

GIS In A Box: Managing A Growing GIS

Mix ingredients and watch it grow!

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Abstract

Do you wish there were simple step-by-step directions for a successful GIS? It would be great if GIS came in a box, like a cake mix, and you only had to add water and watch it grow. It is not quite that simple! GIS comes in all shapes and sizes, however there are some basic steps that every GIS should include no matter how large or small the system. This paper will discuss the common ingredients for a successful GIS, including the basic components, life cycle, management methodologies, and a discussion of pitfalls that can cause failure. You are invited to examine the past, present and future direction of GIS at Arkansas Game & Fish Commission (AGFC).

Introduction

This paper will offer an inside view of a GIS from the beginning to the current state. This account is offered to those who are embarking upon the task of growing a GIS within an organization. Most of us know that the five basic components of GIS are software & applications, hardware, data, people, and training & education. Regardless of the size of a GIS, these components exist. The project management process includes initiation, planning, execution, control, and closing. Applying these processes to GIS implementation is highly recommended and can increase the potential for success. Advice from the GIS community has been essential throughout this process at AGFC and has been greatly appreciated. Hopefully, this shared experience of how GIS evolved in this organization will lend a hand to others who are implementing a GIS or managing an existing program.

Starting from Scratch “Initiation Phase”

Arkansas Game & Fish Commission is a state agency with approximately 600 employees scattered throughout the state in regional and field offices. The primary mission of AGFC is “to wisely manage all the fish and wildlife resources of Arkansas while providing maximum enjoyment for the people.” The organizational structure of the agency consists of a director, two deputy directors, multiple division chiefs, and a board of commissioners.

Early in 1998 the agency obtained approval to hire an agency GIS coordinator. The position would reside in the Information Technology Division. Prior to that time, GIS was utilized on a very limited basis in the Wildlife Management Division. I was selected to fill the new position. Upon arriving at AGFC, there was virtually no equipment, no software, no data, no staff, no standards, and very little direction as to the expectations. After studying the processes in other organizations, I found this was not unusual. In the case of AGFC, a couple of people realized the value of GIS and were able to convince the

decision makers to direct some resources to the cause, thus funding and forming a new position.

Most people coming on board to manage a GIS will find it usually exist in one of two forms. It will either be a pre-existing system that someone has already begun to establish or it will be a brand new program, like a canvas waiting for the artist's first brush strokes. I am grateful to have had the opportunity to experience the later. In either scenario, part of the initiation process is to define the scope of the project and to evaluate the requirements by performing a needs assessment. Several questions need to be answered during this phase. Who will be using the system, where are they located, what products do they desire or require of the system, why is GIS the appropriate solution, where are these users located, and how will implementation and management be accomplished.

The project scope will vary depending upon the organization, because GIS comes in many shapes and sizes. It may exist in the form of one person in an organization performing GIS tasks with a single desktop application or it might entail multiple users in a department working simultaneously from a server application. A more complex system could include multiple users connected to a centralized database like SQL or Oracle on a local or wide area network. Multi-agency and global systems are now possible and becoming more common as technology advances to include applications like Internet Map Services (IMS).

Are You the Right Person for the Job?

Another important aspect of managing a successful GIS is to determine if the right person is in charge and do they have the "right stuff." A GIS manager needs to wear many hats during the course of their career. As with any technological career, the learning will never end. There is a steep learning curve for anyone starting out in this field, but even a well-seasoned veteran of GIS will need to continue their professional development and training throughout their career in order to keep up with changing trends and technology.

A technical understanding of GIS and working knowledge of geography goes without saying, but beyond those skills, a GIS manager needs to be a good leader, communicator, and facilitator. He/She needs to be well organized, possess the ability to adapt to change and to remain calm in the face of diversity. It is important to have a staff who you can trust and who are motivated to work independently. This discipline is one where innovation and creativity are essential. Thinking outside the box is the norm for most GIS professionals. It is often necessary for GIS managers to be both a salesperson and politician, as there will always be a need to maintain buy-in and to steer stakeholders and decision makers toward consensus. Sometimes GIS managers are called upon to instruct others about the technology. At AGFC many of the students had little or no technical expertise with a computer, much less GIS. It is essential to exercise patience with these users, as they often are the only ones who possess the subject matter expertise that is essential to a project. When dealing with the novice users, be sure to deliver training in the least intimidating method possible. Never forget you too where once starting out and technology is not everyone's niche.

Getting the Big Picture “Planning Phase”

The starting point at AGFC was to evaluate the current situation and to establish internal and external lines of communication. Our state has an excellent user forum, the Arkansas GIS User Forum, which enabled me to quickly network with those outside of the agency and to find out about data and projects that already existed in the state. It also provided excellent access to colleagues who were able to make technical suggestions as to how we should set up our system.

Internally, interviews with upper and middle managers of each division were conducted and lists of potential users and uses were compiled. A few major issues became apparent during this process. Many people had no idea what GIS meant or what products could be produced. Users were scattered throughout the state in various locations on a wide-area network and most were very guarded about information related to their work, particularly with someone who they had never met.

These problems were addressed by establishing an implementation team with members who represented each major stakeholder and to initiate an education and training program. The first team was selected by upper management and consisted of only a couple of representatives that new about GIS. The rest of the team was selected based on the fact that they had time to attend meetings. Most had very little concern about the decisions that needed to be made, furthermore the group had to be educated about GIS before we could even begin to make decisions. After many frustrating months, the team disbanded. The second team was later reformed with staff that was a much better fit than the first group. The new team was made of people who had heard enough about GIS to be excited about it. They were far from proficient, but were much more teachable than the first group. They became the disciples of GIS and were willing to go forth to spread the good news.

Moving Forward “Execution & Control Phase”

During the next phase, many things happened almost simultaneously. As the second team was being formed, presentations and training sessions also began. Training was divided into three categories; those who needed to view information, those who needed to create information, and those who needed to analyze information. A short half-day information seminar was developed to educate users who seldom needed to access the GIS and who had never heard of it. The course covered basic information on general GIS concepts and was presented to small groups of about twenty people. Anyone using GIS completed this short seminar and was given the opportunity to return for a two to three day training course. The next level moved a step beyond just educating users. It was a training course, designed to prepare the students for using and interfacing with the system. I became an authorized ESRI instructor for ArcView in order to deliver software training at a minimal cost to our agency. Later, it was necessary to obtain authorization in two more ESRI courses in order to keep up with changes in software. If students were interested in advanced training, they returned for a third training session that covered the advanced topics. At the end of that course students were instructed on how and where to obtain additional training from vendors, websites, and universities.

During this time, our agency was using one data server for GIS. The plan was to purchase a server for data storage and a workstation for production. The GIS would exist as a very centralized program in the beginning, but we quickly out grew this configuration. A good rule of thumb is to hold off on purchasing equipment and software for as long as possible, then purchase the best equipment that you can afford at the time. Also, equipment and software becomes obsolete so quickly that you want to make certain you have a scalable or upgradeable solution, if possible. Once there was enough wide spread use to justify the cost, more equipment was purchased for the system.

At that point, the original interviews that had been conducted with upper and middle managers were helpful, but a more comprehensive evaluation was needed. The second round of interviews was much more productive because users were more educated about GIS possibilities. Our system was growing past infancy and the demand for products was increasing. Most data existed in desktop database applications such as Access, Fox Pro, and Excel. The need for standardization was recognized, not only for GIS, but also for overall management of agency information.

The Information Technology Division was progressing along with the growth of GIS. Efforts were made to move databases into SQL format, desktop computers were upgraded or replaced, and all desktop and server operating systems were standardized to Windows NT. A policy and procedure guide for GIS and GPS was drafted in order to establish guidelines for data collection, project reporting, and standards. Additionally, an updated implementation plan was submitted to upper management to keep them informed of progress and changes.

Commissioners were kept up to date with dog and pony shows, which were presented at least twice a year during this phase. Training and education efforts continued and pilot projects were completed in order to provide quick GIS successes. An opinion survey was introduced during the second year in order to evaluate the level of GIS awareness and use. These performances sometimes seem redundant, but were necessary to obtaining and maintaining the buy in and support that was necessary to the program's progress. It is important to manage the expectations at all levels of your organizations. This is sometimes difficult to accomplish and requires a careful balance between showing possibilities and being realistic about what is feasible with your resources.

During the execution phase, the initial plan was drafted, and then updated in order to design a system that fit the changing needs of the agency. The system was developed, tested, and several pilot projects were completed. A training program was initiated, a policy and procedure document was drafted, and new equipment was deployed to the wide area network. The process was continuously evaluated to determine if changes were necessary.

Surviving and Managing Change

Two and a half years into the project the director of our agency retired. The new director was not only familiar with GIS, but was a user. The GIS program was physically moved into a more visible location and a second person was hired to help alleviate some of the

workload. This allowed more time for coordinating and managing. By the end of the third year, there were thirteen redundant servers in place across a wide area network, thirty floating licenses on a main server, base data and regional project data on each server, an on-going training program, and approximately one hundred users at varying levels. The agency had moved beyond a multi-division desktop system and was beginning to take on the form of an enterprise system.

Technology and situations change, therefore you must be prepared to alter your plans to accommodate these changes. In our case, several changes had to be made to the current plan. We especially changed how we would deliver our service. One software platform was not sufficient to fulfill the needs of our users. A combination of multiple and single seat licenses were obtained in order to support the different type of user environment. In addition to GIS, Global Positioning Systems (GPS) were used extensively and the responsibility of support, training, and maintenance of over two hundred users now fell on the GIS staff. IMS had long been a consideration, but it was ultimately going to become a necessity in order to deliver projects and data to those outside our network. It had also become very clear that customizations were going to be necessary in order to create user interfaces that were easy to use and specific to the type of projects that were being completing.

Growing Exponentially

At the beginning of the fourth year, a third person was hired to support GIS activities. The GIS staff consisted of a coordinator/manager, cartographer/analyst, and a technician. Each person wore many hats and was diverse in their knowledge of agency workings. Professional development and training was essential and continued for each staff member. The situation was like treading water; the program was just barely keeping up. There had been steady growth in the program from the onset, but during the fourth year of the program there was a spark. GIS started to spread like wildfire throughout the agency. Projects, training, and data request were pouring in to the staff. It seemed that overnight the program had transitioned from a steady to an exponential growth rate. This was a sign of success, but a very scary phenomenon to experience.

The beginning of the fifth year brought changes once again with a major re-organization in the IT division and another new agency director. Under the new arrangement, the GIS section reported directly to the Agency's Deputy Director and two employees were transferred to the GIS program from the wildlife management division. These employees were well-seasoned habitat managers who had shown a great potential to learn GIS and bring subject matter expertise to the program. They were responsible for coordinating efforts in the field. The state was divided into two geographic territories and each person was responsible for user support, server maintenance, and project management in the areas of the state beyond headquarters. Things were not perfect, but the program was still moving forward.

We were fortunate to be able to grow our own staff from within the organization. I have found that other organizations have successfully built a program in this manner. The new GIS staff members were familiar with GIS and had attended all levels of training and had

been selected to serve on the second GIS team. Their hard work and desire to apply this technology to habitat management afforded them the opportunity to join the efforts on a full time basis.

This arrangement has been a great catalyst to our program, although we still lack staff with the skills to develop and maintain custom programs and databases at the enterprise level. This has been a sizable pitfall of our program. Ideally, a fully functional enterprise GIS of this size should include a manager/coordinator, application programmer, database administrator, analyst, cartographer, trainer/educator, and at least one technician. Our program is lacking in a couple of areas, however a solution to this issue is being sought. Two part-time people have been added in order to help with projects. The program currently has a staff of five full-time GIS employees and two part-time employees.

Is It Done? What about the “Closeout Phase?”

The shaking and moving is not quite over. As you may have noticed, there is no “closeout phase” discussed. Our job in the GIS program will never be done; there will never really be an end. It is always changing and will always require monitoring, updating, and maintenance. Nine months after the major re-organization, the decision was made to make the GIS program into an independent division that would reside under administration. This was a major milestone for GIS, as it is evolving to new level.

The staff is currently working toward delivering data to the public via IMS and custom web applications. Additionally, they have completed hundreds of GIS projects in the past year. GIS is widely used in the agency these days and GIS information is commonly integrated into presentations at our month Commission meetings. The possibilities of partnering with other state agencies is being investigate in order to leverage the economies of scale and to utilize resources more appropriately.

The GIS program at AGFC is far from perfect, but it has grown significantly. There is still an enormous amount of work to be done in order to integrate existing data, but these days when you mention GIS, people do not stare at you with that blank look and say, “What is GIS?” They know! The term GIS is now part of our agency jargon and it appears to be here to stay.

Conclusion

How does one measure success of a GIS or the benefit verses the costs? This can be very difficult because so many of the benefits are intangible. A GIS should save time, lives and/or money, and its purpose should be consistent with the mission of your organization. Regardless of the amount of data, equipment, and software that exist, if people do not utilize the tools of GIS then it is useless. The bottom line is that GIS can provide a means for people to improve the value of their work, to improve decision-making, and to make jobs easier.

There are many factors that can contribute to a successful GIS. Make certain that you identifying the reasons for implementing GIS, evaluate the current situation, and develop a well-organized plan. In order to develop a good plan, communication and coordination

with stakeholders is necessary. A needs analysis will be helpful in determining the requirements and products desired by the stakeholders, however education and training may be necessary in order to facilitate the process. A successful program needs a good leader who can be many things to many people and is resilient to change. It also requires good people working for the program. It is important to realize that GIS has the potential to change the culture of your organization by cutting across the turf that may have existed for years. Implementing a GIS program will not be simple, but there is an abundant amount of information available to assist anyone tasked with the responsibility of a new program. Learning from your colleagues in the GIS field and how they manage GIS is an excellent way to get a jump-start on the road to your own success.

I sincerely appreciate all those who have worked to initiate GIS in our agency. I am grateful to my excellent staff, a supportive administration, and to my colleagues in the GIS field who have shared their experiences in order to help those starting out. I am hopeful that sharing my GIS experiences will be beneficial to others.

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