Implementation of a Digital Submittal Program for Subdivision Plan Review

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Abstract:

Mecklenburg County completed a pilot project to implement a digital submittal program for the electronic review of single-family subdivision plans. Digital submittals can be used to improve the plan review process and be used as a source to update the GIS. The eight-month project included participation from County, City of Charlotte and Town of Matthews plan review staff and also included two engineering firm participants. This paper will address the challenges and lessons learned over the course of the pilot project.

Background:

The current plan review process for monitoring the safety, compliance, and long-term sustainability of future planned development is a paper intensive process laden with inefficiencies and perpetuated by the paper friendly culture of the land development community. In a typical year within the City of Charlotte/Mecklenburg County, over 100,000 individual pieces of paper are processed to support single and multi-family development projects. In addition to the paper, valuable time is lost waiting during reviews for mail/courier service deliveries as plans pass between review staff. Time must also be spent by staff and the customer coordinating between multiple review agencies who often must be provided with their own set of plans which must eventually be collected, reconciled, and returned in some orderly fashion. From a GIS data maintenance perspective opportunities are being lost for utilizing high-quality previously created digital data to streamline updates to GIS. For these reasons, Mecklenburg County and the City of Charlotte committed to try and improve the current process with the implementation of a digital submittal program beginning with a pilot project launched in March 2002.

For purposes of the pilot project, digital submittals was intentionally constrained to mean single family-residential subdivision plans and final plat maps. To demonstrate commitment to the development community on a new process, participation was sought and secured with plan review agencies within the City of Charlotte, Mecklenburg County, and in the six neighboring Towns (Matthews, Mint Hill, Pineville, Huntersville, Cornelius, Davidson). Collectively, Mecklenburg County reviews between 125-150 preliminary plans and 500-600 final plats each year, resulting in the creation of about 5500 new parcels and over 12,000 residential permits.
To initiate the pilot, several engineering firms were briefed on the project and two were selected who had projects that met the criteria for digital submittals. The primary technology pieces used included Autodesk applications for workflow collaboration (Buzzsaw) and redlining (Volo View). The Autodesk product suite was selected after reviewing offerings from nine companies and doing product comparisons between the top three. Although AutoCAD is the predominant CAD package used by firms doing residential development within Mecklenburg County, this was not the reason for selecting Autodesk products. Many of the plan review staff are not familiar with CAD software, so the primary factors were ease of use and redlining tool functionality. The GIS environment is built around the ESRI product suite including ArcGIS, ArcView, and ArcIMS. NovaLIS parcel editor is used to maintain the GIS tax map data.

The workflow used during the pilot project for digital submittals closely simulated the chain of events that would normally occur during the manual process. Paper copies were submitted along with each electronic submittal to serve as backups in case something was to go wrong. Files were placed onto a secure Internet site hosted by Autodesk (Buzzsaw) in designated project folders set-up for them by plan review staff. Each plan review agency would then review and copy files into their own private folder on the site to make redlines before saving final edits into a designated outbox for the customer to access (see Figure 1). The process would repeat itself for each resubmittal until the plans were approved (essentially the same for preliminary plans as well as final plats). Upon completion of several (usually 2-3 for preliminary plans, 1-2 for final plats) review cycles for preliminary plans, plans were signed off on paper consistent with the manual process.
Challenges and Lessons Learned:

The results of the pilot project can be summarized by more closely analyzing three topic areas pertaining to the electronic redlining tools, customer support, and CAD to GIS conversion.
1) Using electronic redlining tools

The difficulty with the transition for plan review staff from paper to onscreen reviews should not be underestimated. The following is a summary of the primary difficulties encountered by plan review staff:

- Viewing – staff found it was hard to gain an overall perspective view of the plans due to screen size limitations compared with paper.
- Scrolling Sheets - review was especially difficult when having to constantly reference other maps sheets.
- Adjusting - learning to adopt redline tools to existing processes was challenging.

Despite the challenges, there were also several advantages identified by plan review staff during the pilot:

- Measurements – staff found it was easier confirming measurement calculations electronically.
- Time – submittal and distribution can occur much faster online.
- Availability – plans can be reviewed anywhere anytime where Internet access is available.
- Communication – notification to others and with the customer is immediate.
- Neatness – typing forces redlines to be legible and comments to be direct, improving the clarity of changes requested.

In analyzing four primary components of plan review process, the following conclusions can be drawn about using digital submittals:

- Setup – working with digital submittals saves time by eliminating mail transfer.
- Review – planning related reviews are as fast or faster electronically, engineering related reviews take longer.
- Resubmittal – given time savings in being able to relocate previous redlines online, the time comparison to review manually versus digitally is nearly identical.
- Approval – not confirmed because digital signature/certificates were not in place to support solely electronic submittals without paper backup.

2) Customer support for digital submittals

Engineering and surveying firms support for digital submittals is contingent on three criteria:

1) Turnaround time for plan review must be as good or better,
2) Costs to support digital submittals must not exceed perceived benefits,
3) Trust in a fully electronic process must be demonstrated and established.
The concerns of engineering and surveying firms were quite evident early in the project. Challenges presented by surveying/engineering firms are summarized as follows:

- **Document security** – To ensure changes would not be made.
- **Distribution control** – Concerns about loss of control for distribution of plans.
- **Extra time** - Time spent renaming CAD layers to conform with digital submittal standards.
- **Professional licensure** - Fear of violating rules of the North Carolina Board of Examiners for Engineers and Surveyors by submitting plans electronically using electronic seal/signature.

To a large extent, each of the concerns was mitigated through the course of the pilot project. An explanation for each follows:

- **Document security** - The workflow collaboration environment relied on a secure hosted site provided by Autodesk Buzzsaw. The file format requested during preliminary plan review was an AutoCAD DWF that is read-only by design.
- **Distribution control** – Only customers and plan review staff have access to the plans on the site. Each activity on the system is logged and can be reviewed by site administrators. Including the hard copy backup eliminated the need to print copies of the DWF’s.
- **Extra time** – three versions of the digital submittal standards were developed until engineering firms felt comfortable with what was being requested. Internal workflow differences between firms make enforcement of stringent standards difficult.
- **Professional licensure** – presentations and demonstrations made to the North Carolina Board of Examiners for Engineers and Surveyors led to the drafting of a letter authorizing permission for firms to participate in the project. Work continues to develop a methodology for a solely electronic submittal of a final plat.

Once the first two firms found the process tolerable and even positive, others firms quickly agreed to try the process. A summary of the benefits identified by firms who participated in the digital submittal pilot project are as follows:

- **Accountability** – there was improved accountability by plan review agencies, no more lost plans or plans stuck in mail.
- **Costs** – digital submittals will reduce paper costs and fees associated with courier services.
- **GIS Updates** – the community now understands the value of GIS thanks to wide use of online GIS applications. They are therefore willing to help in efforts to reduce turnaround time for making map updates.
• Expedited addresses – Addresses are needed on new lots before final plats can be recorded and permits can be issued. Another incentive added in the digital submittal process was the assignment of address information directly onto the customer plans during final review (usually is separate from review process).
• Twenty four hour access – plans were submitted outside the normal business hours allowing firms the luxury of making submittals without rushing to meet 5:00 p.m. deadlines.

At the conclusion of the pilot project, engineering and surveying firms were asked to provide feedback to City and County executives as to their level of support for continuation of the digital submittal program. The comments provided were supportive enough to warrant a continuation of the digital submittal program into what is now being called phase two or an extended pilot project.

3) Using CAD data for GIS update

Another advantage sought from digitally submitted CAD data was the extraction of select layers for population into the GIS. The goal was to streamline GIS map updates and reduce the time elapsed between when a final plat is recorded and when the GIS maps of the associated area are updated for public access over the Internet. The conclusion drawn was that CAD data could be used for GIS updates so long as data submitted met certain criteria to ensure consistency between firms and to minimize the amount of preprocessing that would be required by staff to make the data usable. The pictures in Figure 2 show the submitted CAD data for a final plat map and the layers that were extracted for input into the GIS.

Challenges occur because the source inputs from surveying/engineering firms will typically be available in one of three conditions:

1) CAD data is in State Plane Coordinates and is tied to state monumentation data (in North Carolina, referred to as the N.C. Grid System).
2) CAD data is not in State Plane Coordinates but is tied to state monumentation data.
3) CAD data is not in State Plane Coordinates and is not tied to state monumentation data.
To provide some level of quality control during the pilot project, digital submittal standards were developed and utilized to assist in electronic file submittal. Involving representatives from the customer community early in the creation of standards was found to be critical towards gaining their acceptance later. These are private projects whereby the City/County does not have contractual control, so during the pilot the standards developed were lenient and mindful of customer time/costs. The primary components of the digital submittal standards instructed submitters to tie their final plat drawings to the North Carolina Grid, orient their drawing to true north, use North Carolina State Plane Coordinates, and to use layer name and CAD feature types (polyline, text, point) specifications for selected features. The original list had over forty (40) features, but eventually this list was paired this down to seventeen layers (17) to reflect data needed to densify the GIS ground control network, assist with street centerline maintenance, and for tax map updates (Figure 3).
Summary and conclusion:

- Collaboration among government units (Cities and County) is essential for generating support and commanding attention among customers.
- Communication with professional license boards and other organizations is essential for building customer trust with the new process.
- A stricter set of digital submittal standards should be put in place gradually over several stages to reduce resistance and build support among customers.
- Successful implementations for select customers will help to motivate others to want to try the process.
- Plan review can be conducted efficiently for small-medium sized projects but it remains undecided for larger projects.
- Conversion of CAD data for GIS updates is possible but is not as straightforward as one would hope.

Given the changing economic times, communities that can offer a streamlined plan review process stand to solicit more interest from developer’s for new land development, supporting economic growth and increasing the overall tax base. With the implementation of a digital submittal program the City of Charlotte and Mecklenburg County are one step closer toward the realization of an integrated land records environment where plan review, recordation, permitting, and tax mapping and other land records processes become available to the customer “online” instead of “inline”.

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