THE POWER OF DELIVERABLES
Benefits of Building an Enterprise GIS at the City of Kirkland, Washington

By Xiaoning Jiang, Brenda Cooper, and Karl Johansen

Abstract

The City of Kirkland, Washington, has committed significant resources toward implementing enterprise-wide GIS since 1998. The bulk of this investment to date has been in data development, although the city has also made significant progress in high-priority, value-added GIS applications. The city's overall strategy, based on an earlier plan and a structured GIS governance process, has been to adopt a quality- and service-oriented business model. This has included an aggressive deployment of ArcGIS desktop tools as well as mobile technology. Substantial benefits identified to date suggest that the approach is sound and likely to show continued growth and success. This overview of Kirkland's GIS implementation explores technical and organizational innovation as a key factor in attracting, retaining, and growing a strong customer base. From both user and management perspectives, the city's program is a result of careful planning, proactive service delivery, and judicious use of limited resources.

Kirkland: the Setting

The City of Kirkland, Washington, sits like a jewel on the shores of Lake Washington, just across the water from Seattle. With 10.42 square miles, and a 2002 population estimated at nearly 46,000, Kirkland is a suburban city with pockets of high density, an active downtown, multiple business districts, and excellent access to transportation. City government has historically promoted close ties between the community and the public sector, and has increasingly supported technology solutions to improve city service delivery. Geographic information system (GIS) technologies have become a key tool in this effort. Kirkland's GIS implementation has involved a substantial investment and a concerted effort by dozens of staff and consultants.

This presentation departs somewhat from the usual technical recitation of a typical GIS' life cycle, and focuses instead on the *genesis* of a successful urban GIS through much teamwork, effort, judicious problem solving, and attention to details. Kirkland is now fortunate indeed to be the proud owner of a major technology asset whose potential to the greater community has only begun to be tapped.

Kirkland's GIS "Baby Steps"

Like many municipal governments, Kirkland introduced GIS in the early 1990s *at the technician level*. This is not a criticism, but rather a recognition of how the technology was regarded, and what it could deliver, at the time. In its infancy, the City's GIS usage was characteristically project-driven, focused on base mapping, and limited in its reach. The City's sole GIS practitioner assumed this assignment in addition to other public works duties, and without significant outside help.

Even a fragmented or piecemeal GIS approach, however, adds some value, and this modest beginning became the foundation of much future GIS development work. Using consultant support, Kirkland soon expanded its GIS capabilities to the Department of Planning and Community Development, where base map updating, thematic mapping, and some spatial analysis occurred. This represented some improvement over the first "baby steps" in the GIS evolution, but still lacked a cohesive structure or direction relative to the overall organization. While not particularly innovative or entrepreneurial, the City's GIS approach at this time continued to evolve and improve.

In the 1998-2000 period, a combination of events launched the City from its toddler GIS stage to greater accomplishments. A GIS strategic plan was commissioned and formally adopted. The City hired

its first GIS administrator. A concerted effort was made to promote and begin implementation of a citywide GIS, based on the strategic plan's recommendations. Consultant resources continued to be used to make up for a lack of technical staff. Even with this forward movement, City GIS activities suffered from massive work backlogs, stalled projects, and some loss of customer confidence. In part, this situation may have been the result of a perceived lack of GIS *deliverables*. However, by late 2000, several factors emerged that ultimately helped the City turn this difficult corner and develop the highly functional GIS it has today.

Evolving a Formula For Success

Managers and council members, as well as technical staff, have long carried forward a vision of implementing this technology to better serve the wider community. In more practical terms, this means planning, building, and applying GIS appropriately across diverse municipal work groups that collectively deliver City services. A majority of municipal activities – and the corresponding information they utilize – are geographic in nature.

If GIS activities can be aligned with and effectively serve an organization's business priorities, the technology's usefulness is assured. Kirkland discovered some impediments to realizing this usefulness:

- Lack of a program structure
- Lack of a highly expert, technical staff
- Lack of the necessary technology infrastructure to deploy GIS enterprise-wide

Kirkland can trace its GIS path through many visionary and operational milestones, but made giant strides forward after a late-2000 reorganization. The City created an Information Technology Department and hired its first IT Director, Brenda Cooper. The City also hired a new GIS administrator, Xiaoning Jiang, who brought to her position a much-needed array of expert-level technical and project management skills in the database, mapping, application, and Web arenas. Karl Johansen, a career GIS professional with over 35 years experience in the municipal and regional GIS sector, was hired under a consultant arrangement to support major data development initiatives. Soon after, the new IT Department staffed aggressively to support Kirkland's expanding technology needs. The City's formula for GIS success began to fall into place with a rapid succession of important events:

1. A program structure was developed including an executive-level GIS steering committee, a technical GIS user group, a detailed annual work plan, and a new GIS funding model.
2. An IT strategic plan was commissioned to guide the City's 5-year budgeting window for technology activities, a key finding of which was that the City was underutilizing GIS and had failed to make major progress in implementing the 1998 GIS strategic plan recommendations.
3. Both IT and GIS staff were hired to support the expanded activities of the new IT Department. At the same time, GIS roles were expanded for staff in Public Works, Parks and Community Services, Fire and Building, and Police departments.
4. The new GIS group streamlined the citywide GIS data management procedure, implemented new procedures for maintaining core GIS data layers, and began a GIS "outreach" program.
5. Across the organization, a concerted effort was begun to retire the massive backlog in data development activities.

What was the outcome of these events?

The City IT and GIS staff actively sought to make measured, steady progress on all work plan elements, but at the same time ensuring periodic *deliverables*, no matter how minute. GIS analysts Kim Sun and Chris Mast assisted Xiaoning in marketing GIS to a rapidly expanding clientele through a combination of standard products, custom services, and training assistance. A philosophical difference emerged between the earlier, somewhat constrained use of GIS in the City. The newer, open, and more collaborative approach underscored the importance of presenting a complex technology like GIS so that it is seen as an asset to the end user.

Building the GIS Centerpiece

What are some of the key "building blocks" of Kirkland's implementation? And how did they come about?

Core base map elements and several thematic data layers have consumed much effort and budget over this first development phase. A major undertaking was to densify the City's Public Land Survey System (PLSS) and re-digitize all 13,000 tax parcels within the city boundaries. The results, done under the direction of a licensed surveyor, were a vast improvement over previous products. Aligned with this mapping were easements, right-of-way, public-owned property, and other parcel-based data layers. Earlier aerial mapping products have been updated and enhanced, with large-scale high-resolution color orthophotography now commonly available across the city and adjoining areas. This project also has yielded useful vector data sets in the form of building rooflines, impervious surfaces, topography, hydrography, and slope mapping. City address records were standardized and mapped at the sub-parcel level to meet the needs of numerous city business functions. So the program initially focused on common GIS layers needed to do other, value-added GIS products and services.

GIS Centerpiece #1: Parks Map

Product Request: The City Parks Department's existing parks/trails guide was badly out of date and nearly out of stock. The department needed a high-quality upgrade of this product to showcase the City's many recreational amenities. The client expected to utilize the best available GIS data and functionality to create a comprehensive guide to parks, points of interest, trails, bikeways, transportation, etc.

Chronology: The project first emerged as a largely unfunded emergency added to the citywide GIS work plan. The project became mired in extended discussion, planning, frustration, and contention on map purpose, ownership, choice of sources, design, etc., as deadlines came and went. Xiaoning assembled a project SWAT team that fast-tracked the planning, handed it off to an expert cartographic designer at the King County GIS Center, and nurtured the product through final completion, publication, and distribution. The City's Parks/Trails map eventually received wide acclaim including awards at regional GIS meetings.

GIS Centerpiece #2: Web Browser

Product Request: The City Manager's Office was searching for better ways to "GIS-enable" more City staff in a variety of disciplines, especially when presenting highly technical subjects in a limited amount of time to policy makers. This did not seem to be working effectively with the City's traditional model of centralized GIS services. The CMO asked IT to focus GIS efforts in any way possible to effect more widespread, innovative use of GIS tools and products in all work groups.

Chronology: The obvious solution to this need was the deployment of an intranet GIS browser, allowing desktop access to GIS tools and data for any staff member connected to the citywide communications network (about 400 users). The expense and effort to install specialized infrastructure (software and dedicated server) and conduct user training turned out to be minor in terms of the tangible and intangible benefits that resulted across the organization. The browser application yields simultaneous benefits by greatly reducing mapping requests on the core GIS staff, and providing significant efficiencies for the individual desktop user. Response throughout the organization has been nothing less than enthusiastic, as the following comments reveal:

> Planning Department: "I've found using GIS reduces the amount of site visits for certain investigations and enables me to have an aerial photo to communicate with others about a property."

> Parks Department: "GIS is not a luxury; GIS is not just the 'new kid on the block;' GIS is in fact one of the first tools we reach for out of the box when we're building a great parks system for Kirkland."

GIS Centerpiece #3: Police Dispatch Map Book

Product Request: The Police Department dispatch operation was struggling with an address/map book that was badly out of date, illegible, deteriorating, and potentially a liability. The department requested that the highest possible priority be attached to replacing this aging product using the best GIS data available, including the commitment to keep it current.

Chronology: Because of the obvious public safety implications, this project was given priority status in the new citywide GIS program. GIS analyst Chris Mast successfully combined parcels, addresses, planimetry, and color orthophotography in a compact map book format designed for the subdued lighting of the dispatch center and police vehicles. The enthusiastic response to the final deliverable is yet another example of technically expert, proactive, responsive customer service by the citywide GIS program to meet mission-critical needs.

> Police Department: "Excitement and appreciation all around; you have a huge fan following in the Comm center now!"

GIS Centerpiece #4: Infrastructure Field Mapping

Product Request: The City's GIS plan placed a high priority on developing high-accuracy GIS data for city-maintained infrastructure, specifically water, storm, and sewer utilities. This element of the GIS implementation grew increasingly more urgent because existing mapping was out of date, not in a GIS format, positionally inaccurate, and not easily integrated with business applications. The City also was under increasing pressure on regulatory compliance issues such as GASB-34, NPDES, and Washington's Growth Management Act. City staff met their immediate needs in a variety of stop-gap ways, including manually creating and updating their own facility maps.

Chronology: The GIS program approached this assignment in the traditional process of planning, user requirements assessment, design, and development, and transition to ongoing operations/maintenance. Xiaoning and Karl Johansen also tried a bold new approach with resounding success: assemble and engage a cross-departmental team, all members of which would have roles, responsibilities, and ownership in a successful project outcome. Most notable among these participants were utility maintenance staff, who received training in GIS and field data collection instruments, and who proceeded to map all of the sewer and surface water drainage utilities, finishing ahead of schedule with a minute error rate. This result was all the more remarkable in that no field mapper was more than marginally experienced in computers, digital mapping, or databases, yet the results speak volumes for both a concerted team approach and the power of GIS solutions, effectively applied. Final products including service area-wide map books and analyses have been impressive. Other projects that have begun to use these GIS-enabled field mapping techniques with good results are right-of-way tree inventory, sidewalk inventory and assessment, water quality monitoring, and sign inventory.

> Sewer and Surface Water Division: "This is the single most important project we have ever done, an opportunity to map our structures at the detail level. We now have faith in the data, can update maps in a fraction of the time, and can manage the utilities better than ever."

The integration of GIS with several other business applications (permitting, utilities maintenance, police dispatch) is well underway, and shows great promise for further extending the power of GIS at the work group level.

Value-added spatial analysis is now a routine, not custom, service of the City's GIS program. Support of drainage basin hydrologic modeling, crime analysis, development impact planning, parks planning and acquisition, natural resource inventory management, urban redevelopment, and non-

motorized transportation planning are all examples of applying GIS data and techniques to support improved decision making.

Standard map products and data CDs are widely distributed to the general public and other agencies, resulting in both benefits and savings. City GIS staff have also freely shared their technical expertise, procedures, standards, and other assets with community organizations, businesses, and other municipal agencies in the beginning stages of GIS implementation. The City is an active participant in professional and regional GIS activities, sharing its knowledge and "lessons learned" with peers in many disciplines and organizations.

The combination of the GIS vision, customer service ethic, and high-quality products have together made this program a valuable and much appreciated part of Kirkland's municipal services. The City intends to protect its investment in this valuable asset, and to build on the outstanding work already accomplished.

Care and Feeding of the City GIS

Returning to the subject of *deliverables*: it is invariably asked, at Kirkland and elsewhere, "When will the GIS be done?" The tongue-in-cheek answer by the GIS guru is, "It will <u>never</u> be done." An analogy might be that, in the same sense that a utility infrastructure requires care, ongoing maintenance, and eventual replacement, so too does the GIS depiction of that facility. While the major data development activities in Kirkland's GIS implementation will soon be "done," it is unlikely that the City's program will diminish in intensity any time soon.

Kirkland is seen as a highly livable destination, as well as historically suburban "bedroom" community. Although largely *built-out*, the City still is developing to some extent and will likely experience increased *re*-development in the future. All the core GIS data layers now in place, and probably some new ones yet to be identified, will require routine, periodic updates and enhancements.

Also, Kirkland may annex an unincorporated area to the north that will increase its area by over half. Most of the GIS data available in that area is substandard relative to what is available within the existing city boundaries. To meet the business needs of all current City GIS users, a concerted effort will be required to extend mapping for all themes in the annexed area.

Equipment and software upgrades are a certainty in this rapidly changing technology, as is the need for cross- and re-training of existing users. As the City positions itself to conduct more (or even most) of its business on the Internet, more sophisticated and powerful IT infrastructure will need to be acquired, managed, and maintained.

The challenge and the opportunity for the City GIS program are to accommodate these new assignments with the same energy and perseverance exhibited over the past several years, and that have yielded such impressive results.

In Summary …

Kirkland's City Manager, David Ramsay, sums up the City's need for GIS in this way:

"For me, it starts with the power of explaining through visuals. In doing so, we are far better at explaining often very technical matters to decision makers like City Councils. GIS can dramatically improve the situation and our chances for a successful outcome. Well done maps, customized to emphasize relevant information, enable decision makers to "get it" quickly. It allows intuition (i.e., common sense) to play a much more important role. I have been particularly impressed with the way that our Public Works engineers have used GIS; several recent agenda items have been very well done. …I continue to be a big fan of our GIS and think that you folks do a great job!"

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