

A Vision for Surveying in a Digital World

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It is presumptuous for me to speak on this topic for several reasons. I don't necessarily know what surveying is and I don't have a crystal ball. I can only share my perceptions of what the future may hold. Furthermore, I'm quite new in New Mexico and still learning about surveying practice here. Maybe I really shouldn't let that stand in the way, but it can make a difference. I taught surveying at Oregon's Institute of Technology for 13 years and learned to know many wonderful Oregon surveyors. They, like New Mexico surveyors are quite hospitable. But, you should know that many Oregonians feel very strongly about their heritage and identity. For example, in Oregon some people attach supplemental tags to their license plates which read, "Oregon Native." Donna and I have three children and only our youngest is an Oregon native. The rest of us just don't qualify.

But I really am grateful for the opportunity to teach surveying at New Mexico State University. This is a wonderful state with rich cultural diversity. New Mexico has an excellent climate, NMSU is a great institution, and I get to work with several of the most renown surveying educators in the world. They have gone the second mile on numerous occasions to be helpful and I am inspired by their dedication to both the profession and to the students. I just hope that I too will be able to contribute in a small way to the growth and continued success of the surveying profession in New Mexico. I don't really know what your view of the future is, but with the move from Ohio to New Mexico in 1998, I've been known to say "I've gone to heaven without dying." As a graduating senior at the University of Michigan in 1973, I wrote to every New Mexico surveying firm listed in the ACSM roster

and inquired about employment. It took 25 years, but we finally made it. Moral: Be careful what you ask for. You might get it.

Back to surveying: Does anyone really know what surveying is? The registration boards in New Mexico and other states have written concise definitions and I don't wish to take issue with the traditional meanings. But, by bringing it up, I already have. So, I need your help. Is surveying what you are or is surveying what you do? I taught surveying at Oregon's Institute of Technology for 13 years and left teaching in 1993 to do some other things. During the next 5 years I had the opportunity to work on some interesting projects and to learn a lot more about "real world" surveying. If I had more entrepreneurial talent and if the opportunity to return to teaching in New Mexico had not come along, I might still be working in the real world. The point is, when I left teaching in 1993, I struggled to find my real identity. I discovered I really am defined by what I do. Others may not be. So I ask again. Answer for yourself. Is surveying what you are or is it what you do? Is your view of the future related to that answer?

Someone asked me what I was going to talk about today. I replied, "circles - drawing bigger ones." That sounds like a good surveying topic but, if not treated creatively, just talking about circles could be boring. Let's look at a bit of history. Roughly from 1800 to 1950, surveying in the U.S. was done with the compass, chain, transit, and steel tape. Computations were latitudes and departures based on logarithms and trig tables. During the past 50 years, that has all changed. With the advent of the electronic computer, photogrammetric mapping, EDM, the hand-held calculator, total stations, GPS, digital levels, remote sensing, GIS, and the internet, it is a new and exciting world for surveyors.

In years gone by, the map was both the end product of a survey and the storage medium. We were paid for making a map which was stored in a flat file. When we needed the information again, we pulled out the map and made another copy. Or, the map is revised by adding a new subdivision or a recent road relocation. After being copied, the revised map was placed back in the drawer. That too has changed. We've made a transition from analog (a map) to digital. Now, spatial data are stored in an electronic file and maps are dispos-

able. A map can be made for a particular purpose and can be very useful. But the primary data are now stored in digital form and are not lost if the map is destroyed. With digital storage, the map may even be transitory. Instead of printing it on paper, now a map is used by calling the information up on a screen and, in some cases, a user can actually move through the data base under control of a joy stick. Let's see now. Are digital data bases, data visualization, and virtual reality part of our services to society? I believe the answer is, "Yes, they are becoming an integral part of what surveyors do." But do those activities define what we are? Careful now, surveyors certainly participate in those activities and can make a valuable contribution, but surveyors are not the only ones able to generate/use spatial data or to evaluate evidence. A recent conference on "Licensing Data or Licensing People" looks at that and related issues.

Many of you know my professional hobby is 3-D. The 2000 NMPS Annual Convention had several sessions on 3-D and the global spatial data model (GSDM). In short, the data we work with is collected with 3-D measurement tools and converted to digital form. Let's see, if we use 3-D data to make 2-D maps, are we throwing away one third of the information we collected? We don't have the time here to pursue that question.

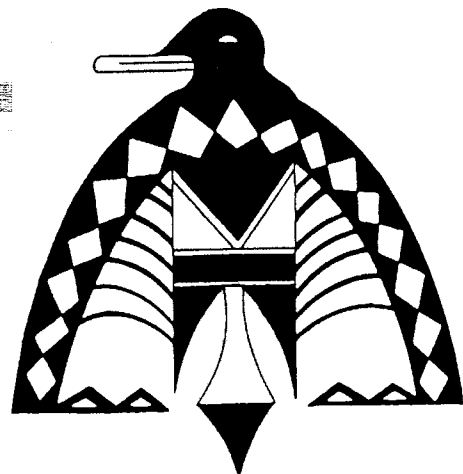
What about this thing called geomatics? In some circles, geomatics is a new name for modern surveying. I'm convinced surveying has a long standing record of service to society and that those services will remain very valuable in the years to come. But, is that the only thing surveyors do? In the past, professions related to surveying included engineering, photogrammetry, map making, and law. But in the digital electronic arena, we find ourselves interacting with GIS specialists, using remote sensing data, integrating data visualization routines into the design process, and becoming computer gurus out of necessity. At what point do we need a bigger circle in which to define ourselves? Is surveying just boundary location or, if surveying is what we do, is it necessary for us to draw a bigger circle?

Speaking of circles, my biographical sketch includes more detail than needed, but it also shows why I've been forced to keep drawing bigger circles. My view of the role of professionals was expanded during the time I was editor of the

ASCE Journal of Surveying Engineering. It is also being enlarged as I interact with those who work on the ACSM Education Committee and, in my activities with the Accreditation Board for Engineering and Technology (ABET), I am challenged to take a broader view of many issues. It is really not unlike surveying where you work hard to gather and understand the evidence. Like you, I develop some level of comfort with my understanding of the issues then some new evidence comes to light which demands a larger circle. The poet Edwin Markham spoke of a similar process when he wrote:

*He drew a circle which shut me out-
Heretic, rebel, a thing to flout
But love and I had the wit to win:
We drew a circle that took him in!*

So, my vision for surveying in a digital world is to draw bigger circles. What does that mean? Does it mean we have to convert to geomatics? I don't think so. But, if it turns out geomatics becomes a name for the many things we do, then so be it. Personally, I believe our service to society will continue to be viewed more in terms of the contributions we make and less of how we view ourselves. Self reflection is important as we seek to identify those "best practices" which serve us so well. But, if we don't look outward and draw bigger circles, I fear the digital revolution will leave us behind. The future is digital, three-dimensional, and larger circles.



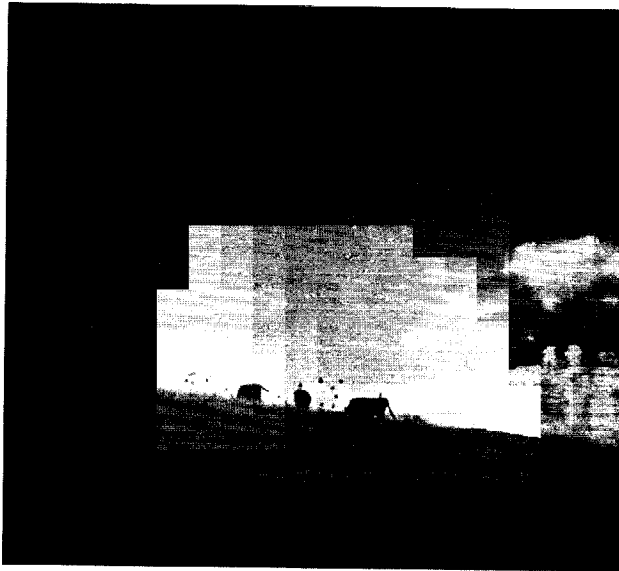
Let's look more closely at some of the tools surveyors use. Historically surveyors used the compass, chain, and steel tape. Conventionally we use the theodolite, EDM, aerial cameras, and calculators. In the modern arena we use electronic tools such as total stations, data collectors, GPS, work stations, computers, and the internet.

What about intellectual tools? How does our understanding of spatial data (how they are generated, how they are stored, how they are manipulated, how they are used) affect our service to society and our ability to compete in the digital future? This is probably the question most closely related to the importance of a solid educational foundation for our profession. At a conference

of engineering educators recently, I came across a quote from William Butler Yeats, "Education is not so much filling a pail as it is lighting a fire." My goal for the surveying engineering program at NMSU is that we can help light those fires. But, we at NMSU also need the help and support of NMPS to provide fuel and nurture the flame. We can't do it alone.

I'm sure it is news to no one that surveying is a diverse profession. Our activities and work environment varies from corporate board rooms, to corner suites, to personal offices, to agency cubicles, to construction sites, to urban streets, to rural landscapes, to moun-

tain vistas, to dry deserts, to deep canyons, to steaming jungles, to polar areas, and even to space. People with diverse talents are attracted to surveying and a college education is not required for many things surveyors do. And, there are productive persons working in the surveying profession who never will be licensed and there is



an indisputable need for competent technicians who understand and are able to use modern tools. The contribution they make is enormous. But when we look at the overall contribution the surveying profession can make to society, we should also realize we need a solid educational background as a "bat" if we are going to stand at the plate and hit that game-winning home run. For example, persons in Maine have recently pushed for the adoption of three plane coordinate projection zones in place of the 2 zones supported by the NGS. Part of the discussion centered around the fact the surveying profession had little or no input to the action. What does it take to bring sur-

veyors to the table at which such policy decisions are made? I wish I knew.

Having looked at various issues, the real question might be, "What does it take for surveyors to survive in the digital future? I'm convinced education is a vital part of it, but on a more practical level, we need to ask some other questions. For example, "Who is the competition?" That could be other registered professionals, professionals in other disciplines, Joe Blow and his electronic gadgets (GPS) or international exchanges of data and information. With the internet, the flow of ideas does not recognize physical boundaries, land boundaries, or ideological boundaries. Competing successfully in the global digital arena will require continued development of our intellectual tools in addition to the electronic tools which have given us such an edge in the global market place. I'm optimistic it can be done but it won't happen in a vacuum.

While I was on sabbatical during 1990/91, I looked at the issue of leadership. Many persons complain about the obscene salaries some people get. I'm not here to defend anyone's salary, but I have come to realize that competent leadership is a very valuable quality and I no longer begrudge the high salary of those leaders who earn it. With proper leadership, ordinary people can accomplish marvelous things. So, I am not worried we will not compete successfully. But sometimes I wonder how the pieces will come together. It takes the concerted efforts of many people working together. Can we do it? I believe we can.

Several years ago in Oregon, a local election just didn't go the way community leaders figured it should. Several of the elected officials just didn't have what it took to handle the job. The editor of the local paper reminded the voters, "we did it to ourselves." Apathy being what it is, we need to realize that is only part of the problem. Nike might have some insight with their motto, "Just do it" but I think we need to make it more personal than that. If I ever run for office, my motto will be "We can do it for ourselves or we can do it to ourselves. Where will you contribute your efforts?" Surveyors are a talented group and have the ability to make an enormous difference with regard to the way society uses spatial data. What will your contribution be?

Motivation is a key issue. I don't know what it is about surveyors that is unique, but it seems that surveyors have more of a passion for professionalism than some other disciplines. I audited Dr Steven Frank's ethics class last year and came away with a renewed sense of commitment and professional pride. I always thought I was an ethical person, but I came to realize I have a lot of room for growth. A point discussed with a classmate was, "What does ethics mean to someone who has nothing to lose? We could speculate a long time on that, but I'd like to turn it around. The surveying profession has built an enormous heritage of service to society and we all have a lot to lose. Maybe that is why ethics is so important to us and why we are so highly motivated when it comes to supporting our profession. I'd like to believe that is the case.

Ability is another factor which contributes to our success. Some people have a talent for details and numbers. Others have insights more closely related to interpersonal relationships. Some have developed their talents more than others and some have yet to develop the talents they have. My point is, regardless of the talent one brings to education, it takes practice, lots of practice, to become good at anything. And, the students here can vouch for the fact that I expect them to do a lot of work in the classes I teach. Does that make me a good teacher? No, but I'll do my best to help each one take advantage of the tools and opportunities available to them even though some of it is just plain hard work.

Ultimately, I believe our success in the digital future will be measured in terms of the contribution we make to society. The service will take many forms. I don't know what they all are but I am convinced that those with the best tools, those with the ability to use the tools and those who draw bigger circles will be key players. New Mexico surveyors have an excellent record of service and have displayed the desire and motivation to stay engaged. In closing, I'm honored to be a part of the surveying profession - especially in New Mexico. Thank you.