not individual people.

The online survey was replicated across the state of North Carolina in January 2011, using a one-time access to the email contact lists for members and e-subscribing nonmembers of the North Carolina Center for Nonprofits. The North Carolina Center for Nonprofits is 501(c)3 nonprofit organization that networks, advocates for, and provides capacity-building information to the nonprofit community (including over 1300 member organizations) statewide. The one-time access to contact information was obtained by special permission with the help of a nonprofit organization that has a working relationship with the center, and the agreement specified exclusion from mentioning the

center in the invitation to participate in the survey. An invitation was sent via email to a total of 2,344 addresses. Approximately half were nonprofit contacts that were registered members of the Center for Nonprofits while the rest were from the nonmember list that was sorted out manually to remove contacts not associated with a nonprofit entity (the nonmember list had originally contained 3,074 records). The email invitation contained a hyperlink to the “What is GIS” PDF posted online using the Google Docs cloud-based file sharing and collaboration software, rather than an email attachment, to prevent interception of the email by security filters. The previously conducted Guilford County nonprofit survey was mentioned in the email with a request for organizations to disregard this invitation if they had already participated in the first survey.

Some minor changes were made to the survey to enhance its use while retaining the ability to compare its results to the version used in the county-level survey. These changes include an additional field for respondents to type in a physical office address on the first question, and an additional question asking for the category that best fits the work of the organization according to the National Taxonomy of Exempt Entities Core Codes (NTEE-CC) used by the U.S. Internal Revenue Service. On questions regarding budget, extra choices were added to the maximum end of the dollar range spectrum, to best capture some larger organizations that the NC Center for Nonprofits knows to operate in the state. The maximum option was changed from “Over \$1M” to two categories of “\$1M-\$5M” and “Over \$5M” for the question on total annual budget. On the following question (originally Question 5) regarding annual budget for categories of interest (IT, GIS, and Marketing), the maximum monetary option of “Over \$25K” was

broken up into “\$26K - \$50K”, “\$50K - \$100K”, and “Over \$100K”. Also, “Research (capacity building or program/planning related)” was added as a category, and an optional comment field was added to collect any desired clarification. On what was originally Question 13 on the survey, the option of “Virtual Private Network (VPN)” was added to the list of IT tools, and in the next question the options of “social media (Facebook, Twitter, etc.)” and “press releases” were added to the list of marketing materials. An open-ended text box question was added at the end of the survey inviting questions or comments that were not addressed elsewhere in the survey.

Both the Guilford County and North Carolina statewide survey invitations included an incentive for participation, in which responding organizations were automatically entered into a drawing for a gift card after the closing date of the survey collection. The Guilford County survey offered a drawing for a \$100 gift card toward the respondent’s choice of gasoline fuel or office supplies, and the statewide survey offered a drawing for one \$150 gift card for office supplies. The randomly-selected winning organization from each survey was notified by email to arrange delivery of the gift card.

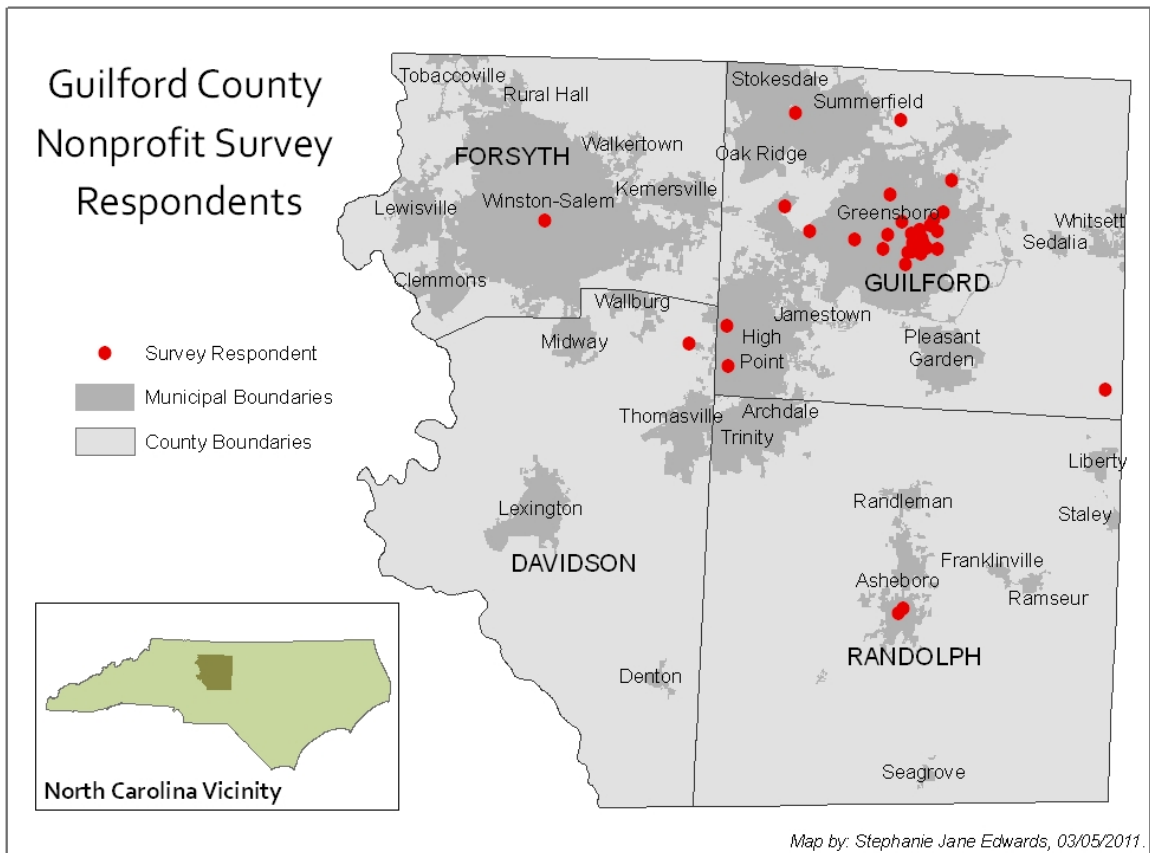
Once each survey was conducted, the results were downloaded from Survey Monkey and formatted in Microsoft Excel for analysis. After all responses were collected, as many of the responding organizations as possible from the county-level survey were classified according to their NTEE-CC category. This was not necessary for the statewide survey because information on these codes were included with some of the contact information, and collected in a new question on the survey. Addresses for the Guilford County nonprofits were included with contact information, and a significant

number of P.O. Box mailing addresses were replaced with physical addresses using organization websites and other online information. Addresses for the statewide nonprofit respondents had to be collected with the additional field in Question 1 of the survey, then formatted for mapping addresses by geocoding. Addresses were geocoded in a GIS with a spelling sensitivity of 80, minimum candidate score of 10, and minimum match score of 60 (the software's default geocode settings). The North Carolina Master Address File was used as the primary address locator database. Addresses that did not find a match in the master address file were then geocoded using a statewide street centerline layer as the reference, and matches were manually selected for addresses that did not match automatically and for which a reasonable match could be found. Large quantities of P.O. Boxes supplied by organizations that did not have a physical address were geocoded to the centroid of the city or town in which they are located. After completing the geocoding process, the survey results were examined for spatial patterns. Maps of the finished survey result data were exported for presentation to the Guilford Nonprofit Consortium and NC Center for Nonprofits along with a tabular Excel file version and a copy of this study for any desired future reference. Cross tabulations of responses for multiple survey questions were conducted using Microsoft Excel and Survey Monkey's analytical functions, to highlight any relationships between variables. This additional crosstab analysis was used primarily for the statewide survey results, for which a larger sample size was obtained.

CHAPTER IV  
ANALYSIS AND RESULTS

**Guilford County Nonprofit Survey**

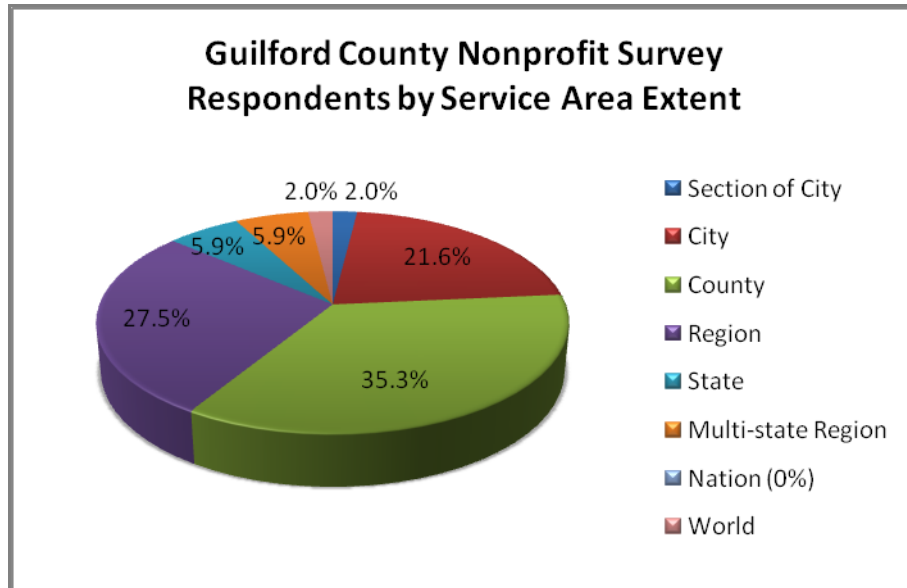
Out of the 187 survey invitations that were successfully sent out to Guilford County nonprofits, 51 responses were submitted, resulting in an overall response rate of 27.3%. Some of the nonprofits operating in Guilford County are headquartered elsewhere, and a few survey responses came from three additional counties adjacent to the Guilford County study area (Figure 2).



**Figure 2:** Guilford County Nonprofit Survey Respondents. Map of Guilford County “GIS and the Social Sector” nonprofit survey respondents by office location.

***Profile of Guilford County Nonprofit Respondents***

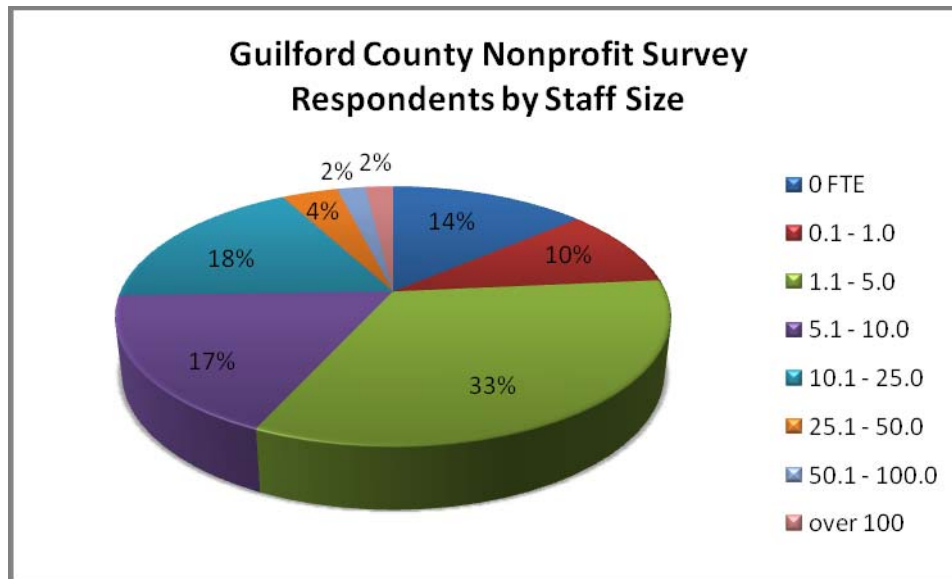
The respondent organizations were diverse in regard to their size and purpose. Respondents represented a variety of service area extents. The most common extent, reported by 35.3% of Guilford County nonprofits, was at the county level (see Figure 3). Regional and city service area extents also had significant



**Figure 3:** Guilford County Nonprofit Survey Respondents by Service Area Extent.

representation, with 27.5% and 21.6% of nonprofits respectively. Slightly less than six percent of respondents have a statewide service area and an equal number of respondents work in a multi-state region. Staff sizes ranged from zero to 150, reported in Full Time Equivalency units (FTE) for paid staff members only (see Figure 4).

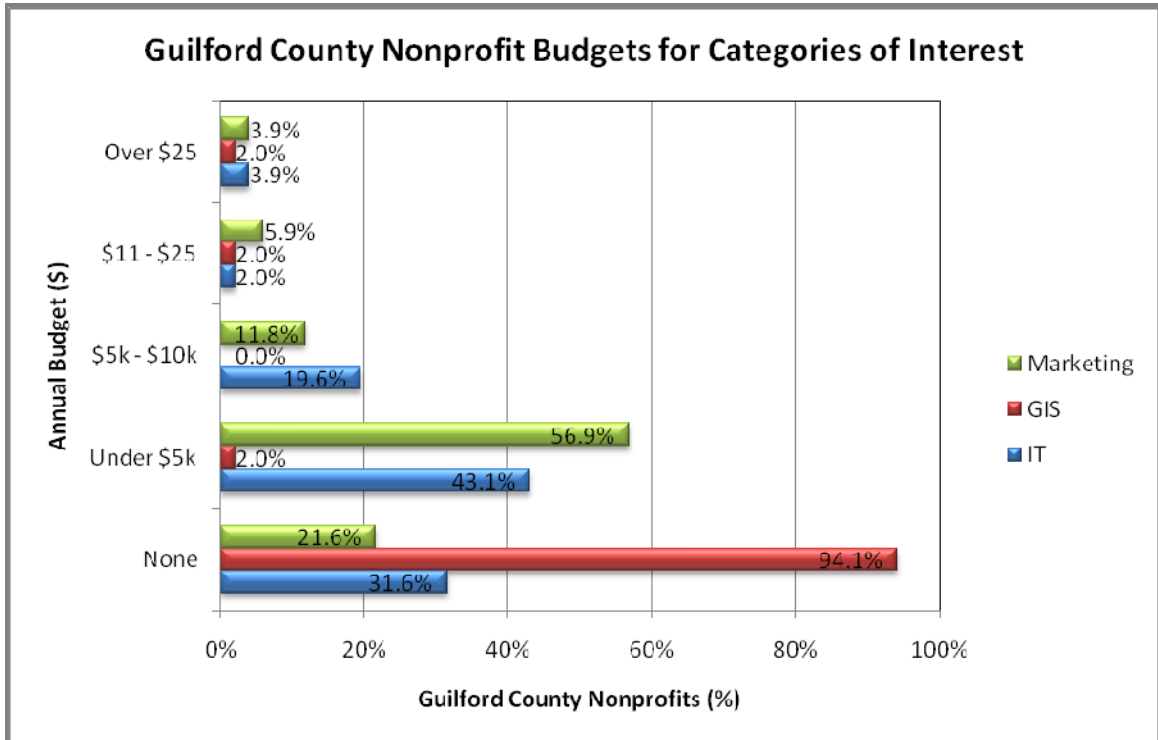




**Figure 4:** Guilford County Nonprofit Survey Respondents by Staff Size. Expressed in Full Time Equivalency (FTE) units.

An FTE unit measures paid staff size in such a way that one 40 hour per week position equals 1.0 FTE, and a 20 hour per week position equals 0.5 FTE, and multiple positions can be reported as a single quantity; in this example the two positions together would be reported as 1.5 FTE. Nonprofits with a paid staff of more than one fulltime position but fewer than five represented the largest segment (33%) of Guilford County participants, followed by organizations with between five and ten FTE (17%), and those with no paid staff (14%). Almost all responding Guilford County organizations had a staff size of 25 FTE or fewer. Only one organization had between 50 and 100 FTE, and one other had a staff size of 150 FTE. There was an even distribution of Guilford nonprofits among sizes of total annual budget, with 25.5% being under \$100,000, 35.3% being between \$100,000 and \$500,000, 17.6% being over \$500,000 but not higher than \$1 million, and 19.6% being over \$1 million. Only one nonprofit in Guilford County reported no funds for their

total annual budget. Among all these same survey participants, the majority (56.9%) had less than \$5,000 in their annual budget designated for marketing, and another 21.6% had no money for marketing (see Figure 5).



**Figure 5:** Guilford County Nonprofit Budgets for Categories of Interest. Expressed as percentages of survey respondents reporting various levels of annual budgeting for Marketing, GIS, and IT.

The largest percent (43.1%) of responding nonprofits had an IT budget that was less than \$5,000, while 31.4% had no IT funds, 19.6% had a budget over \$5,000 but no more than \$10,000, the smallest percentage (2.0%) had over \$10,000 but no more than \$25,000, and 3.9% reported a marketing budget greater than \$25,000. Almost all (94.1%) of the nonprofits reported no money from their annual budgets designated for GIS. Only three Guilford nonprofits reported an annual GIS budget, one with under \$5,000, one with

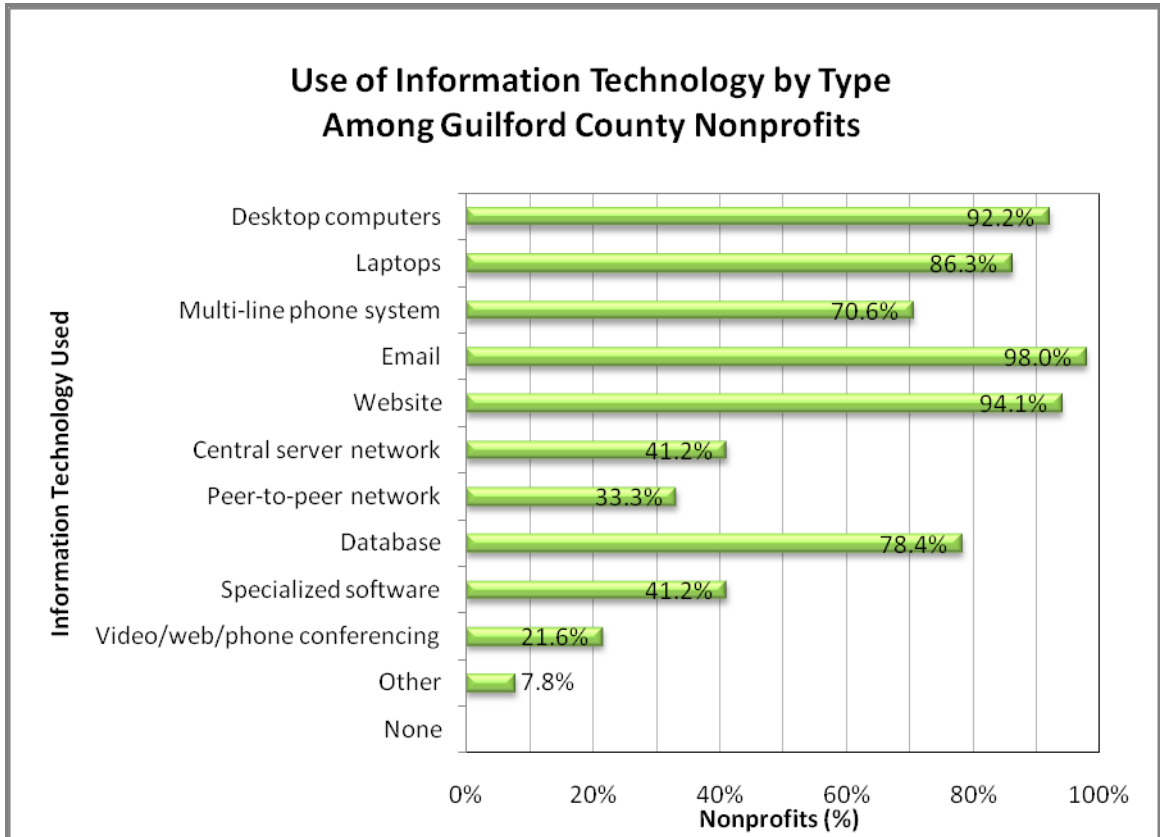
more than \$10,000 but no greater than \$25,000, and one with over \$25,000. All three of those nonprofits had total annual budgets of at least \$100,000. Two of these three had total annual budgets of more than \$500,000 and one was over \$1M, but neither of these were the one with the largest GIS budget.

Ninety-two percent of Guilford County nonprofits say they dedicate time and/or resources to strategic planning, and 44.4% of these have a current strategic plan document. Another 24.4% have a strategic plan document that needs to be updated, and 20.0% have one in the works, while the remaining 11.1% conduct strategic planning but without a formal document. Two-thirds (66.7%) of the Guilford County nonprofits surveyed have a working relationship with at least one government agency other than those related to maintaining tax-exempt status, and other types of strategic partnerships were mentioned often in survey comments.

### ***Information Technology Among Guilford County Nonprofits***

As shown in Figure 6, basic information technology-related tools were reported most utilized among respondents, including email, used by 98.0% of respondents, followed by an organization website (94.1%), desktop computers (92.2), and laptops (86.3%). Other popular IT items were databases and multi-line phone systems, used by 78.4% and 70.6% of surveyed nonprofits, respectively. Less prevalent information technology included central server networks and specialized software, each used by 41.2% of respondents, in addition to peer-to-peer networks (33.3%) and video/web/phone conferencing (21.6%). Additional IT examples were offered in the “Other” category by

7.8% of respondents and included the use of enterprise software and web-based document storage for multi-point access. No respondents reported using no IT as an organization.

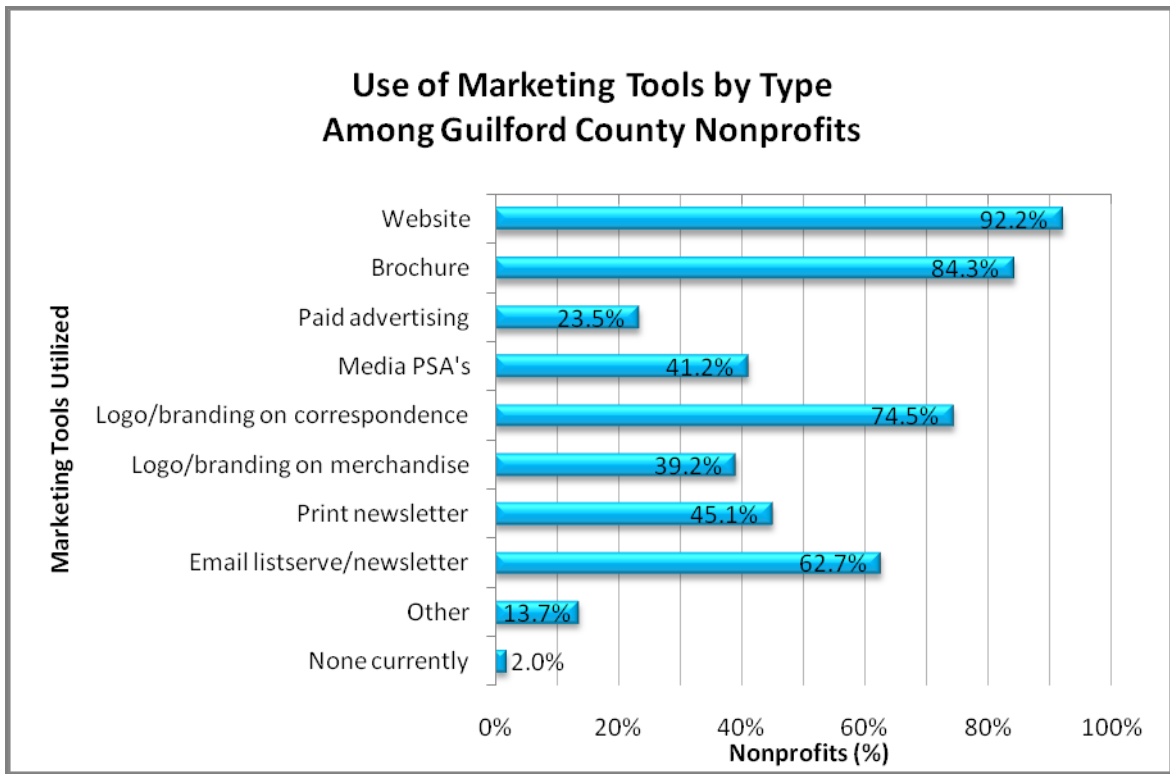


**Figure 6:** Use of Information Technology by Type Among Guilford County Nonprofits. Expressed as percent prevalence of use among survey respondents for selected types of information technology.

### ***Marketing Among Guilford County Nonprofits***

When asked about the employment of marketing tools, 92.2% of Guilford County nonprofit organizations reported utilizing a website, 84.3% use at least one brochure, and 74.5% use a logo and/or branding on correspondence; these were the three most utilized marketing tools (see Figure 7). Mass email communications/newsletters were also

relatively popular, utilized by 62.7% of respondents. Less popular marketing tools included print newsletters (45.1%), media PSA's (41.2%), logos and/or branding on merchandise (39.2%). Paid advertising was utilized by the fewest (23.5%) nonprofits compared with other marketing tools. Open-ended responses in the "Other" category for marketing tools were supplied by 13.7% of respondents and included events-based and grassroots marketing, posters, and one-time email blasts (not as part of an e-newsletter), as well as several instances of social marketing. All nonprofits reported having at least one marketing activity of some kind, and this marketing work is commonly done by existing staff who are also have other responsibilities (reported by 64.7% of respondents), and almost as frequently this work is done by volunteers (reported by 54.9% of respondents). Marketing work done by actual designated marketing staff was reported by 13.7%, and marketing work typically done by an intern was reported by another 13.7%. It was not specified whether the interns used are paid or unpaid, or if they are also responsible for work unrelated to marketing.



**Figure 7:** Use of Marketing Tools by Type Among Guilford County Nonprofits. Expressed as percent prevalence of use among survey respondents for popular categories of marketing tools.

### ***GIS Among Guilford County Nonprofits***

More than half of the respondents (58.8%) had at least one person on staff that was already familiar with GIS prior to the survey. However, a strong majority of 80.4% answered that they do not currently use GIS for any aspect of their work. Of the 19.6% reporting that they do use GIS, 70% have some capability to do so in-house, 20% acquire assistance with GIS service from government staff, 20% have help from a fellow nonprofit or other partner, 20% use the expertise of one or more volunteers, and 10% have GIS help from a university. The options for reporting means by which organizations acquire GIS services are not mutually exclusive, so nonprofits using a

combination of methods are reflected in these results. None of the nonprofits currently using GIS do so via the services of a for-profit consultant. There was an “Other” category for GIS services, which was selected by one nonprofit with the clarification that GIS work was done by research and planning staff in the national-level office of which the respondent organization is part at the local level. Of the Guilford County nonprofits that answered previously in the survey that they do not use GIS, 5.0% (2 organizations) have utilized GIS in the past; one of these did so with the help of local government staff and the other had a volunteer board member that assisted with some form of GIS implementation. Most non-GIS using nonprofits (80.0%) had also never utilized GIS in the past, and 15.0% of respondents answering on behalf of their nonprofit indicated that they did not know whether GIS had been utilized in the past or not. This likely includes instances where the respondent had uncertainty of their organization’s entire history due to turnover or restructuring; there may also have been some respondents with uncertainty on the full definition of GIS when considering whether it had ever been utilized, despite the explanatory document included with the survey.

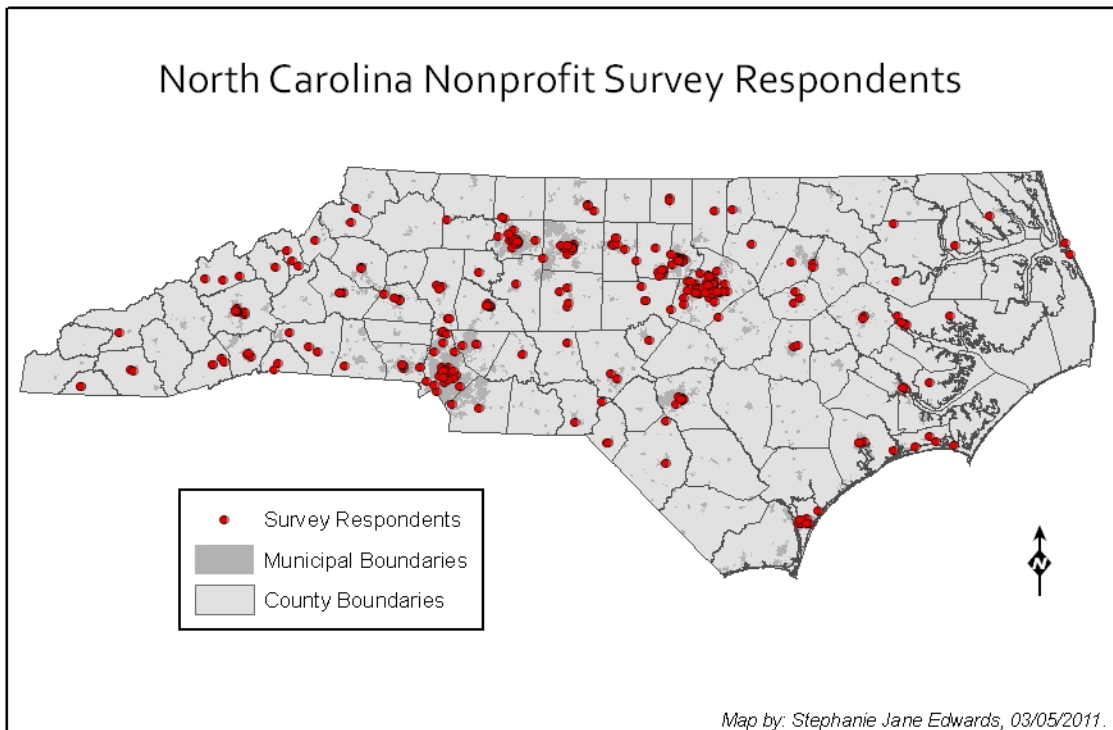
When ranking perceived usefulness of GIS for their organization on a scale of 1 to 10 (or "I really can't tell"), the winning single category was "I really can't tell" with 22.5%; however, the strong majority of respondents to this same question picked an actual ranking, and 35.4% of these selected a perceived usefulness of 7 or higher. Almost half of the Guilford County nonprofits (45.1%) reported that there are specific projects they know of with which GIS could help them. In contrast, only 33.3% (18 organizations) say they have some knowledge of where to look for potential GIS services. Of those

answering that they would know where to obtain GIS: 7 (38.9%) mentioned a government agency, 5 (27.8%) would pursue in-house GIS, 5 (27.8%) mentioned a university, 2 (11.1%) mentioned inquiring among consultants, and 2 (11.1%) mentioned nonprofit sources. These various options are not mutually exclusive and several nonprofits offered a combination of sources they would approach to obtain GIS capabilities. Among all Guilford County respondents, 84.3% reported that they are not aware of any partner organizations that currently use or have used GIS to help them with their work. The remaining 16.7% (eight organizations) that do know of such a partner organization offered an assortment of examples, most (five) of which involved a government agency, while four examples were a fellow member of the social sector, and one example was given regarding a local university. Survey results were unclear as to the extent to which these GIS-using partner organizations are considered sources from which responding organizations could seek information about obtaining GIS products or services for their own work.

### **North Carolina Nonprofit Survey**

For the survey that was replicated statewide in North Carolina, a 15% response rate was achieved with 363 total respondents. These nonprofit respondents were distributed across every major region of the state (Figure 8). The main clustering pattern of survey responses seen arching through the central part of the state corresponds to the North Carolina “crescent” comprised of the three largest metropolitan areas (Charlotte, Greensboro/Winston-Salem, and Raleigh/Durham) connected by major highways.





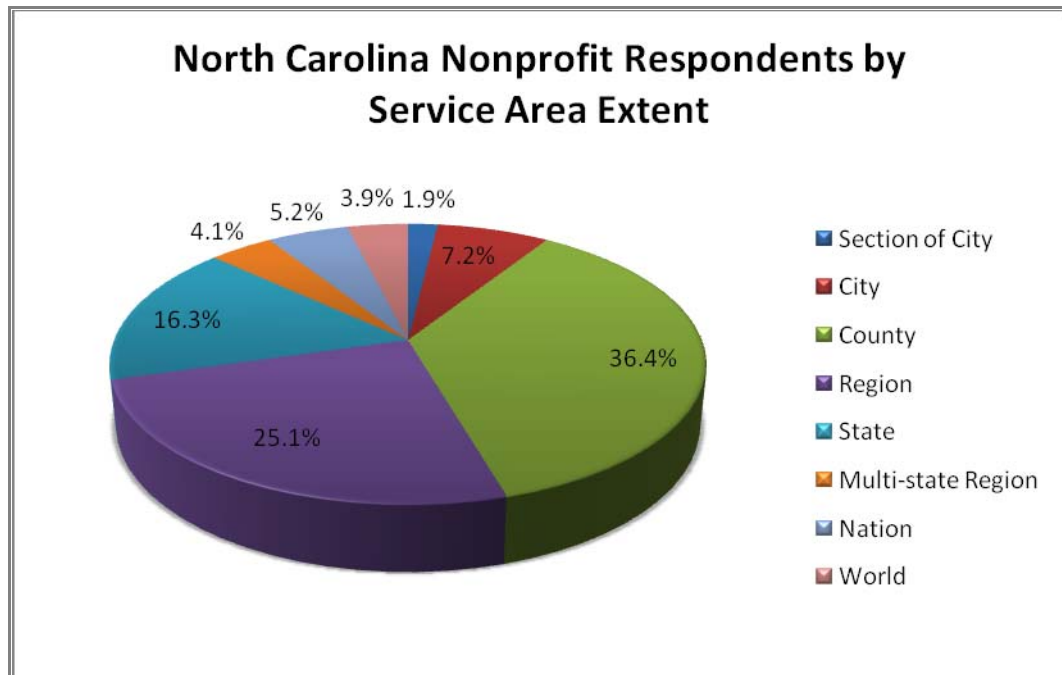
**Figure 8:** North Carolina Nonprofit Survey Respondents. Map of “GIS and the NC Social Sector” survey respondents by office location. Three nonprofit respondents headquartered outside of North Carolina are not shown.

It must be noted that the statewide contact list contained multiple contacts for the same organization in a number of cases, and since only one response per organization was received and used for the results of this survey, the calculated response rate is artificially lowered to some degree.

***Profile of North Carolina Statewide Survey Respondents***

Survey respondents across North Carolina work in a diversity of geographic extents and represent a full spectrum of focus topics. The most prevalent type of nonprofit by category of work was Human Services (17.6%), followed by Education with

13.8%. The largest portion of North Carolina nonprofits, 36.4%, works within a single county (Figure 9).

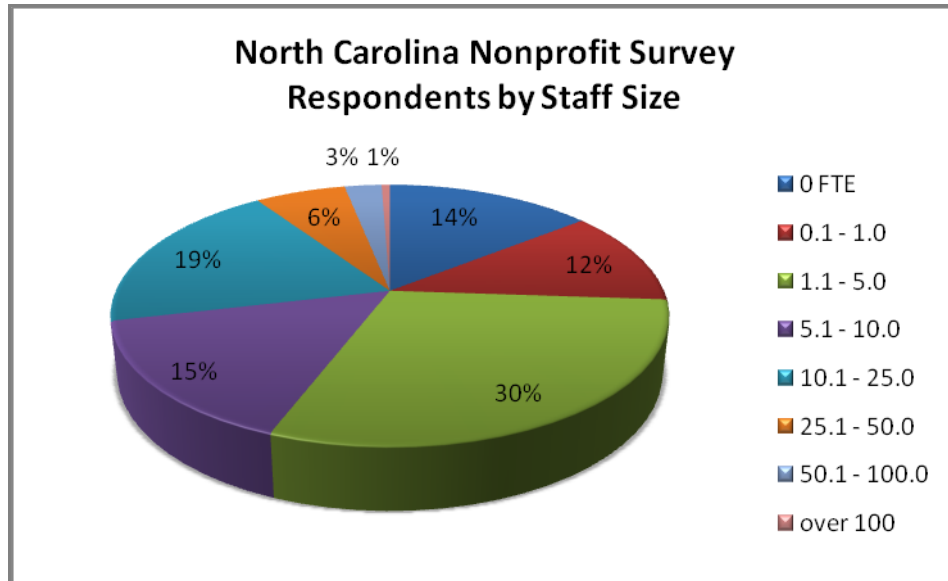


**Figure 9.** North Carolina Nonprofit Respondents by Service Area Extent. Respondents in 2011 North Carolina nonprofit survey broken down by service area extent.

Another 25.1% works across a region within a state, 16.3% work across a state, and 7.2% work within a single city. Nonprofits working at the national level represented 5.2% of respondents, those working in a multi-state region represented 4.1%, and those working throughout the world represented 3.9%. The smallest percentage of nonprofits (1.9%) work within a section of a single city.

Nonprofit respondents statewide represented a distribution of staff sizes that was strikingly similar to those of the Guilford County respondents; all categories were within

3% of one another among the two surveys (Figure 10). Staff sizes of more than one FTE up to five FTE was the most common with 30% of respondents.

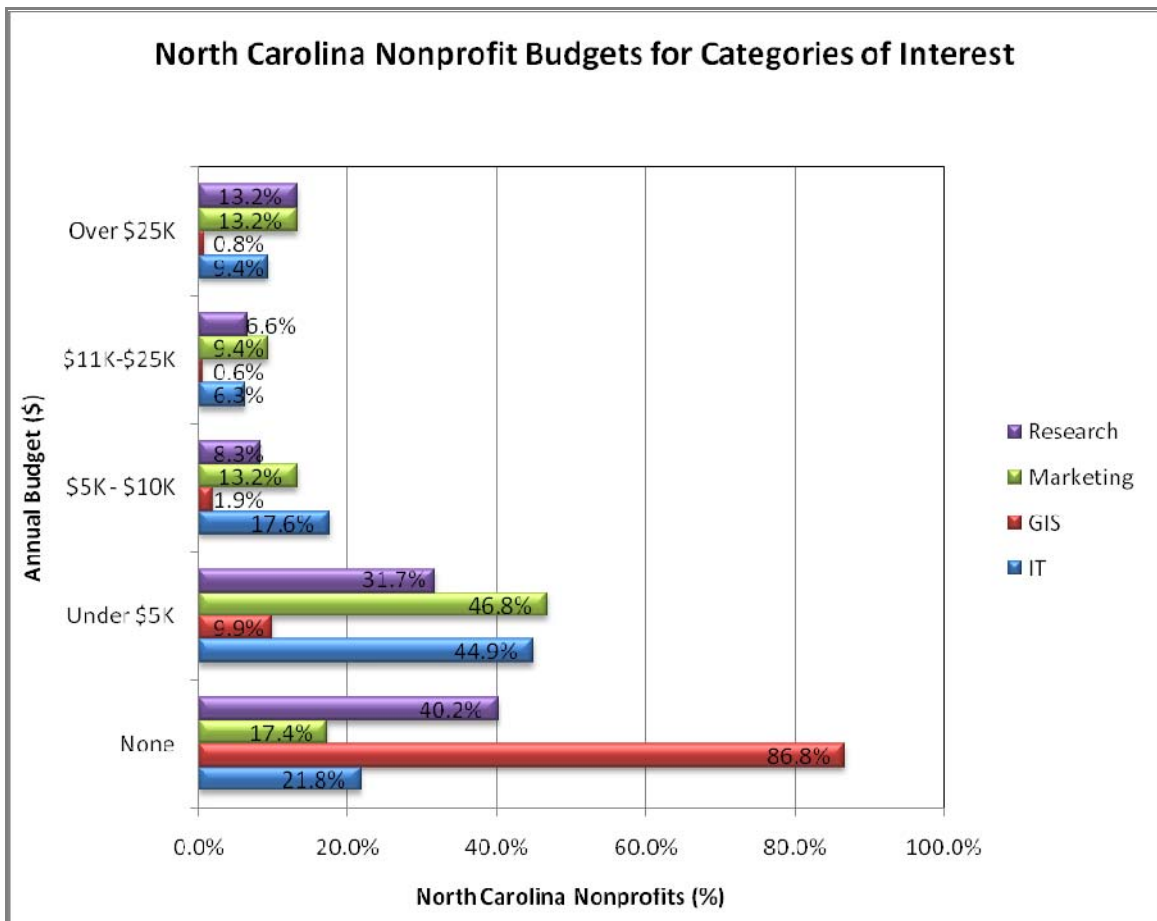


**Figure 10:** North Carolina Nonprofit Survey Respondents by Staff Size. Percentages of survey respondents by category of FTE (Full-Time Equivalency) units.

A healthy range of total annual budgets were also represented by the survey respondents. A small percentage of organizations (1.9%) report having no annual budget at all, while 24.5% have an annual budget below \$100,000. The largest percentage of nonprofits (32.2%) report an annual budget greater than \$100,000 but not greater than \$500,000. 11.8% have an annual budget over \$500,000 but no greater than \$1 million, 22.3% have over \$1 million but no greater than \$5 million, and 7.2% have an annual budget greater than \$5 million. For comparison to the Guilford County Survey, the total segment of survey respondents with an annual budget of over \$1 million was 29.5% across the state of North Carolina. The largest segment by purpose for each budget tier was Human

Services, except for organizations with an annual budget of under \$100,000, for which Education was the most prevalent purpose.

Statewide nonprofit annual budgets for marketing, information technology, and GIS loosely match those reported by Guilford County nonprofits (Figure 11).



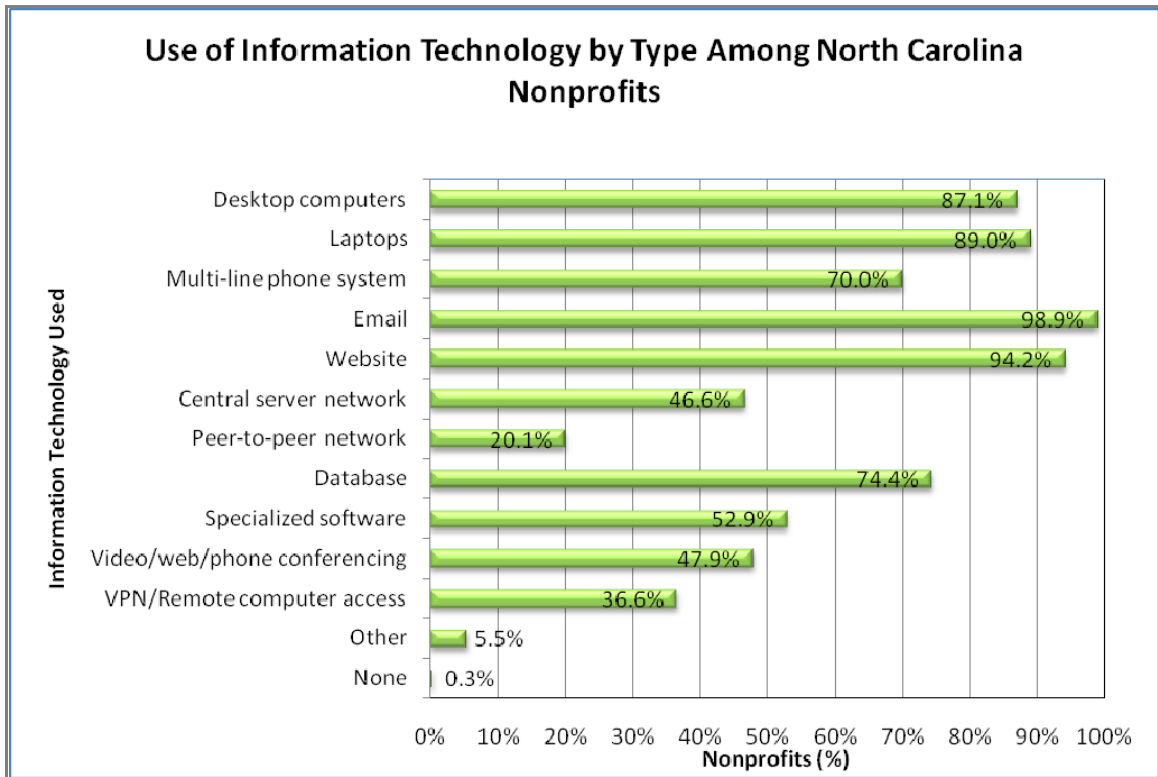
**Figure 11:** North Carolina Nonprofit Budgets for Categories of Interest. Percentages of survey respondents reporting annual budgets in pre-defined ranges for categories of interest. Categories included research (for planning and capacity building), marketing, GIS, and IT (Information Technology).

The largest segment of nonprofits (46.8%) have a marketing budget under \$5,000, followed by 17.4% with no designated marketing budget, 13.2% with a budget above \$5,000 up to \$10,000, 9.4% with a budget above \$10,000 up to \$25,000, and 13.2% with more than \$25,000 annually for marketing. Information Technology budgets were also most commonly under \$5,000 (reported by 44.9%) or with no funds at all (21.8%). There were 17.6% of nonprofits with an IT budget over \$5,000 up to \$10,000, 6.3% with a budget over \$10,000 up to \$25,000, and 9.4% that have a budget greater than \$25,000 annually for IT. Research was a new category for the statewide survey, and results indicate that most North Carolina nonprofits have little or no designated funding for research applied to capacity building, strategic planning, or program evaluation. The largest segment (40.2%) of nonprofits had no research budget, and 31.7% have an annual research budget under \$5,000. Though representing low percentages, there are some nonprofits with more substantial research budgets; 8.3% reported a budget of over \$5,000 up to \$10,000, 6.6% reported a budget higher than \$10,000 up to \$25,000, and 13.2% reported a budget of over \$25,000 annually. With strong similarity to the results of the Guilford County survey, the overwhelming majority (86.8%) of North Carolina nonprofits have no designated funding for GIS. A small segment of nonprofits statewide (9.9%) did report a designated budget of less than \$5,000, and only 3.3% reported any funding amounts higher than that. It must be considered that annual budget estimates may be difficult for some organizations to calculate if a significant portion of investment into the items is in the form of untracked staff time, and this was indicated in comments by some respondents. This applies particularly to the category of research, where survey

participants may vary in criteria for determining what activities qualify as research, or where resources (such as staff time) spent on such research are largely blended into daily workflow. However, the response choices for this survey question were fairly broad budget ranges, which allow for a qualitative description of designated funding trends without as much impact from these uncertainties.

***Information Technology Among North Carolina Nonprofits***

When asked about the use of IT tools, statewide survey responses closely resembled those of the county level survey (see Figure 12).

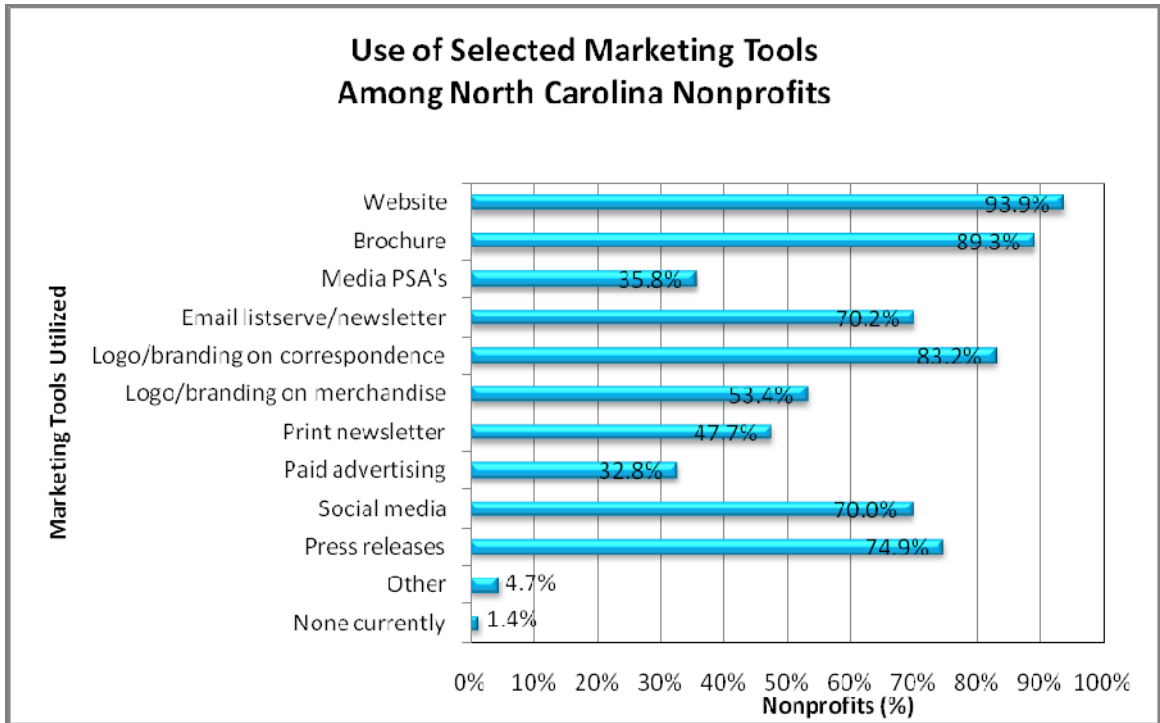


**Figure 12:** Use of Information Technology by Type Among North Carolina Nonprofits. Prevalence of information technology types used by survey respondents across North Carolina, 2011.

Standard IT tools like desktop computers, laptops, email, and websites are very commonly used among North Carolina nonprofits, reported by 87.1%, 89.0%, 98.9% and 94.2% respectively. The use of databases and multi-line phone systems are also fairly popular, used by 74.4% and 70.0% of nonprofits respectively. Central server networks are used by 46.7% and peer-to-peer networks are used by 20.2%, specialized software is used by 52.9%, and video, web, or phone conferencing is used by 47.9% of surveyed nonprofits statewide. Virtual Private Networks (VPN) and other remote computer access represented a new category for the statewide survey and are used by 36.6% of surveyed nonprofits. Only one organization (0.3%) reported no use of IT at the time of the survey, and this was likely an error as the same organization also selected almost all of the other IT options in the survey question. Some nonprofits (5.5%) selected “Other” and offered additional input about IT tools they use that were not already listed. Over a third of these mentioned social media, and input also included mobile technology and handheld devices, cloud computing, credit card processing, CRM (Customer Relationship Management) systems, VOIP (Voice Over IP) phones, biometric identification, and GPS.

### ***Marketing Among North Carolina Nonprofits***

Statewide survey results regarding marketing tools generally resembled those of the Guilford County survey in most categories (see Figure 13).



**Figure 13:** Use of Selected Marketing Tools Among North Carolina Nonprofits. Prevalence percentages of selected marketing tools and materials among surveyed North Carolina nonprofits in 2011.

Websites, brochures, and logos/branding on correspondence were still the three most prevalent tools, reported by 93.9%, 89.3%, and 83.2% of nonprofits respectively. Mass email communications/newsletters are also relatively popular, used by 70.2% of the nonprofits. Print newsletters are used by 47.7% and media PSA's are used by 35.8% of surveyed nonprofits. Slightly over half (53.4%) of nonprofits statewide reported using logos/branding on merchandise, which represents a higher prevalence than in the county survey by 14.2%. Paid advertising, at 32.8%, also had slightly higher usage than in the county survey. This likely reflects the larger overall budgets represented by a portion of the statewide respondents. Two new categories on the statewide survey were social media, which 70.0% of the nonprofits use, and press releases, used by 74.9% of the



nonprofits. Nonprofits reporting their own marketing tools in the “Other” category (4.4%) most commonly listed printed materials other than a brochure such as annual reports, fact sheets, magazines, newspapers, and banners. Events and fundraisers were also mentioned by a few organizations as marketing tools. Many North Carolina nonprofits utilize multiple avenues for accomplishing marketing work, and three categories were particularly popular: 32.0% of respondents have at least one designated marketing staff person (which could be full or part time), 39.4% use other staff, and 30.9% use the help of volunteers to get marketing done. Sixty-four organizations (17.6%) specified their primary means of marketing work in the “Other” category, and most of these said that their marketing is done by one or more board members (which are technically volunteer positions in nonprofits) or the Executive Director, which is sometimes a paid position and sometimes unpaid, but apparently not considered a member of staff by most respondents. Only 6.8% of respondents use an outside paid consultant for marketing work and 6.3% use an intern, and 2.8% report that no one is currently doing marketing work for the organization.

Designated time and resources are used to engage in strategic planning in 86.2% of all statewide nonprofit respondents. Of those that do strategic planning, 44.3% have a current strategic plan document, 24.7% have a strategic plan document that is in need of an update, 22.2% do not yet have a document but one is in the works, and 8.9% do not currently intend to put strategic plans in writing.

### ***GIS Among North Carolina Nonprofits***

Across North Carolina, 56.7% of nonprofits responded that they have at least one staff person with some degree of familiarity with GIS, while 43.3% have none. Organizations who say they currently use GIS represented 21.2% of respondents statewide, and of those, getting the GIS work accomplished in-house was by far the most popular method (reported by 53.2% of respondents). Of the 78.8% of all surveyed nonprofits that do not currently use GIS, only 9.2% say that they have used it in the past. Most (72.9%) report having never used GIS, and individuals responding on behalf of 17.8% of organizations statewide could not determine whether their organizations had ever used GIS in the past. Organizations that are not currently using GIS but who say they have used GIS in the past most commonly reported doing so in-house (37.2%) and/or with government staff assistance (18.6%). Help from a partnering organization/fellow nonprofit, for-profit consultant, or university were other options each used by 14% of organizations who reported only a past use of GIS. An additional 9.3% used volunteers in their past GIS, the same percentage responded in an “Other” category, and in 7.0% of these organizations the individual completing the survey did not know the means by which past GIS work was done. Only 22.6% of respondents statewide reported being aware of any partnering organization that use GIS in their work. As in the Guilford County survey, statewide nonprofits reported a full spectrum of responses when asked to rank the perceived usefulness of GIS to their organization on a scale of zero to ten, and the most popular category again was “I really can’t tell” with 24.5% of statewide respondents. Unlike the county-level survey, the most popular single ranking among

nonprofits who selected an actual number for perceived usefulness was zero representing “not at all”, selected by 11.3% of respondents. However, the highest rating of 10, representing “extremely useful” was the second-most popular category with 9.4% of statewide respondents. Overall, 35.5% of nonprofits selected a 4 or lower while 30.9% selected a 6 or higher, and 9.1% chose a 5 which was the third-most popular category and could represent a moderate view that GIS could be somewhat helpful to the organization. This ranking of 5 could also indicate some level of indecision or hesitation about the benefits of GIS, which collectively is amplified in the wide range of responses and heavy use of the “I really can’t tell” category. A significant minority of 35.5% in this survey reported that they could identify specific projects for which GIS has the potential to improve. Approximately a third (33.6%) of nonprofits statewide reported that someone on staff would have knowledge about where to obtain GIS products or services if needed.

In the comment box added to the statewide survey, 79 comments were received containing additional input or questions from participants. Several common themes could be found in the responses. Thirty of these (38%) included a request for additional information about GIS and/or the results of the study on GIS and nonprofits, and 20 (25%) included a positive expression of interest in GIS for either that particular organization, one or more partnering organizations, or social sector organizations in general. There were 17 comments (22%) including statements of confusion and uncertainty about what GIS is and its benefits, some even suggesting training and education on this topic for their organization or nonprofit community. Some comments indicated that this was the respondent’s first introduction to GIS, and these were not all

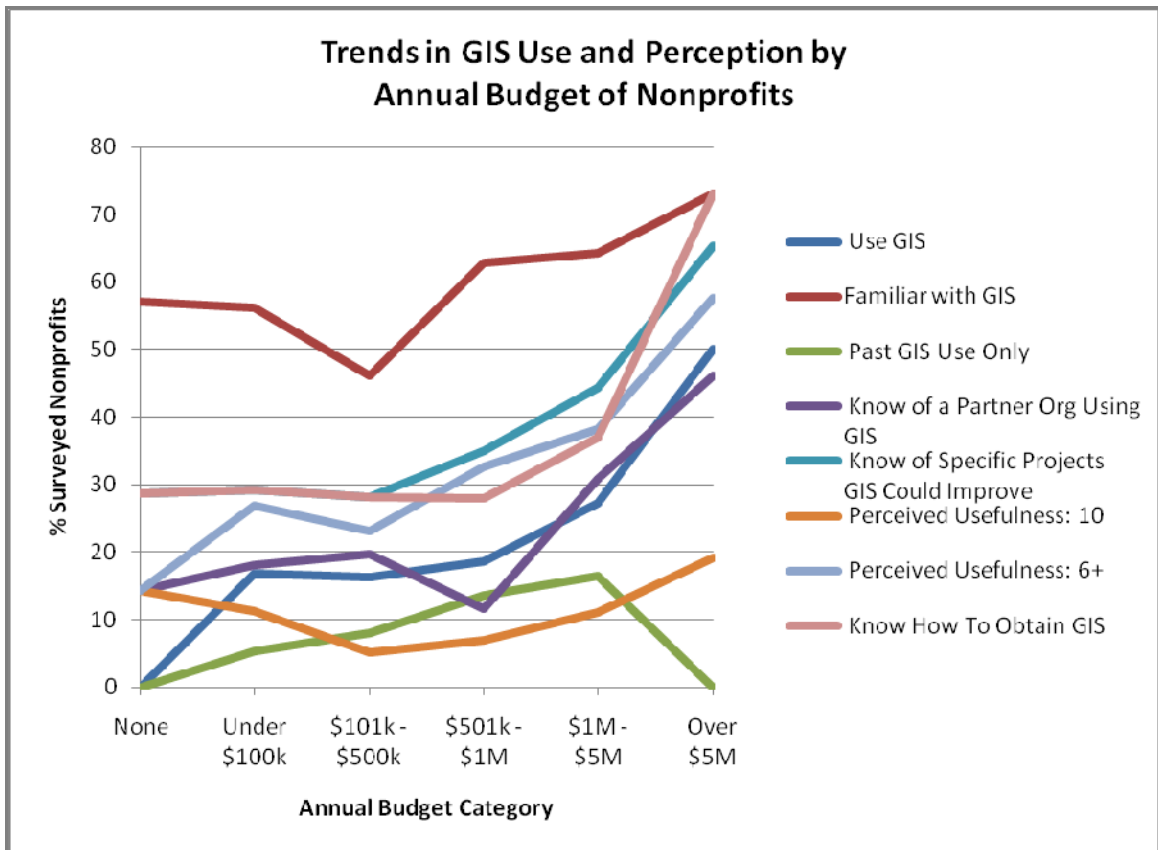
included in the same comments that indicated confusion. Four nonprofits left comments indicating and/or describing ways that they use GIS technology. All four were fairly simplistic, but some included analytical uses for strategic planning or other decision-making, as did many of the expressions of interest and requests for more information. Five comments expressed a disinterest in GIS such as a request not to be contacted later with any sales offers for GIS technology. Three comments mentioned cost as a perceived barrier to GIS utilization, and some comments described aspects of organizational structure, staff, and IT use which may have been intended to indicate a barrier to GIS adoption. For example, one interesting comment from a small Human Services nonprofit read, “Our office didn't have a computer until four years ago! We have developed a database and are slowly moving client files from 4x6 cards to online. We are completely run by volunteers...many of whom don't know how to turn a computer on!” While not representative of a sector standard, or even of the nonprofit survey respondents, this statement does illustrate the institutional challenges that may be encountered by an organization whose work may be significant to the community and whose impact may be increased through GIS technology.

### ***The Influence of Total Budget Size***

Income size for an organization did seem to be a factor related to the awareness and use of GIS. Organizations in the highest total annual budget category of over \$5 million had a 50% rate of current GIS use, compared to the 21.2% rate for the entire survey group, and only 16.9% for the lowest budget tier besides zero. A larger

percentage of organizations in the highest budget tier had someone on staff that is at least somewhat familiar with GIS, 73.1% compared with 56.7% for all tiers. The organizations with larger annual budgets also had significantly larger staff sizes. The largest segment of nonprofits in every total budget category except the highest (Over \$5M) responded that their spending for each of the items of interest (IT, Marketing, GIS, Research) were in one of the lowest two brackets: either no funding or under \$5,000 annually. For the nonprofits with budgets over \$5M, a significant jump in budgets IT, Marketing, and Research budgets was observed, where the largest segment of organizations report spending over \$100K on each item. However, spending on GIS did not increase significantly among any total budget category, indicating that cost is not the single primary obstacle to more advanced utilization and integration of GIS among nonprofits using GIS. Organizations with larger budget sized did have a broader distribution of responses across all the categories of spending for each given line item. The use of information technology tools generally increased across all IT types proportionally to increasing budget size (except for peer-to-peer networks which were not popular in any budget range). It is interesting that a higher prevalence of IT tools was not matched with an equivalent increase in use of marketing tools for organizations with the highest budgets, though certain categories such as press releases and paid advertising did rise. The notable change regarding marketing for organizations with the largest budgets is that 76.9% get marketing done in-house with at least one designated marketing staff person, and a significant minority (38.5%) reported using an outside company. Not surprisingly, organizations with small or no annual budget use primarily volunteers for

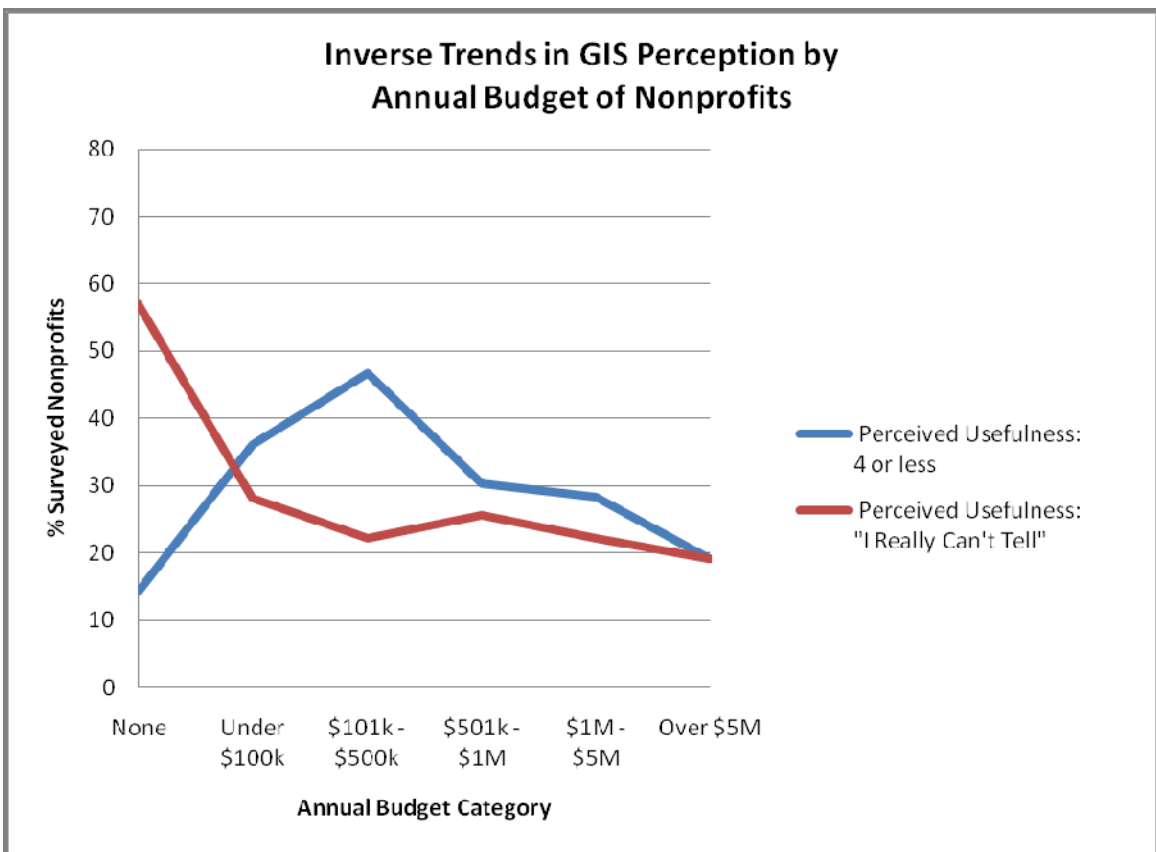
marketing work instead. The ability to have larger staff sizes and designated staff for marketing suggests that there is also a greater possibility of designated staff for GIS work in larger nonprofits, particularly for those who already use GIS in-house. Organizations in the highest tier of total annual budget were similar to the other organizations in many other respects such as most common purpose category being human services, service area extent being county, and getting GIS done in-house. Figure 14 shows the upward trend seen in GIS use and perceived usefulness among surveyed nonprofits as budget size increases. There are a few exceptions in the trends, represented by dips at the corresponding data point, and this could be attributed to natural variation in the relatively small sample size. The drop to zero percent for the highest budget tier on the percent of nonprofits not currently using GIS but who have used GIS in the past (green line on the graph) may also be due to a successful or otherwise committed implementation of GIS such that those nonprofits began to use GIS they continued to do so up to the present.



**Figure 14:** Trends in GIS Use and Perception by Nonprofit Annual Budget. Percent of surveyed nonprofits across North Carolina who responded in certain ways (listed in legend) to various questions about GIS use and perception.

Conversely, responses to the question about perceived usefulness that were expected to have an inverse relationship to budget size are shown in Figure 15. The portion of nonprofits that could not determine how useful GIS is or could be for their organization (red line) generally follows a downward trend with increasing budget size. The portion of nonprofits rating usefulness at 4 or less on a scale of 0 to 10 (blue line) did have a negative slope where the four highest budget category data points were concerned, but it had a positive slope when comparing annual budgets ranging from zero to the “\$101-\$500k”. Only 14.3% of nonprofits with no annual budget gave this low perceived GIS

usefulness rating, and this corresponds to the high percentage of organizations in this category that could not determine the usefulness of GIS to them. These organizations may know some basic concepts about what GIS is and how it works, and have little or no understanding of ways it could help them, but are not familiar enough with the technology to determine that it would not be useful.



**Figure 15:** Inverse Trends in GIS Perception by Nonprofit Annual Budget. Percent of surveyed nonprofits across North Carolina that, when asked about perceived usefulness of GIS to that particular organization, selected a 4 or less on a scale of 0 to 10, or selected “I Really Can’t Tell”.



### *The Influence of Investment in Key Categories*

There was a definite increase in GIS familiarity and adoption rates with increasing sizes of IT and research budget across all nonprofits. For example, organizations reporting that they have at least some familiarity with GIS increased by 31.3% across categories of increasing budget size for research. Likewise, actual GIS use increased by 41.9%. However, larger budgets for these items of interest were found to be associated with larger budget sizes overall, which inflates the proportional increases seen between support activity investment and GIS variables. Though the survey choices for budget amounts being stated as ranges prevent the total removal of variation in total budget size as a confounding variable, its influence is significantly minimized in results that compare “item of interest” budgets and GIS-related variables within a single total annual budget bracket. Once survey results were broken down into the ranges of total annual budgets, the sample sizes were not small enough to reach statistical confidence when examining these variables, but the findings can still serve as general indicators by which to inform further discussion and research.

It must also be considered that there are many activities that organizations might consider research (from basic fact-finding to sophisticated analysis). Also, organizations may have used a very broad definition of in-house familiarity with GIS (for example, a staff person who has heard about mapping services from the local government GIS office versus a full-time GIS analyst on staff).

No observable trends were found in GIS familiarity or utilization across categories of increasing marketing budget in any given total annual budget category.

Some degree of correlation between investment in marketing and GIS variables had been expected due to the frequent use of GIS among marketers in other sectors. However, the great majority of marketing tools employed and described by nonprofit respondents are those that do not necessarily incorporate analysis for the targeting of messages or projects. There is a need for further investigation of the connection between more advanced social sector marketing strategies and GIS analysis as marketing support.

Within each total annual budget bracket, upward trends in reported GIS familiarity were found in association with increasing IT budgets (Table 3).

**Table 3.** GIS Familiarity and Use by IT Budget Size. Percentages of nonprofits reporting GIS familiarity and/or use, by category of annual IT budget within each total annual budget bracket. Percentages are listed by IT budget across all total budget brackets in the last section.

<b>GIS Familiarity and Use by IT Budget Size</b>				
Total Annual Budget	IT Budget	Nonprofits (#)	GIS Familiarity	GIS Use
Under \$100k	None	31	48.4%	9.7%
	Under \$5K	52	59.6%	21.2%
	\$5K - \$10K	6	66.7%	16.7%
	\$11K-\$25	0	n/a	n/a
	\$26K-50K	0	n/a	n/a
	\$51-100K	0	n/a	n/a
	Over \$100K	0	n/a	n/a
\$100k-\$500k	None	25	44.0%	8.0%
	Under \$5K	67	44.8%	16.4%
	\$5K - \$10K	19	47.4%	15.8%
	\$11K-\$25	5	60.0%	60.0%
	\$26K-50K	1	100.0%	0.0%
	\$51-100K	0	n/a	n/a
	Over \$100K	0	n/a	n/a

\$501k-\$1M	None	9	66.7%	11.1%
	Under \$5K	17	64.7%	35.3%
	\$5K - \$10K	15	53.3%	6.7%
	\$11K-\$25	2	100.0%	0.0%
	\$26K-50K	0	n/a	n/a
	\$51-100K	0	n/a	n/a
	Over \$100K	0	n/a	n/a
\$1M-\$5M	None	6	16.7%	0.0%
	Under \$5K	23	56.5%	21.7%
	\$5K - \$10K	22	59.1%	18.2%
	\$11K-\$25	14	78.6%	42.9%
	\$26K-50K	6	83.3%	33.3%
	\$51-100K	6	83.3%	50.0%
	Over \$100K	4	100.0%	50.0%
Over \$5M	None	2	100.0%	0.0%
	Under \$5K	3	66.7%	33.3%
	\$5K - \$10K	2	0.0%	0.0%
	\$11K-\$25	2	50.0%	0.0%
	\$26K-50K	1	100.0%	0.0%
	\$51-100K	4	100.0%	100.0%
	Over \$100K	12	75.0%	66.7%
All	None	79	49.4%	7.6%
	Under \$5K	163	53.4%	20.9%
	\$5K - \$10K	64	53.1%	14.1%
	\$11K-\$25	23	73.9%	39.1%
	\$26K-50K	8	87.5%	25.0%
	\$51-100K	10	90.0%	70.0%
	Over \$100K	16	81.3%	62.5%

Increases were seen in GIS adoption rates associated with larger IT budgets, though these increases were not unanimous. A relationship between IT budget and GIS adoption was expected, due to the close connection between GIS and other IT types. Other than the limitations of sample size, the uncertainty of this relationship could point

to the significantly lower level of entrenchment GIS has in social sector culture in comparison to many other types of technology, for any given IT budget. Most organizations now find it useful or even necessary to make use of computer networks, laptops, websites, social media, and handheld communication/computing devices, and have adopted these technologies accordingly over time. In organizations that already have a large IT budget, a lack of perceived need for GIS may still remain, in which case an approach emphasizing the integration of GIS with other technologies already in use may be best.

Within each total budget bracket, there were generally more organizations with some GIS familiarity among organizations with higher research budgets (Table 4).

**Table 4.** GIS Familiarity and Use by Research Budget Size. Percentages of nonprofits reporting GIS familiarity and/or use, by category of research budget within each total annual budget bracket. Percentages are listed by research budget across all total budget brackets in the last section.

<b>GIS Familiarity and Use by Research Budget Size</b>				
Total Annual Budget	Research Budget	Nonprofits (#)	GIS Familiarity	GIS Use
Under \$100k	None	43	48.8%	16.2%
	Under \$5K	38	60.5%	18.7%
	\$5K - \$10K	3	66.7%	33.0%
	\$11K-\$25	4	75%	25.0%
	\$26K-50K	1	100%	100.0%
	\$51-100K	0	n/a	n/a
	Over \$100K	0	n/a	n/a
\$100k-\$500k	None	49	34.7%	4.0%
	Under \$5K	40	57.5%	20.0%
	\$5K - \$10K	15	53.3%	40.0%
	\$11K-\$25	5	40.0%	20.0%
	\$26K-50K	6	50.0%	33.3%

	\$51-100K	0	n/a	n/a
	Over \$100K	2	100.0%	0.0%
\$501k-\$1M	None	16	62.5%	6.3%
	Under \$5K	16	68.8%	18.8%
	\$5K - \$10K	1	100.0%	0.0%
	\$11K-\$25	6	50.0%	33.3%
	\$26K-50K	3	66.7%	66.6%
	\$51-100K	0	n/a	n/a
	Over \$100K	1	0.0%	0.0%
\$1M-\$5M	None	27	40.7%	11.0%
	Under \$5K	15	73.3%	33.0%
	\$5K - \$10K	11	72.7%	57.0%
	\$11K-\$25	9	77.8%	44.0%
	\$26K-50K	10	80.0%	20.0%
	\$51-100K	4	50.0%	0.0%
	Over \$100K	5	100.0%	80.0%
Over \$5M	None	6	66.7%	66.0%
	Under \$5K	4	75.0%	0.0%
	\$5K - \$10K	0	n/a	n/a
	\$11K-\$25	0	n/a	n/a
	\$26K-50K	3	100.0%	66.0%
	\$51-100K	4	50.0%	50.0%
	Over \$100K	9	77.8%	55.6%
All	None	146	45.2%	11.0%
	Under \$5K	115	62.6%	19.1%
	\$5K - \$10K	30	63.3%	36.7%
	\$11K-\$25	24	62.5%	33.3%
	\$26K-50K	23	73.9%	55.6%
	\$51-100K	8	50.0%	25.0%
	Over \$100K	17	76.5%	52.9%

Any relationship between research budget and use of GIS was not readily apparent.

While this does not support the expectation that organizations more active in research would be more likely to adopt GIS, it is consistent with other findings which indicate that some familiarity with GIS does not automatically translate to GIS adoption. Despite the

uncertainties of a relationship across each IT budget category, there were consistently higher rates of GIS familiarity and use among organizations that reported any designated research budget versus those that reported having none.

Strategic planning is an indicator of organizational maturity that typically involves support research to guide decisions about the organization's next steps. As would be expected, the proportion of nonprofits investing resources into strategic planning, particularly those with an up-to-date strategic plan document, rise proportionally with increased research budgets. Most nonprofits (88.1%) currently using GIS are found among organizations that have dedicated resources to strategic planning and have worked to develop a strategic plan document, and 48.8% of GIS users have a strategic plan document that is complete and current. Similarly, 28.6% of nonprofits that keep a strategic plan document current also use GIS, compared with 21.2% of all nonprofits and only 7.1% of nonprofits that report strategic planning but without any formal document. While many nonprofits do maintain a current strategic plan without also using GIS, the apparent correlation found between these variables indicates that organizations with higher levels of engagement in strategic planning may be more interested and prepared to explore GIS implementation.

### ***The Influence of Partnership***

The largest numbers of nonprofits that know of a partner organization currently using or having used GIS in the past are doing environmental work. This supports the expectation that environmental conservation has a more explicitly recognized connection

to spatial distribution (i.e. factors across land area), and thus has the highest uptake rates for GIS among nonprofits. This expectation is also supported by review of previous research and current nonprofit activity in the GIS community. The greatest percentage of nonprofits who do not know of a partner organization using GIS are in the Human Services category, consistent with that being the largest segment represented overall. The majority of all respondents statewide, 71.6%, have a working relationship with at least one government agency other than any related to maintaining tax-exempt status. Organizations having such a relationship with a government agency represented 90.2% of those with partner organization using GIS, while representing 66.2% of those without a partner GIS-user.

North Carolina nonprofits who know of a partner organization using GIS are more likely to be GIS users themselves (59.8%), while the large majority (90%) of those not aware of GIS use at any partner organization is also not using GIS. In addition, 41.7% of non-GIS users who had used GIS at some point in the past did so through a partnering organization and/or fellow nonprofit. Most (74.4%) nonprofits with a partnering GIS-user feel they would know how to obtain GIS services or products for themselves, compared to only 21.7% of those without a partnering GIS-user. Seventy-two percent of the organizations with a GIS-using partner also responded that they knew of specific projects in their organization with which GIS could be of help, compared with 24.9% of organizations without such a partner. Perception of the usefulness of GIS to the organization was also markedly higher in organizations who know of a partner using GIS; the winning category from the 0 to 10 scale for this group was a 10 with 24.4% of

the votes, while 29.5% of organizations without partners who use GIS made “I really can’t tell” their most popular category. These findings support the idea that nonprofits adopting GIS are likely to share other functional characteristics as well to make them candidates for partnership with one another, and that GIS utility is communicated and shared among partners as a beneficial resource (partner recommendation is a frequent means of innovative practice diffusion in the social sector). The findings may also indicate that organizations not using GIS are less able to identify its use in partnering organizations. Further investigation of these possibilities would be helpful to develop strategies that make use of partner networks to introduce GIS in social sector organizations.



## CHAPTER V

### DISCUSSION AND CONCLUSIONS

The expectation is not that the leveraging of GIS analysis will be feasible and appropriate for every social sector organization, just as it is not necessarily feasible and appropriate for every government agency and commercial business. It is, however, desirable that GIS be made accessible and integrated into the social sector's culture so that any given organization will have the opportunity to determine feasibility of GIS utilization at various levels.

The survey among nonprofits in Guilford County, North Carolina and across the entire state served as an effective tool for making some general assessments of GIS perception and utilization in the social sector. The fact that the results of the two surveys were largely in agreement raises confidence about their applicability to the social sector in general. This agreement at least establishes the findings of the county level survey as largely representative of the state on this topic. Conducting a similar survey in at least one state with demonstrated differences from North Carolina would be a valuable addition to this research. For example, North Carolina is considered relatively progressive in overall GIS adoption across sectors (including state and local government agencies, college and university programs, public sector, available state-relevant online resources, and public familiarity), which may indirectly inflate social sector responses on

GIS awareness and utilization. Therefore a state considered not progressive in overall GIS use may be a good candidate for replicating the survey.

Some limitations do apply to the survey conducted in this study, as well as some opportunity for further research. Larger numbers of survey results could potentially be obtained using contact information from a commercial data vendor, and if so this could also remove the bias of including organizations that are members of a nonprofit network and/or receive their electronic communications. Depending on the commercial vendor's method, however, a new bias could be introduced by including only nonprofits that have a web presence with contact info for example, or the more extensive contact list could still fail to reach a staff person knowledgeable enough to ensure accurate completion of the survey. Higher response rates may be obtained if there are resources for follow-up calls or a mailed post-card survey invitation to supplement the email invitation. More robust information could potentially be collected using more questions in the survey or more specific open-ended answers versus the multiple choice categories that were used. For example, questions could be asked about the phases of development or growth an organization is in, to see if these factors have any apparent correlation with awareness and adoption of GIS. However, the need for information must be balanced with a brevity and ease-of-use that will encourage participation in the survey. The survey question about annual spending on IT, marketing, GIS, and research proved to be helpful in exploring a correlation between investment in these areas as a measure of perceived importance and an organization's relationship to GIS, as well as to relate that relationship back to the potential GIS holds for contributing to each of these areas (i.e. GIS in marketing, GIS for

research, etc.). The survey questions regarding use of IT and marketing tools could potentially be reworked to more effectively capture indications of investment and/or capacity a given organization holds in these two areas. Subject matter experts or previous studies on IT and marketing adoption could provide insight on ways to best enhance these questions. Large-scale surveys would be helpful to assess not just the current utilization of general IT in the social sector, but specifically the GIS utilization, understanding, and potential for future capacity. The survey developed in this study is replicable in nature and its results could be compiled or compared with results from other localities or at larger scales. With more time and resources, the survey could be conducted on a larger scale as in the national-level survey by Gifts In Kind International (Hackler and Saxton, 2007). It could also be interesting to include more social sector organizations that are not necessarily incorporated nonprofits, such as churches and other faith communities, which often have outreach and service components. Spatial analysis on a larger sample size could reveal any patterns in GIS use or awareness as it may correlate with affluence of the surrounding community, nonprofit agency clustering, or proximity to urban cores.

Through collection and mapping of survey information on nonprofit organizations in North Carolina, this study produced a sample spatial inventory of a nonprofit community. Further development of such spatial inventories combined with analysis and contact with participating organizations could begin to capture a scalable landscape of nonprofits by purpose, sources of support, and target service areas. Innovative projects are being pioneered in very recent times to make such spatial resources and platforms for sharing them available to the social sector and the general

public, with a great deal of progress still to be made. A crucial objective to be achieved is connecting a broader base of social sector organizations to available resources in a sustainable fashion. Adding interactivity to such an inventory and sharing online through an API and functionality for visualization, data sharing, community assessment, and identifying service area overlaps and gaps would significantly increase value for social sector organizations and others. This creates centralized access to social sector information, and facilitates potential for networking, collaboration, and resource sharing. Providing this “big picture” perspective to members of the social sector may provide a critical resource toward addressing the significant connectivity issues that exist among many organizations.

In this study, a number of trends were demonstrated through two surveys in the nonprofit community regarding nonprofit organizations’ relationships to GIS. Organizational aspects with some expected relevance to an organization’s use or perception of GIS were investigated, including budget/organization size, partnership with other organizations, and investment into strategic planning information technology, marketing, and research activities. It was found that a moderate majority of nonprofits have at least some degree of familiarity with GIS technology, yet adoption rates are low, at approximately 20%. Most nonprofits that currently use GIS do so using a combination of means (often including help from volunteers and local government agencies), with in-house GIS work being by far the most popular method. The majority of organizations (particularly medium and small size) have very few resources for research or tools for marketing and information technology, which likely suppresses familiarity with and

adoption of new tools even if they could save the organization resources over time. This finding indicates that involvement from an external party may be needed to introduce such tools (including GIS) for many organizations to begin considering adoption. Organizations with larger total budgets and staff sizes are more likely to be GIS users. These larger organizations are also more likely to have familiarity with GIS, a positive perception of its potential utility for them and confidence that they would know where to seek GIS products or services.

Survey results support the possibility that greater levels of investment in one or more key categories can serve as an indication of organizational maturity and fewer obstacles for advanced GIS utilization. For example, it was found that higher levels of investment in areas of IT and research are likely associated with higher rates of reported GIS familiarity. However, the familiarity gained does not currently translate into a clear or more positive perception of usefulness, or into higher rates of GIS adoption. These findings imply that increases in the activities with some relationship to GIS must also be paired with another, more direct means of learning about the benefits of implementing GIS. Though marketing is an activity for which GIS holds great relevance, a relationship was not found between marketing budgets and GIS familiarity or use. Nonprofits using GIS are more likely to be among organizations that dedicate resources for strategic planning and that have developed a strategic plan document. This is particularly true for organizations with a strategic plan document that is kept current. Additional research is needed with larger sample sizes and more specific metrics for GIS familiarity and investment in IT, marketing, research, and strategic planning.

GIS users were also more often found among organizations who partner with other nonprofits that use GIS or with government agencies. In light of the strong and increasing emphasis on collaborative partnerships in the social sector, this finding indicates that a viral approach (utilizing referrals and partnership networks) could be strategic for increasing GIS adoption.

GIS is a powerful decision-making resource that can be applied in any sector to improve efficiency and effectiveness. Due to unique characteristics and constraints, the social sector lags behind in the utilization of such technological resources. These same characteristics and constraints create the need for a custom approach toward adoption and full utilization of GIS. Current literature reviewed in this study indicates a meaningful convergence of GIS and the strategic nonprofit, but more specific research that builds on previous work is needed. Collaborative action and research focused on Social Sector GIS is recommended, as direct attention will result in more effective GIS integration and realization of benefits. Survey results among nonprofit organizations indicate that education on the capabilities and benefits of GIS will be a crucial part of implementation in the social sector, and will need to be combined with resourceful actions to make GIS accessible to nonprofit organizations. Some key next steps in this work may include identification of key players in the social sector (such as major foundations/funders, coalition leaders, IT nonprofits, and others) whose understanding and acceptance of GIS could influence its adoption in a wider circle of organizations. Educational outreach particularly to major funders will foster their understanding of the potentials of GIS for projects they may decide to fund in their area of interest. Other steps should include

creation of a more diverse palette of social sector case studies with which to illustrate the relevance and impact of GIS in social sector organizations. If and when feasibility can be determined and the obstacles of upfront costs can be overcome, GIS utilization saves resources, and the social sector, now more than ever, is in need of saving resources through informed allocation, collaboration, and strategic planning. More advanced utilization of GIS across the social sector also holds the potential to facilitate transparency of information to the public, collaborative data sharing among social sector organizations, and the contribution of new information from the social sector as a public good. If these efforts continue to grow in upcoming years, the social sector will greatly benefit from added value and productivity, and the field of GIS will benefit from expansion into a market of vast opportunity.

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## APPENDIX A: GIS FACT SHEET FOR SURVEY PARTICIPANTS



# What is GIS?

Think of maps on computer. That's a very simple way to start understanding GIS. Let's break down the term Geographic Information Systems, to understand each part:

**Geographic** = a location. For example - your house, a city, a highway connecting two cities

**Information** = information about the location. For example - how many people in the house, name of the city, lanes in the highway

**System** = this ties in the above two

GIS is unique because:

- It combines location and information about the location. Using GIS, you can not only see the 'place' but find out more information about the place. Putting this concept in a system - typically a computer software - gives the ability to analyze this information in a powerful way.
- It gives the ability to see and analyze many 'layers' of information at once. Many types of data can be layered and analyzed together.
  - For example, to find a suitable site for a new business in a city, one would need these different layers: land parcels, roads, population, household income, etc.

### Some common GIS terminology:

**Spatial** : relating to 'space' or 'location'.

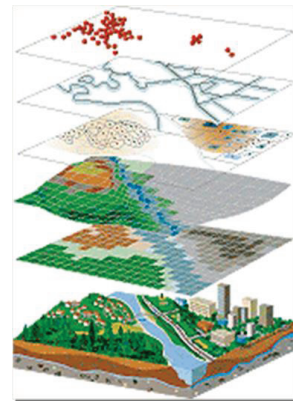
**Geospatial**: Relating to location on earth, commonly used term to describe many GIS data and analyses.

**GPS**: Global Positioning System, a satellite based system that gives accurate location information anywhere on earth.

### How does GIS work?

The GIS workflow consists of following steps:

- **Data Collection**: To build any GIS, we need data. The data is collected, converted to a convenient format and stored for use in subsequent processes.
  - Example: If you are building a GIS Emergency Response, one needs data on road networks in the city, location of hospitals/fire stations/police stations, addresses of residents etc. Various tools such as GPS devices, Aerial photos, Survey equipment etc. can be used for data collection.
- **Display and Analysis**: The stored data is displayed and analyzed as per requirement. The data is displayed on a computer screen and the operator gives commands to perform analysis.
  - Example: To find the shortest route from a house to the nearest hospital, the operator analyzes using a route finding algorithm on the roads data and the resulting path is displayed on the computer screen. Many different types of data is displayed as different layers and they are analyzed together.



## APPENDIX A

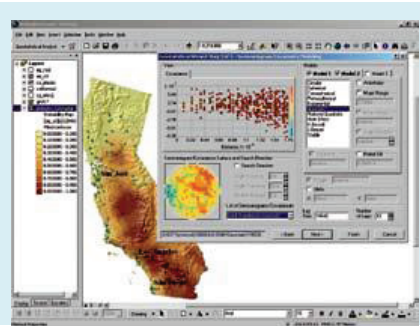
- **Sharing:** The result of analysis needs to be shared with the decision maker for further action.
  - *Example: In emergency response, the shortest route found using analysis, can be shared with the ambulance driver in form of printed or verbal instruction.*
  - Google Knol Beta [http://knol.google.com/k/spatialthoughts/gis-for-beginners/jtpfq4rvve4s/2?domain=knol.google.com&locale=en#What\\_is\\_GIS\(3F\)](http://knol.google.com/k/spatialthoughts/gis-for-beginners/jtpfq4rvve4s/2?domain=knol.google.com&locale=en#What_is_GIS(3F))

“GIS is a computer system for capturing, storing, checking, integrating, manipulating, analyzing and displaying **data related to positions on the Earth's surface**. Typically, a Geographical Information System is used for handling **maps** of one kind or another. These might be represented as several different **layers** where each layer holds **data** about a particular kind of feature. Each feature is **linked** to a position on the graphical image on a map and a record in an attribute table.

**GIS can relate otherwise disparate information on the basis of common geography, revealing hidden patterns, relationships, and trends that are not readily apparent** in spreadsheets or statistical packages, **often creating new information** from existing data resources.

Hidden in most data is a geographical component: an address, postal code, census block, city, county, or latitude/longitude coordinate. With GIS, you can explore the spatial element of your data to display soil types, track crime patterns, analyze animal migration patterns, find the best location for an expanding business, model the path of atmospheric pollution, and make decisions for many types of complicated problems. “

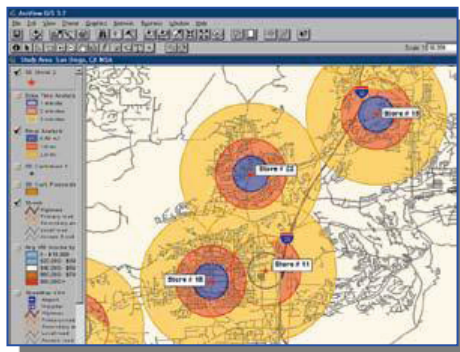
- Stanford University, <http://library.stanford.edu/depts/gis/whatgis.html>



Coupled with this [spatial] data is usually tabular data known as **attribute data**. Attribute data is generally defined as additional information about each of the features, which can then be tied to spatial data. An example of this would be schools. The actual location of the schools is the spatial data. Additional data such as the school name, level of education taught, school capacity would make up the attribute data. It is the partnership of these two data types that enables GIS to be such an effective problem solving tool through spatial analysis.

GIS operates on many levels. On the most basic level, GIS is used as computer cartography, i.e. mapping. The real power in GIS is through using spatial and statistical methods to analyze attribute and geographic information.

- GIS Lounge, May 1, 2008 <http://gislounge.com/what-is-gis>



“...GIS applications are tools that allow users to create interactive queries (user created searches), analyze spatial information, edit data, maps, and present the results of all these operations. **Geographic Information Science** is the science underlying the geographic concepts, applications and systems, taught in degree and GIS Certificate programs at many universities.”

- Wikipedia, “Geographic Information System” May 11, 2009