

Gaining Support for GIS in a Rural Environment

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Abstract

Benefits of GIS might be readily apparent in urban areas, but what about areas with smaller populations? The County of Kauai serves a population base of approximately 60,000 people. Until very recently, many County-wide systems (not just GIS) have been primarily paper-based. Many people are reluctant to move away from familiar systems to computer-based alternatives. In addition, it has been difficult to convince decision makers that GIS is a worthwhile investment, as they typically tend to think of GIS as a tool for urban planners in very large cities. However, we have successfully implemented some small GIS applications, and as we build momentum, it's exciting to see that many people around the County are enthusiastic about this new technology. This paper will examine some of the issues that we have faced and offer suggestions to those in similar situations.

Introduction

The County of Kauai is a small rural community comprised of the two north-westernmost of the eight major Hawaiian islands, one of which is privately owned and off-limits to outsiders. For most residents, the County consists of a single island – Kauai. We are self-contained, but are certainly not self-sufficient, somewhat isolated and very dependant upon resources from the outside.

This is a crucial time for Kauai. Until the latter part of the 20th century, it was largely an agricultural island. Sugar cane was the major crop, and sugar plantations provided jobs to a large portion of our population, which was local and family-oriented. Tourism played a big part in the economy, as it does for the entire state of Hawaii, and there were other industries as well. But by and large it was still a rural community. Fortunately or unfortunately, depending upon your perspective, those days are gone forever. Sugar is gone, agriculture is now greatly reduced, and tourism is huge. Pressures for development are great.

The population is approximately 60,000 and growing. As a population density, that works out to about 110 people per square mile, but that distribution is obviously not uniform. The interior of the island and much of the north shore has terrain too rugged to be built upon, so the population is distributed between several small towns in coastal areas that are connected by a single major roadway. Traffic jams have descended upon our sleepy island with a vengeance.

Many of our challenges are unique. Our way of life is influenced by the fact that Kauai is an island, and a Hawaiian island at that. To say that tourism is a huge part of the economy is to greatly understate the point – it's absolutely vital to the economic health of the County, just as it is for all of Hawaii. The tourism industry capitalizes on the natural beauty that surrounds us and continues to experience rapid growth. Trips to the beach,

hiking in the mountains, helicopter tours, and just soaking up the sun in a breathtakingly beautiful environment are all part of what makes Kauai such a popular destination.

Public safety, most notably search and rescue and evacuation in times of emergency are of great importance here. Hurricane Iniki devastated Kauai in 1992, leaving thousands homeless and stranding many thousands more tourists who were unable to leave. Iniki's legacy lives on – residents are keenly aware of how vulnerable we really are to hurricanes. But we also face threats from tsunamis, flash-flooding, wildfires, earthquakes, and more.

The aloha spirit is part of what makes Hawaii unique, it's part of what makes it such a popular tourist attraction, and it's something that is slowly disappearing. It has been said that the Hawaiian culture is a culture under siege. Spiraling real estate costs and a dearth of employment opportunities have forced thousands of locals to relocate permanently, taking much of the culture with them. Pressures for new development have brought an old problem into the limelight once again – culturally significant historical sites. Numerous such sites exist, but pressures to build anyway are unceasing. To further complicate the issue, known sites are not necessarily catalogued effectively. Most may be known to someone somewhere, but may nevertheless be overlooked when considering building sites.

Apart from these unique challenges, Kauai also faces many of the same challenges that other small communities experiencing growth encounter. Limited infrastructure (roads, municipal water and sanitation, traffic signals, etc) is inadequate in many cases, and what we do have is oftentimes aging and in need of repair or replacement. Attempts to hold growth to a sensible pace coupled with the natural beauty and desirability of the area have led to housing costs far beyond the reach of all but the very wealthy, while a limited economy means few jobs are available. The result is a changing population demographic. Family communities are being supplanted by part-time residents. The County is struggling to cope with this changing demographic and still serve the population in the best way possible with the limited resources at its disposal.

Finally, there is the issue of technology – it's often misunderstood. Until quite recently, all County systems were paper-based. As a result, many processes are manual and understood only by highly trained personnel with very specific job skills and experience. Some in these positions are resistant to change, but may also now face retirement age. As they move on, there is no mechanism in place to allow for the transfer of knowledge to allow things to keep running the way they always have. We cannot continue with the status quo, yet there is some hesitancy to adopt a technological approach to problem solving. GIS is no exception. There are any number of ways in which the County can benefit from GIS, but gaining support for it can oftentimes be challenging.

Learning GIS

If you're reading this, then you presumably already know a bit about GIS. Which means that, in all honesty, you probably know more about it than I do. I'm definitely still a learner, and I only get to learn and work with GIS on a very part-time basis. My job title is Database Administrator, which places me solidly in the IT sector, but I started out as an engineer (with very poor drafting skills) and have always loved maps. So my enjoyment of computers and love of maps together make a natural fit – GIS is very much right up my alley. It's cross-disciplinary, and, as such, provides a wealth of learning opportunity. There is so much to learn, and in the process of learning, I've been able to communicate to others what GIS can do. We are still *very* small and many of the things we're doing with GIS are simplistic, but it's exciting to watch it grow and to see others get excited about the technology.

The specifics of ArcGIS provide a great starting point, of course. I know a little. Not much, but I *am* enjoying learning. It seems like an area where I can spend years learning and applying what I've learned. But specific software is only part of it. I'm trying to learn some of the specifics of geography, things that a lot of people in the GIS community take for granted. In my experience thus far, most people I've met are approaching this from some sort of geography and/or planning perspective – quite the opposite from me. I've got a lot of work to do to fill in the gaps. Datums, projections, cartography – all new to me. It's great fun to learn all this stuff.

It didn't take long to see some obvious GIS applications that could benefit the County of Kauai. We are experiencing growth and need to allow for expanded development, but where and when should this expansion take place? Growing tourism and the need to protect the public health and safety mean we need to make significant investments in our infrastructure, but again – where and when? Increased property values provide increased revenues for the County, but where is the increased revenue coming from exactly, and what does it mean? How can we provide services for our growing population, and, perhaps more importantly, the shifting dynamic that makes up that population? We are growing away from a small family-oriented place and more and more towards a home for a semi-transient population. How do we deal with that?

Early on, it became clear that we should have a three-pronged focus and approach to GIS – public safety, development/planning, and taxation. Prioritizing these three have allowed us to gain the most support for GIS in the shortest amount of time by providing relevant and useful applications that easily demonstrate the power of the technology behind GIS.

It's been my experience that in trying to get GIS off the ground in a small community, it was invaluable to have done my homework first. I could identify the areas of greatest need, but had to go a step further and identify the areas where we could get the most done for the right people in the least amount of time. I realized that, while I might be aware of how useful GIS is, if the decision-makers aren't, then I probably didn't stand much chance of getting things off the ground.

For the County of Kauai, the natural starting point was taxation. If you're in an organization that doesn't have GIS and you want to get GIS, I'd recommend doing the same thing I did. When in doubt, follow the money. Start with the revenue stream. If you can use GIS to get information in the hands of the people that have the power to use it to affect revenue (positively, of course), you're golden. How can they say no once you've done that?

After you've identified the goals that can get the notice of the decision makers, make a plan to reach those goals. Set specific tasks and take those specific tasks with you as you learn more about GIS. Find out how to use GIS to solve your exact problems and always, always, *always* be looking for opportunities to showcase its capabilities. Problem-solving is what it's all about. To me, it's become a hobby that's useful. Uncommon, I know.

Leveraging Existing Resources

I joined the County about eighteen months ago. At that time, there was little GIS in place, but there were quite a few existing GIS resources. This proved to be a double-edged sword. There have been several false starts on GIS, and many correctly felt that a good deal of money had been spent in years past with very little to show for it. Most of the expenditures had been in the form of specific projects undertaken for reasons that were sometimes poorly understood. The finished products, while meeting project requirements, often proved to be of little use.

Although there was some reluctance to try again, I asked for and received approval to spend some time researching what we did have. That time was well spent. This was my very first exposure to GIS, so I had to ask some very basic questions, but by doing so I was able to learn about some of the things we had and why they hadn't been as successful as some had initially hoped.

The County did not have, and still does not have, any dedicated GIS personnel. However, there are some people in our Planning and Water Departments that use GIS as part of their jobs. Most notably, they have used and continue to use a parcel layer created by Royce Jones – head of ESRI's Honolulu office. This layer was created by merging plat maps with real property assessment data, and is in use by government and private organizations throughout the state. It provided the launching point for several different GIS endeavors that have gained the attention of County administration.

In addition to the parcel layer, I was able to take advantage of several layers created by the University of Hawaii in support of a state-wide disaster preparedness study done in the wake of Hurricane Iniki. Much of Kauai's critical infrastructure had been mapped out as part of this study, but was not being used by anyone at the County because of lack of tools and GIS expertise. "It's there, but what do we do with it?" was a common complaint.

Starting With a Specific Application

It quickly became obvious that the parcel layer could be a powerful tool for tax revenue analysis. The timing was fortuitous – I discovered its existence at a time when the County was involved in significant debate surrounding rising property taxes. This is still a very hot topic, but there were several tax relief proposals under consideration at that time. There was no easy way to understand the ramifications of competing proposals. Everyone agreed that relief was necessary, but how could the County ensure equitable distribution of taxation and at the same time budget in a fiscally responsible manner? Population growth and distribution changes are difficult to understand in the context of spreadsheets and columns of numbers. On the other hand, information that can get lost in pages and pages of numbers can quite literally leap off a map.

As part of my job duties, I developed statistical computer simulations of several different tax relief scenarios. While the County administration was expecting numbers only, I merged the data with the parcel layer to produce a visual representation of the results of each simulation. This led to several new studies which produced results used by our County Council in setting tax rates and drafting tax relief programs over the following two budget cycles. The hook had been set – GIS proved to be useful, relevant, and something more than just a money pit.

The GIS Community – It's a Friendly Place!

The GIS community, and especially the community of ESRI ArcGIS users, is an extremely friendly and helpful place. Kauai has been the recipient of much wisdom bestowed by many people who have gone before. We continue to gain the benefit of their experiences. You can, too!

If there is an ESRI user group in your area, then by all means, go to the meetings. Interacting with other GIS users in an informal environment provides a great way to learn about what others are doing and find solutions to many problems you may be facing. If there is no user group in your area, then start one! I did. And I'm so glad I did. The contacts we've made have helped tremendously, and the greatest support has come from ESRI and from similar government organizations. If you're in a similar situation, then enlist ESRI's aid – they're always willing to help. Try to find organizations that are similar to yours. If you can't find any, ask ESRI. Odds are they'll know somebody.

It's no secret that ESRI isn't like the majority of other software companies. In my experience, their willingness and ability to help their customers is absolutely unprecedented. In part because of the County's previous bad experiences with little return on investment, I was unable to secure approval to make any initial purchases. So I first began an investigation into GIS without any actual GIS software. I read about what GIS was, formulated some ideas about how it might be useful, and then made initial contact with ESRI. I was pleasantly surprised to discover that Royce Jones, head of ESRI's Honolulu office and the face of GIS to many in Hawaii, was planning a trip to Kauai in

the very near future. He was more than willing – in fact, quite eager – to meet with me to discuss GIS at the County. At that meeting, I mentioned that I didn't have any software and inquired into the possibility of obtaining a trial version of ArcView to work with until I was able to purchase a fully licensed copy. I expected a formal (perhaps complicated) process, but Royce reached into his briefcase and produced a CD with a fully functional copy of ArcView and all extensions – good for sixty days. I used this trial copy in my initial tax relief simulations. The task was admittedly small, but it was enough to gain the interest of our decision makers and got me the go-ahead to investigate GIS further – and actually purchase the real thing.

After we met, Royce returned to Honolulu and (electronically) introduced me to the GIS coordinators for the other counties in the state and for the State of Hawaii itself. They all have proven to be more helpful than I ever could have hoped. The State of Hawaii has proven especially helpful. They have provided us with a wealth of resources – everything from a multitude of existing layers to willingness to host County IMS on State computers and everything in between. Last fall we were able to partner with the State to purchase high-resolution satellite imagery of the entire island of Kauai for approximately 1/6th the normal price. The project was actually tied to FEMA and their new D-FIRM maps. DigitalGlobe, owner of the Quickbird 2 satellite, was willing to allow federal, state, and county governments to share the cost of this imagery. This is the first time high-resolution satellite imagery of the entire island has ever been taken, and is a tremendous asset to the County's fledgling GIS endeavors. The purchase coalition and licensing issues were not things I would have even known how to approach, but the State took the initiative and bent over backwards to make sure we were included.

There are many others. Representatives from the counties of Honolulu, Maui, and Hawaii, Federal government agencies including, but not limited to, FEMA, NOAA, and USGS, private engineering firms in Honolulu and on Kauai, and many others have been ready, willing, and eager to help at every step. This has been a tremendous boon, and has made us realize that, while we might be physically isolated, we are far from alone.

Making Friends with Decision-Makers

The County of Kauai is of course subject to political pressures from community leaders, and real estate development on the island is one of the biggest sources of that pressure. Developers, contractors, architects, and others involved in the construction industry are clamoring for technical advances to help the building permit process. GIS is seen as a large component of that potential solution, and I have been able to meet with members of commissions and boards that provide input to the Mayor and County Council members. They have stated many times over that GIS is critical, and people are beginning to listen. There is still the specter of past money spent for little tangible result to overcome, but it's clear that our administration would very much like to see GIS work to provide services to these community leaders and to the population at large.

And producing tangible results isn't as difficult as many had feared. In fact, by choosing reachable goals, we have been able to start small and deliver to many different internal users. Backing from Department heads – usually in the form of moral support, but also with some concrete resources as well – has helped people at the County believe in GIS once again.

Delivering Big By Starting Small

After computer simulations of taxation scenarios, we turned our attention to the Kauai Police Department's dispatch center. In 2004, KPD implemented a new Computer-Aided Dispatch (CAD) system that includes a GIS component that geocodes addresses based on caller ID to pinpoint emergency locations. However, its default configuration uses a streets layer consisting solely of purchased data, which proved to be woefully inadequate for our purposes. In Hawaii, nobody knows or uses route numbers, but streets were labeled as such. Hawaiian spellings were frequently incorrect, address ranges were oftentimes inaccurate, and many streets simply did not exist at all. We used our new ArcView license to clean up the streets layer, added the parcel layer, and then lined all streets up with parcels. When the CAD system went live, we were able to configure it to search for a specific address in the parcel layer, then geocode against a much-improved streets layer as a fallback.

The biggest gains, at least from the perspective of gaining GIS support, came from real property taxation analysis, but this information was not widely known outside of the Finance Department. Once again, Royce Jones and ESRI came to our aid. Royce provided us with several copies of a color-coded map showing all major landowners on the island of Kauai. It's really quite striking. I gave copies to personnel in Finance (Taxation, Collections, and Accounting), Council Services, Planning, the Mayor's office, and many others. Everybody loves them, and everybody is always asking for more of them. They provided a great starting point for our Finance Director and Deputy Director to begin discussing GIS and its applicability for the County. This in turn provided us with the impetus we needed to gain financial and moral support for GIS.

We've also done several other things with GIS, but I'm focusing on these in particular because they help drive home an important lesson we learned early on – moral support is great, but it takes a financial commitment to resources to make dreams a reality. And the best way to gain that support is to show the people that control the pocketbook how much GIS can help.

Gaining Financial Support by Impressing the Controllers of the Purse-Strings

By starting small and delivering applications that were useful and relevant, we were able to secure financial commitments from our County Council. This past year, IT was given a budget of \$50,000 with which to purchase GIS infrastructure. We've put the money to good use, and now have centralized GIS servers hosting ArcInfo editing licenses, centralized ArcSDE, and centralized ArcIMS to serve GIS via the County intranet. We have satellite imagery at approximately 1 GB per quad – raster sizes which make a good case for the use of an enterprise geodatabase scheme. High-end editing is possible with ArcInfo, and we are able to use ArcIMS to push layers to personnel without GIS software via a web browser. NOAA is creating a hazard mitigation tool for us – the only major requirement on the County's part was an investment in ArcIMS. NOAA's fear was that this would be a difficult sell to the County – they were shocked, amazed, and quite pleased to find that we had already purchased it. The feeling is mutual – I'm quite pleased and extremely grateful that they're doing so much for us. The funding to make this all possible was given to us as a direct result of a budgetary surplus made possible in part by previous GIS analysis and database work. The funds were originally earmarked for consultant services to do real property database analysis. GIS enabled us to do most of this work in-house, and a surplus was returned to the budget. Even after allowing us a healthy sum for GIS, the County still saved a significant amount.

Of course, we still don't have any actual dedicated GIS staff. And this coming year's GIS budget is a tiny fraction of what we had last year. So we're still small and doing our best with what we have. Nevertheless, last year's budget gave us a great start. And the biggest reason we don't have much County funding per se is that we now have several hundred thousand dollars of grant money tied to specific projects – projects which would not have been possible had we not made the investment in GIS infrastructure. These projects are currently all out-sourced, but we are able to take advantage of this work by having someplace to put everything. That constitutes another victory as far as I'm concerned, since it means I get to keep working with GIS part-time.

Summary – Having Fun with GIS

GIS is an exciting technology. The potential applications are truly endless. While it's obvious how it can be used in large urban areas, I've discovered that it is just as useful wherever you may be.

The County of Kauai is still a small place. We are very much tied to our rural roots, yet are excited about moving into the future. GIS will help us plan for intelligent, responsible growth while still preserving those things that are most important to us. Belief in this technology and its applications has already helped to overcome many hurdles and prepared us to overcome the many hurdles that still remain.

You may encounter any number of limitations in your attempts to bring GIS to a smaller organization. Lack of funding and a general lack of understanding of technology (and perhaps a certain amount of justifiable hesitance as well) were, and continue to be, our biggest challenges. But learning about how GIS can help and getting that information into the hands of the right people in a format they can use and at a time when it was really needed helped us get things moving.

If your imagination is really the only limit, then use your imagination! You might be surprised at how much you can accomplish. And, perhaps most important of all – just enjoy this technology. Enthusiasm is infectious. If you enjoy what you're doing, and if you can use that enthusiasm to build a vision for where GIS can take you, then it's a lot easier to gain the support of those that can help make your dream a reality.

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