WestFed and the Future of Surveying

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Based upon discussions by the "Direction Committee" and the "Revenue Committee" at the September 24th meeting of the WestFed Board Meeting in Seattle, these comments are intended to provide a basis for further discussion. Specifically, Earl F. Burkholder requested about 15-20 minutes of time at the January 2012 WestFed Board meeting to discuss ideas in support of the goals of those two committees. This "draft" is provided to both committees for preliminary consideration. The overall concept should be reviewed by the "Direction Committee" and the "Revenue Committee" before being presented to the entire WestFed Board. If the ideas do not pass muster with them, there is no reason to waste Board time.

The entire proposal is prefaced on using the proven "3-D Global Spatial Data Model (GSDM)" for handling surveying & mapping data. The 3-D concept is proven and reliable but, admittedly, "is a bit ahead of the curve." The material should be viewed as an opportunity rather than a mandate and is described in a book written by Burkholder called, "The 3-D Global Spatial Data Model: Foundation of the Spatial Data Infrastructure" – CRC Press 2008. Most of the material in the book is also posted at www.globalcogo.com.

In broad terms, goals of WestFed include, but are not limited to:

1. Provide additional services to affiliate associations and their members.
2. Generate more revenue for the WestFed organization.
3. Avoid competing with affiliate associations/members (compete for the same dollars).

A number of assumptions/observations are:

1. The surveying community provides valuable services to society in many ways.

2. Modern surveying practice relies heavily on various concepts:
   a. Understanding of legal issues related to defining and describing land ownership.
   b. The ability to evaluate both record and physical evidence and to relate that evidence to solving existing problems/challenges.
   c. Being able to organize and run a successful business enterprise.
   d. Routinely using measurements and 3-D digital spatial data.
      (This last category will be the focus of Burkholder's suggestions.)

3. Surveyors are good at learning how to use tools and procedures developed by others:
   a. GPS, scanners, EDM, theodolites, levels and other field equipment.
   b. Computers, mobile devices, and other electronic gadgets.
   c. Software for word processing, computations, drafting, and other tasks.

4. Vendors are good at building and marketing equipment and software that are used as tools of production. Productivity has soared and fewer surveyors are needed than before to get the job done. But, with new technology, the underlying body of knowledge required to compete successfully is also greater than before.
   a. Vendors make good money building and selling what the consumer will buy.
   b. Some say that any successful endeavor boils down to "marketing." Is that true?
   c. Many vendors' approach seems to be, "Let us do your thinking for you. You just buy the technology from us and we'll show you how to use it."

5. Individuals (including professionals) need both education and training.
    a. Vendors will train a customer to use their brand of equipment – who pays?
    b. Only minimal education is needed to learn how to use equipment and follow procedures as established by others (both clients and fellow surveyors).
    c. Who is responsible for selecting the specifications and procedures to be followed in using the purchased equipment? Who is responsible for quality control?

6. Education is time-consuming and expensive but it is an essential foundation for the successful professional. WestFed is to be commended for supporting education via scholarships but there is so much more that can be done. With regard to digital data, many persons in the spatial data user community (including surveyors) are long on training and short on education. The surveying profession is in a unique position to greatly enhance the value of our services to society. Although some money will be required, the biggest investment will be in time and building intellectual capacity - education. A well-designed effort to enhance the level of service surveyors provide to society with regard to the use of 3-D digital spatial data can pay enormous dividends. In my opinion, it is something we can do if we just put our minds to it.

7. The "digital divide" is a term (use Google) that is applied to those on separate sides of digital technology applications. Of course, surveyors routinely work on the digital side of the divide but, given our comfort with traditional procedures and ways of doing things, there are enormous strides to be made with regard to modern efficient uses of digital spatial data. Some of the issues include:
    a. We still separate horizontal and vertical concepts for purposes of computation.
       (The GSDM is built on a 3-D data base and uses rules of solid geometry.)
    b. Using tools and software products designed by others (and their assumptions).
       (Assumptions built into the software written by others limits what we can do with it.)
    c. Working with geodesy equations on the ellipsoid surface.
       (The number of geodesy equations needed to use the GSDM is minimal.)
    d. Needing parameters for state plane coordinate zones.
       (There are no zone parameters or zone constants in the GSDM.)
    e. Reconciling grid distance & ground distances – localization and/or combined factors.
       (The GSDM directly provides tangent plane ground level distances.)
    f. Geoid modeling and knowing which geoid model to use.
       (If/when ellipsoid heights are used for elevation, no geoid modeling is needed. This item is opposed by the NGS but, eventually, good science well prevail. See www.globalcogo.com/elev.pdf.)
    g. Using grid azimuths rather than true directions.
       (The use of grid convergence is either non-existent or minimal with the GSDM.)
    h. Extending a project beyond zone boundaries.
       (The GSDM covers the entire world simultaneously. There are no zone limits.)
    i. Worrying about use of International Foot or U.S. Survey Foot. Which is correct?
       (The GSDM is metric. However, user has option of displaying any units desired.)

8. What are the perceived advantages of a "low distortion projection"? The 3-D GSDM is a system already in place that contains all the advantages of a low distortion projection with added benefits of preserving 3-D integrity of the data and providing the ability to establish, track, and use standard deviations for all derived quantities.

Proposal for WestFed and members of the state affiliates:

1. The WestFed Board will entertain a proposal to embark on an exciting well-designed effort to enhance our collective understanding of the 3-dimensional characteristics of spatial data. The economic advantage will be that surveyors will enjoy greater recognition as the knowledgeable experts on the generation, manipulation, analysis, evaluation, and use of 3-D digital spatial data.

2. A systematic approach will or may include:
   a. Seminars and/or webinars to explain concepts.
   b. Well-designed exercises to enhance learning of and practice using the concepts.
   c. Individual study and/or group study.
   d. Competitions to motivate excellence in mastering the concepts.
   e. Pilot projects to illustrate use of the GSDM. Existing examples include:
      i.) Static GPS survey network on NMSU Campus:
      http://www.globalcogo.com/nmsunet1.pdf
      ii.) Using GPS to establish First-Order Elevation on existing HARN station.
      http://www.globalcogo.com/ReilElev.pdf
      iii.) Section breakdown using GPS and "no distortion" procedures
      http://www.globalcogo.com/3DGPS.pdf

3. Standards and specifications: Probably the greatest value in using the GSDM will be derived from being able to establish, track, and use standard deviations of all derived quantities. Yes, using the GSDM means writing down the HI of each station occupation in order to preserve the 3-D qualities of the data. But making a realistic estimate of the standard deviation of each measurement (or obtaining those data from a least squares adjustment) and using those values when defining the 3-D position of each point will enable the user to determine the statistically valid standard deviation of each and every derived quantity. This part is still pretty far out, but the theory and the procedures are all defined as part of the GSDM. Comments:
   a. If no standard deviations are used, the GSDM coordinates and the derived quantities remain perfectly valid. With no standard deviations, they are treated as "exact" quantities – the way most surveys are now platted.
   b. Spatial data standards are already well defined by the FGDC. See http://www.fgdc.gov/standards/standards_publications/
   c. But, to cut through a lot of words and qualifications, see page 2-3 of http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy/part2/chapter2

What I've outlined herein is more than can be accomplished in my lifetime. But, the road to the future is paved with good concepts and if we collectively discuss the benefits of staying on the pavement and if we work together and help each other, it will be amazing how far we will be able to travel in a short time and how much fun it can be for everyone.

Again, I've described an opportunity that I believe surveyors should embrace. Of course, the same opportunity is available for anyone interested in pursuing same. No one is telling surveyors they must travel this road.

I'll be happy to revise, modify, change, improve or enhance the proposal as presented.

Earl F. Burkholder