Reflections and Aspirations
(Also called "Additional Concerns" in NCEES posting and January 2017 issue of Benchmarks)

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January 2017

The November 2016 issue of Benchmarks contains the fifth of five articles written in the context of the NCEES effort to examine the Future of Surveying. Moving on, this article is called "Reflections and Aspirations." Specifically, the reflections relate to possible elimination of the Surveying Engineering Program at NMSU and my aspirations promote the vision that the surveying profession will ultimately embrace the challenge of providing additional leadership in beneficial use of 3-D digital spatial data.

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Cards on the table – My loyalty is to surveying. In my career, I've enjoyed the luxury of being able to earn a living doing what I enjoy. I've made many friends and the profession has been rewarding in many ways. I've also made mistakes and I've trampled on toes where I should not have. Understand, it happened without malice. Even now I share what I feel will benefit the profession with the goal of respecting the views of those who see things otherwise. But I will cling tenaciously to the vision that surveying is (or can be) just as equal as any other profession. Collectively, we have much to offer society. Although the digital revolution has imposed a huge learning curve on our profession, learning can be fun, enjoyable, and even profitable.

Although my entry into surveying was as a draftsman, my first job out of college was with an international engineering firm serving the utility industry – worldwide. Yes, I've helped build high-voltage powerlines throughout the US and on two other continents. That is beside the point. More to the point, the unofficial motto of the company was, "time and money being no object, Commonwealth engineers can do anything." Our optimistic division manager was a fan of Muhammad Ali, known for pounding his chest and saying "I am the greatest." Our manager wanted us all to be more like Muhammad. In making the case for additional staff professional development, my boss and I reminded our manager on several occasions that Muhammad Ali endured countless hours in the practice ring honing his skills in support of his greatness claim. In short, he earned it. Should we do any less in the professional arena?

My employer, Commonwealth Associates Inc., paid me well but I realized that I needed more education - hence back to graduate school at Purdue University. From there, I went on to teach upper-division surveying classes at the Oregon Institute of Technology (OIT). As the polytechnic institution within the Oregon State System of Higher Education, OIT had (at the time) no graduate programs (they do now). Our mission was to prepare students for productive employment. Institutional leadership took the mission seriously and OIT excelled in two areas – student advising and curriculum design. Consequently, OIT grads were aggressively recruited and our grads established an enviable reputation for the institution. On the curriculum side, the OIT BS Surveying Program was designed in the early 1980s and evaluated by ABET in 1984. Ours was one of the first two BS Surveying Programs to be accredited by the ABET Engineering-Related Accreditation Commission (ABET/RAC) – now called the Applied Science Accreditation Commission (ABET/ASAC).

With proliferation of personal computers, GPS, and GIS, the impact of the digital revolution on surveying increased dramatically during the 1980s. Yes, it was an exciting time to be teaching surveying and I count my 13 years of teaching at Oregon Tech to be the highlight of my career. Even though I enjoyed teaching and was involved in the larger professional community as Editor of the ASCE Journal of Surveying Engineering, I wanted more. I was granted a sabbatical leave from OIT for the 1990/91 academic year and spent most of the year at

the University of Maine learning more about GPS and other innovations. Long story short – that is where the seeds of the concept now known as the global spatial data model (GSDM) were planted. That sabbatical was the most productive year of my life.

Recognizing the power and simplicity of solid geometry for handling 3-D digital spatial data and realizing that the surveying profession could enjoy huge benefits by embracing a 3-D spatial data model, I decided to leave teaching and build a business on capturing the value of the third dimension. It was an exciting 5 years during which time I did a lot of work for the Southeastern Wisconsin Regional Planning Commission (SEWRPC). Notably, while self-employed:

- I did OK financially, but I learned that I am not a gifted entrepreneur. My wife wanted a steady income.
- I incorporated Global COGO, Inc. and obtained the BURKORD™ trademark.
- I began writing a book, "The 3-D Global Spatial Data Model" - published by CRC Press in 2008.
- I realized that I had tackled more than I could handle with business, writing, and software development.
- When the opportunity came to return to teaching at a research university (with Dr. Reilly), I took it.

My decision to apply for employment at NMSU was well informed. While at Oregon Tech I wrote a chapter on "Geodesy" for *The Surveying Handbook* compiled by Roy Minnick and noted *Elementary Surveying* author Russell Brinker. A stickler for detail, Mr. Brinker taught me a lot about writing. Oh yes, Mr. Brinker was CE Department Head at NMSU in the 1960s. I was also aware that the BLM sent Doug Wilcox to NMSU in the 1980s to assist in developing a surveying program. And, I had an opportunity to visit NMSU in June 1990 as a candidate for administering the surveying program. A correct decision was to hire Dr. Reilly for that position. When a teaching position became available at NMSU in 1998, I was happy to apply and to be hired.

While employed at NMSU I had the opportunity to teach advanced surveying classes as well as beginning-level classes. My peripheral interests in 3-D were compatible with my teaching responsibilities and I contributed to the NMSU program in a positive manner. As a previous Editor I was familiar with the mandate for university faculty to "publish or perish." I wrote and published articles because I wanted to broaden the (3-D) knowledge base for surveyors. Such publications supported my case for tenure but my motivation was otherwise. I became an ABET Program Evaluator while still at OIT and I had the opportunity to serve on an ABET Commission while teaching at NMSU - serving as Chair of the ABET/RAC during 2000-2001. Although the ABET experience provided significant insight into the accreditation process. I am still looking for an answer to the question, "Is a program good because it is accredited or is a program accredited because it is good?" It seems too many administrators get it backwards.

I am a firm believer in the capitalistic system in which goods and services are marketed in a competitive environment. Furthermore, I believe that each person is to be responsible for making informed decisions as a consumer. And, I believe in a robust system of checks and balances in which exploitation of the consumer does not get out of hand. That is where the licensing board finds a niche of "protecting the public against incompetent practice of engineering and/or surveying." But, who "checks the checker?" Our licensing boards have a long well-established reputation for many policies and practices but, in my opinion, the impact of the digital revolution has created a challenge for our licensing boards that needs to be addressed. I am not questioning the dedication or integrity of persons serving on our boards but I cannot remain silent when the NM Board of Licensure for Professional Engineers and Professional Surveyors (BOLPEPS) adopts minimum standards for surveying in which elevation is listed as a necessary part of basis-of-bearing. Technically, the two are quite irrelevant. It is harsh to say and I wish it were not true, but that falls under the definition of incompetence. Hopefully, the BOL (with input from NMPS) will take the necessary steps to correct that defect.

Use of vendor software is another challenge each BOL needs to address. Vendors are smart and in business to make money – that is our system. But, vendors are not bound by the same canons of ethics as licensed

professionals and, for various reasons, are not subject to BOL oversight. BOLPEPS grants a license to a person, not to a company. To my knowledge, there is no clear-cut demarcation between individual responsibility and corporate responsibility with regard to who makes the tool and who uses the tool. Like many, I object to excessive regulation and vendors are to be commended for self-regulation. But, challenges exist. An exaggerated example is the Light-Squared fiasco of several years ago. More subtly, the use of a low distortion projection (LDP) is an example that needs careful attention. Don't get me wrong, a LDP can be used beneficially but there are many opportunities for a LDP to be misused with unintended consequences. Is the public an unwitting victim?

What does all this have to do with eliminating the surveying program at NMSU? Lots!

If we go looking for hypocrites I'm probably one of the first you will find. That is my problem. We need to acknowledge our imperfections move on together. I've encountered three attitudes that seem to get in the way of real progress. While it is not my place to be judgmental, but I believe honest discussion of issues has little room for the following attitudes:

1. The rules were made for someone else.
2. I'm not guilty if I don't get caught.
3. The right (authority) to make a rule, makes the rule right.

There are also several principles that apply to problem solving.

1. It takes money to solve problems.
2. Spending money does not solve problems.
3. People solve problems.

My aspiration is that surveyors and the surveying profession continue to embrace the challenge of defining and protecting property boundaries. That is fundamental and many are doing that in a constructive manner. The added challenge I see is that of using 3-D digital spatial data in a competent manner and standing toe-to-toe with other professionals who use spatial data. Collectively we have a lot of catching up to do. That is why I advocate a radical overhaul of surveying education and raising the bar on professional licensure. We will not get the respect we deserve from other professionals until we do. One way to do that is to eliminate the existing NMSU Surveying Engineering Program and to start over – from scratch. That means all stakeholders need to hold serious discussions about the role of surveyors in society, about the use of technology, about the need for professional licensure, about opportunities for education, about establishing and enforcing appropriate minimum standards, about continuing education for current licensees, about ethics and running a business, and about interdisciplinary use of spatial data – there are others. I've laid out a challenge that will probably extend beyond my lifetime but my sincere aspiration is that the surveying profession will embrace the challenge, both from the top down and from the bottom up, and be recognized by society for the dedication, diligence, and hard work it takes to achieve parity with other professions.

I had the opportunity to present a poster at the American Geophysical Union Fall Meeting in San Francisco on December 13, 2016. That poster is printed on a separate page and is available from the following link www.globalcogo.com/poster.pdf. The poster describes implementing the 3-D global spatial data model for all spatial data users. In my opinion, there is no reason that surveying professionals should not be leaders in that transition. But, that will require a huge commitment on the part of many. It is an opportunity we should not ignore.