

A Successful Enterprise GIS: Can It Be Duplicated?

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Since 1996 Pierce County has utilized an ArcView application, called CountyView, as the county's enterprise GIS. After 6 years of use the application continues to draw more and more users, most of them grateful to be able to access the system from their desktop. This paper will attempt to describe what has made CountyView a successful enterprise GIS, and categorize the elements needed in creating a successful enterprise system. CountyView has grown and changed some over the years but most of the original structure is still intact and can provide a model for similar enterprise systems. Also to be discussed are lessons learned in its growth and where it's headed in the foreseeable future.

Pierce County GIS first began to work on an enterprise approach to GIS with the release of ArcView 2.x in 1995. Previous releases of ArcView did not allow for customization of the application. It was with the introduction of Avenue as an ArcView development language that ArcView became a viable enterprise solution to GIS. Therefore with the completion of the digital transformation of Pierce County Assessor/Treasurer's parcel maps, the county was ready to introduce GIS data in, many if not all, of its various departments. The GIS department began the arduous task of learning a new programming environment in Avenue and using a new GIS data structure, the shapefile, in order to conceive of a software product that could be used by both seasoned GISers and the many new and yet to be users of GIS data and services. CountyView was founded with both of those types of clients in mind. The Pierce County GIS user group of that day began to meet to give input into what they would like to see and how the GIS data should be organized. Organization of the data turned out to be a key factor in CountyView's early acceptance by the established users and by new users. The data, it was decided early on, should be organized not by data owner or data user but by data type. I believe this decision was vital to establish CountyView as an enterprise system and not just the private property of one or two of the larger departments. The same organizational structure continues to keep CountyView as necessary today to its many new users, as it is to those who have used it for years.

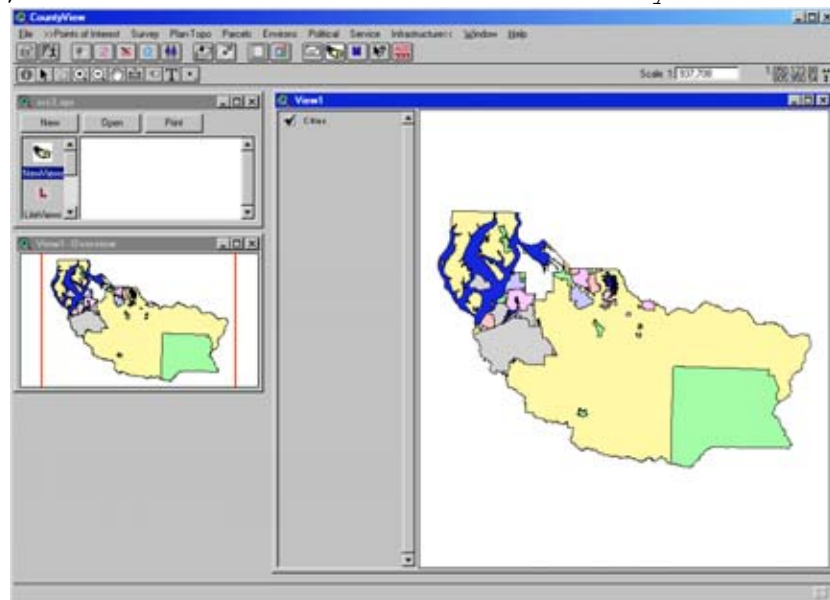


Figure 1. The Original CountyView

Later when ArcView 3.x was introduced and along with it the Dialog Designer and Extensions, custom dialogs and controls helped to streamline the data menu organization of CountyView. The dialog designer also allowed for the development of easier to use controls and greater functionality of the depth of ArcView tools. The underlying software, of course, was a large factor in the success of CountyView, but it was only one of many factors that contributed to its success. Some of those factors we planned in advance, most we stumbled on to in years of providing GIS software and services to the County.

The following is a discussion of what we found worked for us, and some things that did not. I am indebted to an article from the July 2002 Geospatial Solutions magazine entitled "The Worst Mistakes in GIS Project History (And How to Avoid Them)". The author Jeff Myers in this article listed the 10 Top Mistakes made in GIS implementation, which got me to thinking and discussing with coworkers what it is that has made CountyView work and even more amazingly continue to work.

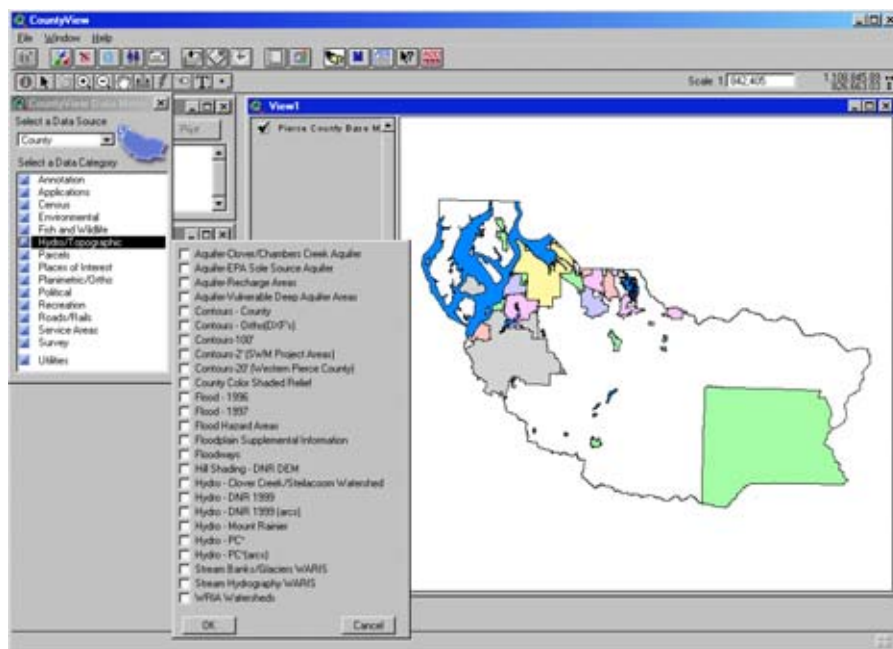


Figure 2. Today's CountyView with Data Menu

The first condition then for being a successful enterprise GIS is that the system

1) Must contain something that everyone needs. In this case it is the data. GIS data even in the mid 1990's was still a unique type of data in the world of tabular IS datasets. Being able to query data on a map was truly an amazing concept. Therefore as CountyView was being introduced the two data sets that were most in demand were the Tax Parcel layer and the Roads layer. Every department within the County had some use for these two layers. To be able to access that data with the ease of clicking a menu choice in CountyView seemed too good to be true. Couple the ease of accessing the data, with a function that allowed the user to find and display a particular parcel or address along a road segment, and CountyView became a needed piece of software form many County employees.

CountyView was introduced with not only these two essential layers, Parcels and Roads, but also with a list of almost 100 different layers. The

layers were organized into data categories including: Environmental, Topographic, Parcels, Places of Interest, Planimetric, Political, Roads, and Survey. These many layers had been in the domain of the few GIS users within county departments and now CountyView was making that data available to anyone who had the CountyView application on their desktop. CountyView also had the additional functionality of locating oneself within the county by parcel number, owner name, plat name, plat number and address. CountyView could also create mailing lists by proximity to a feature, query census data, contained a yellow pages listing of county businesses, and a crime mapping application. Beside those custom functions CountyView also made available all the functionality of ArcView for those who would become power users of the standard ArcView software.

Another important feature of CountyView was its ability to display Metadata for each of the data layers available in CountyView. After some initial training on why and when to use the Metadata CountyView users found it a convenient way to answer most of the data related questions, such as, what are these fields, or what is the meaning of that code or when was this data created, etc. Having the Metadata available not only helped the user get a better understanding of the data, but also eliminated many support calls attempting to find answers to those questions.

Later the addition of orthophotography of nearly the entire county drew a second wave of interest in CountyView. Suddenly there was a need for this imagery in almost every department within Pierce County. The demand was high for the orthophotos and when every year a section of the county was re-flown the historic value of the orthos was easy to see. More layers continued to be added to CountyView until today there are over 400 data layers available. It was and continues to be the data which drives the use of CountyView.

2) Must be easy to use. Of course we have all heard this admonishment many times, but we did try to take ease of use into account in developing the CountyView user interface. The data was and is accessed from a menu organized in categories of data type, the user merely clicks on layer they want to work with and it is displayed in the view. There is no need for navigating to the data or creating a legend or display classification for the data. The data displays with a classification or legend designed by the data owner. Thus it displays as the owner originally intended for it to be displayed. For most users this is more than adequate to meet their needs. They merely want to see the data on their map. However for those more experienced users who want to change the display for their particular project they can do so since all the ArcView functionality is available to customize the display.



Figure 3. The LiteGUI

The CountyView project opens to a GUI that is a subset of the complete ArcView user interface. The pared down interface, known as the LiteGUI, is much easier for the new or inexperienced user to deal with. The choice of buttons, tools, and menus is not quite as overwhelming as in ArcView. The custom CountyView buttons use colors beyond the standard black and gray of their ArcView counterparts, making them easy to see and identify. However the complete ArcView GUI is also available with the click of a button.



Figure 4. The Full GUI

A second facet of ease of use is the amount of training needed to use the software initially. Pierce County GIS has developed a two hour training course entitled CountyView Lite that introduces users to CountyView using the LiteGUI and enabling hands-on exercises for a quick start into the world of GIS. These classes are continuing to be taught on a monthly basis. Since this training is free of charge clients may take the class more than once and are encouraged to do so as their use of the product changes.

3) Must be easily and readily available. An enterprise piece of software needs to be easily installed. In Pierce County there is a PC and Network Services (PCNS) division that sets up computers, installs software and maintains those systems for County owned desktop computers. PCNS personnel were trained in how to install ArcView and CountyView. This includes both UNIX and PC versions of ArcView, since CountyView runs the same project file on either system. Having trained personnel installing the software and the flexibility of using UNIX or PC versions, allowed for the dissemination of the software to any location within the county. Most technical problems could be solved without bringing in additional GIS personnel. Soon CountyView was viewed as just another standard piece of software that most everyone would have access to.

Once installed, CountyView was also maintained through normal IS channels, i.e. the Help Desk. It was essential that help desk personnel were trained in the use of CountyView and were given additional training in some of the common problems that occurred with CountyView's use. This training also led to CountyView having wide acceptance because common problems could be reported quickly resolved without relying upon one or two "GIS experts" who may or may not be available. Also within IT's Production Services Division one person was specifically designated to GIS to maintain UNIX servers and work with printer problems that come with the fact that maps are the typical GIS end product. Again this person's familiarity with not only the usual IS maintenance tasks but also those specific to GIS helped to bring about a smooth running system.

4) Must serve multiple departments equally well. As discussed earlier the CountyView menu system being organized by data type and not by departments was and is a key factor in the acceptance of CountyView countywide. Keeping the data organized in this manner did not allow any one department to dominate the use of the system and the way the GUI was displayed. Therefore everyone got at the data the same way and it was available to all. However, that said, another key factor in CountyView's success is that each department can combine CountyView data with their own data and create and save projects of their own. Projects can be created and stored for later use with the CountyView GUI intact in those projects.

In unison with the ability to store projects is the ability to create, plot and store maps within CountyView projects. CountyView allows for the creating and plotting of 5 standard size of maps 8.5 X 11, 11 X 17, C, D and E size plots. A template is built through a wizard like interface which creates the map and plots it with minimal user interaction. However, like in other parts of CountyView, the full functionality of ArcView is also available to customize any or all of the standard map features. It is quite satisfying to

see these maps turning up at conferences, displayed in presentations and even appearing in the local newspaper from time to time.

CountyView was originally designed to be used as a tool within Pierce County government. It wasn't too long though before outside municipalities, agencies and businesses began to take notice of the possibilities of using CountyView within their own business environments. Soon Pierce County GIS was further customizing CountyView to fit in with these other jurisdictions needs. The menu system was expanded to include categories of data for these other users or subscribers. These new categories were placed at the same level as the County data. They were subdivided into the same organizational data types as the County data. Now there was another level of data reached from a menu which by default displayed County data but could be changed to access data from other jurisdictions such as Lakewood, University Place, Puyallup, etc and private companies such as Leroy Survey and Engineers. These subscribers to CountyView pay a fee to use the system and also agree to share data they create in CountyView with the rest of the CountyView users, thus expanding the range of data available within CountyView.

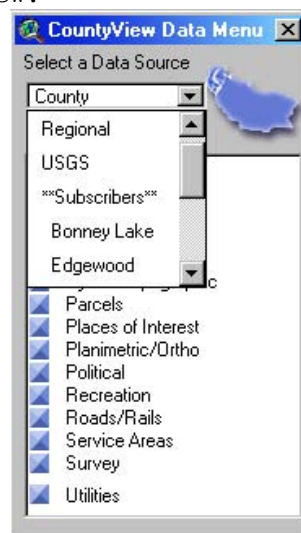


Figure 5. Other Data Sources

5) Must be easy to maintain. In order to keep an enterprise system going well, there is plenty of maintenance that needs to be done. The most visible of these tasks is keeping the data up-to-date. Facilitating data entry, editing and deletion is a wizard driven interface. New data is identified, given a legend or classification, and added to the menu system all through the wizard. The new data wizard allows for non-programming staff to maintain the data within CountyView, freeing the programmers to do other more specialized maintenance tasks for CountyView. All CountyView data is stored on a single data server. None of the data resides in the ArcView project in which CountyView is stored. The data is only added to the project when requested. Each data layer format is stored in an ArcView data structure called an object database or ODB file. These ODB files are read when the data is requested. They contain pointers to the data source, its legend, any scale dependencies, indexes, labels or other display features needed in CountyView. The wizard then creates, edits and stores these files to keep CountyView running smoothly. Since the ODB files are stored separate from the CountyView project, maintenance on these files can take place while the system is running. The fact that the data is also stored outside of the CountyView project keeps the project file itself small and easy to start. Slow starting projects were a problem identified early in the

development process and avoided at all costs. No one likes to use a piece of software that takes minutes rather than seconds to start.

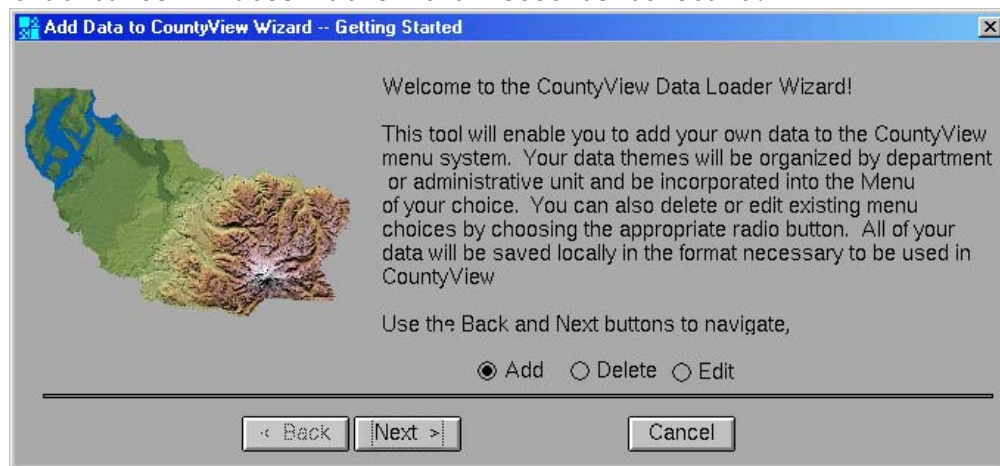


Figure 6. CountyView Data Loader Wizard

Other pieces of CountyView were also developed to be independent of the main project. As CountyView grew and ArcView evolved, Extensions were introduced along with the Dialog Designer. These development tools allowed for the independent development of CountyView enhancements. The CountyView menu system was redesigned with Dialog Designer and added to the project as an extension so that update to it could be done without affecting the core project. Other key tools were also redesigned in this way to keep maintenance efforts at a minimum.

The spreading out of the maintenance also allowed for multiple programmers and techs to do maintenance and learn the inner workings of CountyView. It is important that an enterprise system not be a one man show. One of the factors which keeps a system fresh and working well is input from multiple sources and not only from the users but also from other developers. CountyView has been able to spread out its maintenance and input and change with new developments in hardware and software.

6) Must have a manager or spokesperson to promote use at high-level. If there is no support amongst departmental management there will be no one to use the system. You must be willing to show users from the highest levels of management to the lowest how this enterprise system will benefit them and their departments. Merely handing them the product will not result in it being used. CountyView was presented over and over again in various contexts for it to gain acceptance and this process continues even now in some of the smaller departments that have never even thought about where GIS would fit in their department. Within the departments normally one or two users will be the first to use the product. When these individuals are identified special support can be given to them so that they are able to reach people within the departments which would not be reached otherwise. Once a base of users is established within a department keeping them informed is the major task of GIS staff. This information can take the form of regular meetings in which new software developments and data additions can be discussed or in the form of a newsletter. We found that early on the meetings were necessary but as the system matured the newsletter was the most effective way of communicating what was and is happening within GIS.

Finally make sure that the flow of information is not just in one direction. Listening to user feedback, however unpleasant it is at times, is essential for a system to grow and continue to be used. When clients can see some of their ideas show up in the product it gives them ownership and provides a definite opening for that user to spread the word further.

7) Must provide a complete set of GIS tools. CountyView was designed with two sets of users in mind. First the general user, it was for this user that the LiteGUI was developed, in order not to intimidate and start the inexperienced user easily into his introduction to GIS. The other set was what we referred to as our "power" users. Early on these users were made up of those who had formerly used ArcInfo and were already familiar with many of the capabilities of GIS. They had some new learning to do in order to use the new tools but it was mostly finding out new ways to do the tasks they had formerly done with ArcInfo and AML. In order to accommodate these users a button was added to the end of the default LiteGUI which opened up CountyView to the full functionality of ArcView. Later as some of the new users began to explore and ask questions about this other level of functionality more users began to take advantage of the full power of ArcView. Two GIS staff also became ESRI certified ArcView instructors to train those who wanted to take the next step into the world of GIS. We soon learned that we should never underestimate our users as they came up with new and unique ways of using CountyView that we had never even dreamed of.

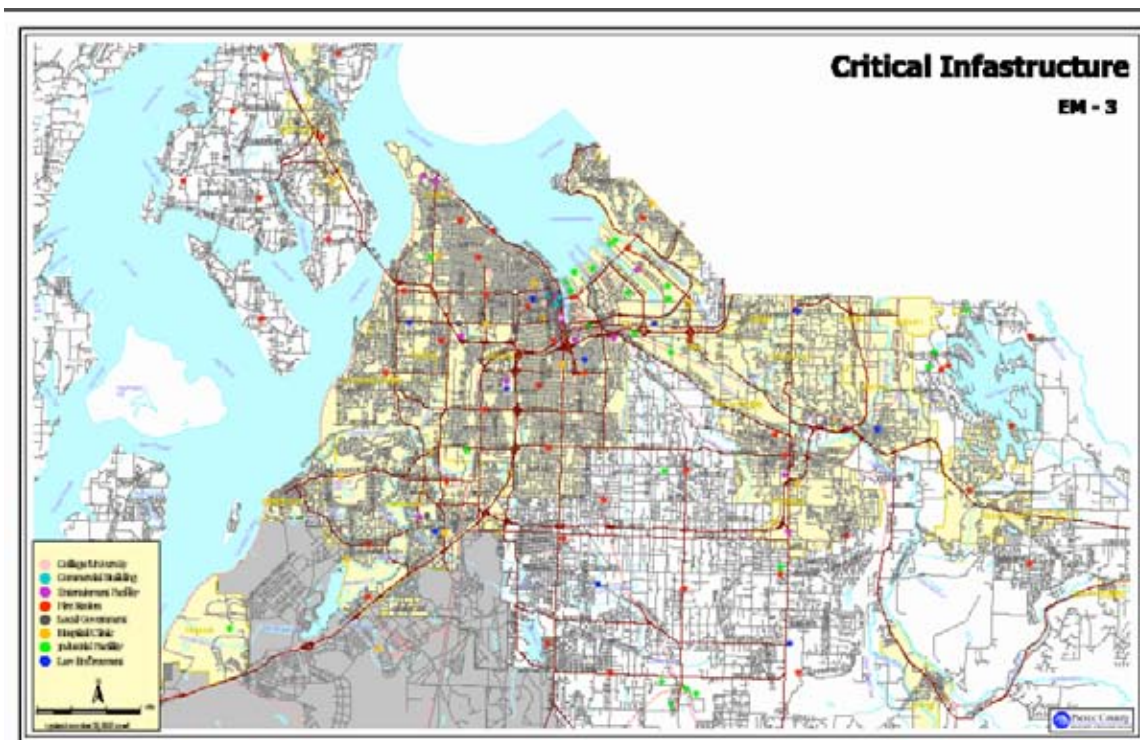


Figure 7. Emergency Management Map Generated From CountyView

CountyView is only as successful as the use it gets. That is the true measure of the success of an enterprise GIS system. The proof is in the ever increasing number of departments using the system, the number of subscribers continuing to make use of the system and in the multitude of ways in which it is used creatively to analyze and display the business activities of its users. We foresee CountyView evolving into a web service type of application, even more

widely accessible than it currently is in its desktop environment. Its parts are able to be accessed by other applications to build more specific solutions to the users business needs. Presently it does not seem that all of the pieces are available to make this happen but we are looking toward some sort of melding of ArcObjects and ArcIMS to achieve this end.

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References:

Jeff Myers, **The Worst Mistakes in GIS Project History** (And How to Avoid Them); GeoSpatial Solutions, Volume 12, Number 7, July 2002; Advanstar Communications, Duluth, MN

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