

# Surveying Body of Knowledge



By

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# Authors of the Surveying Body of Knowledge

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- **Jeffery N. Lucas, JD, PLS, Esq.** – **Law**
- Joe Paiva, PhD, PLS – Geomatics Consultant – **Positioning**
- Jim Bethel, PhD, – Purdue University – **Imagery**



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## Why body of knowledge

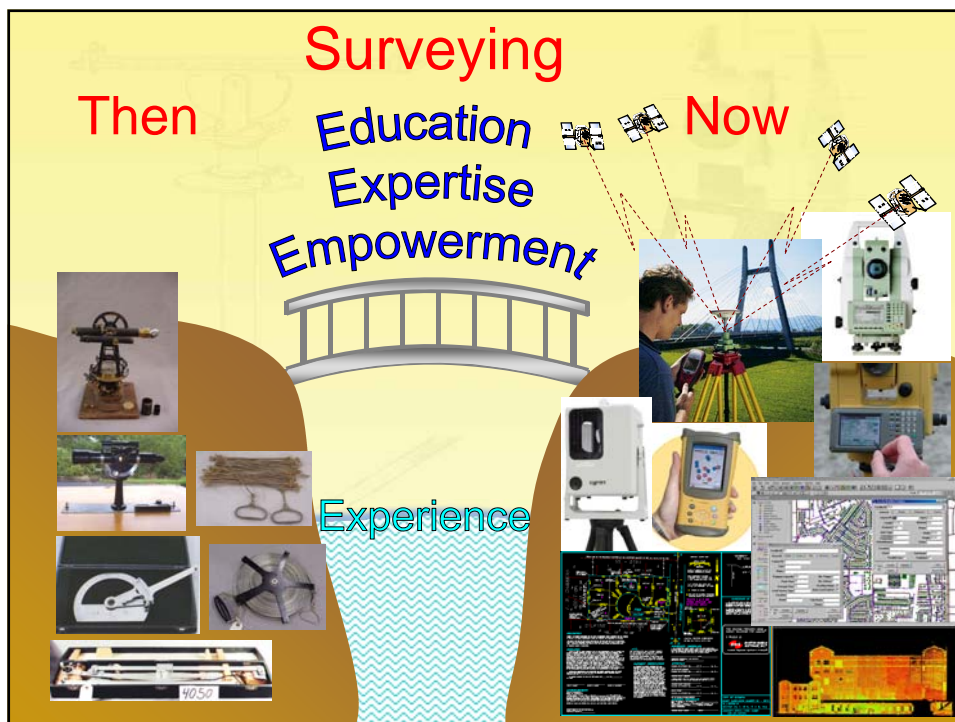
### Internal reasons:

- To formulate the scope of the profession
- To enable the recognition for the need for college education
- To help surveyors in business development
- To develop surveying scholarship

### External reasons:

- To help promote the profession
- To define the distinctive contribution of surveying to spatial information

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## Approaches to developing a body of knowledge

- Macro level
- Micro level
- Technology centered
- Theory and science centered
- Knowledge vs. skills
- A combinations of the above

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## Knowledge vs. Skills

*Knowledge* is knowing *what*, and *why*.

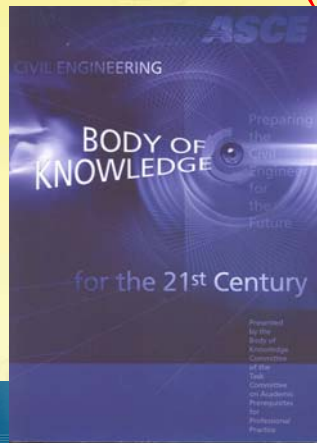
- It's about knowing the concepts, the terminology.
- Ability to use concepts from one field to another, to spot patterns between things.

*Skill* is about knowing *how* and being useful

- it's *only* about being able to do things
- Not about knowing *why* things are as they are or *what* exactly they are. It's just that you can do it

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## Resources for Body of Knowledge (BoK)



The image shows a table titled "Geographic Information Science & Technology Body of Knowledge" from the "UNIVERSITY CONSORTIUM FOR GEOGRAPHIC INFORMATION SCIENCE". The table is organized into several columns and rows, detailing various knowledge areas and their associated skills and competencies.

Analytical Methods	Cartography and Visualization
<ul style="list-style-type: none"><li>AM1. Analytical and scientific methods</li><li>AM2. Data acquisition and processing</li><li>AM3. Data management</li><li>AM4. Data analysis and interpretation</li><li>AM5. Data visualization and presentation</li><li>AM6. Data integration and interoperability</li><li>AM7. Data security and privacy</li><li>AM8. Data quality and assurance</li><li>AM9. Data standards and interoperability</li><li>AM10. Data governance and ethics</li></ul>	<ul style="list-style-type: none"><li>CV1. Map design and development</li><li>CV2. Map production and distribution</li><li>CV3. Map evaluation and quality assurance</li><li>CV4. Map communication and user interface</li><li>CV5. Map integration and interoperability</li><li>CV6. Map security and privacy</li><li>CV7. Map standards and interoperability</li><li>CV8. Map governance and ethics</li></ul>
Conceptual Foundations	Data Modeling
<ul style="list-style-type: none"><li>CF1. Geographic information science</li><li>CF2. Geographic information systems</li><li>CF3. Geographic information science and technology</li><li>CF4. Geographic information science and technology</li><li>CF5. Geographic information science and technology</li><li>CF6. Geographic information science and technology</li><li>CF7. Geographic information science and technology</li><li>CF8. Geographic information science and technology</li><li>CF9. Geographic information science and technology</li><li>CF10. Geographic information science and technology</li></ul>	<ul style="list-style-type: none"><li>DM1. Data modeling and analysis</li><li>DM2. Data modeling and analysis</li><li>DM3. Data modeling and analysis</li><li>DM4. Data modeling and analysis</li><li>DM5. Data modeling and analysis</li><li>DM6. Data modeling and analysis</li><li>DM7. Data modeling and analysis</li><li>DM8. Data modeling and analysis</li><li>DM9. Data modeling and analysis</li><li>DM10. Data modeling and analysis</li></ul>



Leadership and Quality Assurance in Applied Science, Computing, Engineering, and Technology Education



National Council of Examiners for Engineering and Surveying

## The Macro Level Surveying Body of Knowledge

## Macro Level Overview

- A technical core of knowledge and breadth of coverage in mathematics, science, and technology.

Law, ethics and professionalism

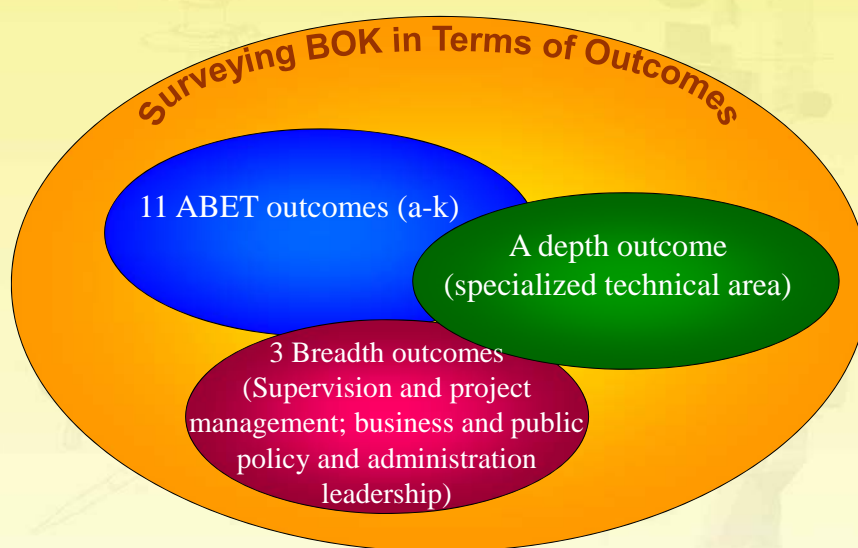
Communication, history, social science and contemporary issues

Business, economics, management

At least one in-depth specialty in surveying law, geodesy, GIS, image based mapping, or other.

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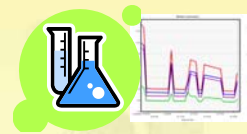
## The 15 BoK Outcomes



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## The 21<sup>st</sup> Century surveyor must demonstrate:

1. an ability to apply knowledge of mathematics, science and engineering/applied science/technology. (ABET (a))
2. an ability to design and conduct **experiments**, as well as **analyze** and **interpret** data. (ABET (b))
3. an ability to **design** a system, component, or process to meet desired needs. (ABET (c))



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## The 21<sup>st</sup> Century surveyor must demonstrate:

4. an ability to function on **multi-disciplinary teams**. (ABET (d))
5. an ability to identify, formulate and solve **Surveying problems**. (ABET (e))
6. an understanding of **professional and ethical responsibility**. (ABET (f))



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## The 21<sup>st</sup> Century surveyor must demonstrate:

7. an ability to **communicate** effectively. (ABET (g))
8. a **broad education** necessary to understand the **impact of Surveying solutions** in a **global and societal context**. (ABET (h))
9. a recognition of the need for, and an ability to engage in, **life-long learning**. (ABET (i))



## The 21<sup>st</sup> Century surveyor must demonstrate:

10. a knowledge of **contemporary issues**. (ABET (j))
11. an ability to **use the techniques, skills, and modern Surveying tools** necessary for surveying practice. (ABET (k))
12. an ability to apply knowledge in a **specialized area related to Surveying**



## The 21<sup>st</sup> Century surveyor must demonstrate:

13. an understanding of the elements of **supervision and project management**
14. an understanding of **business and public policy and administration fundamentals**
15. an understanding of the **role of the leader and leadership principles**



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## The Micro Level Surveying Body of Knowledge

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## FIG Definition of the Functions of the Surveyor

1. The determination of the size and shape of the earth and the measurement of all data needed to define the size, shape and contour of any part of the earth and any change therein.
2. The positioning of points in space at any time as well as the positioning of features, structures and earth masses above or below the surface.
3. The development, testing and calibration of sensors, instruments and systems for the above-mentioned purposes and for other surveying purposes.

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## FIG Definition of the Functions of the Surveyor

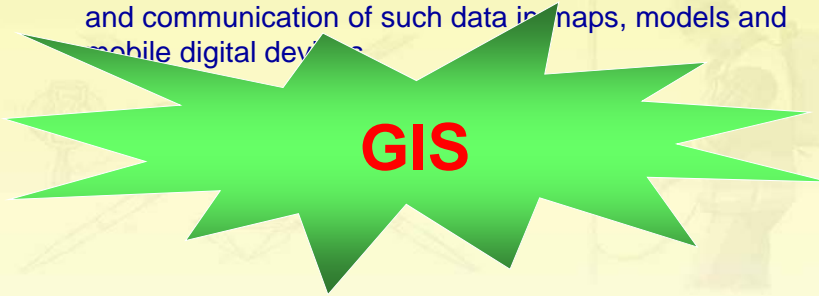
4. The acquisition and use of spatial information from close range, aerial and satellite sensors and the processing of these products.
5. The determination of the position of the boundaries of public or private land and the determination of the relationship with the law.

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## FIG Definition of the Functions of the Surveyor

6. The design, establishment and administration of geographic information systems (GIS) and the collection, storage, analysis, management, display and dissemination of data.
7. The analysis, interpretation and integration of spatial objects and phenomena in GIS, including the visualisation and communication of such data in maps, models and mobile digital devices.



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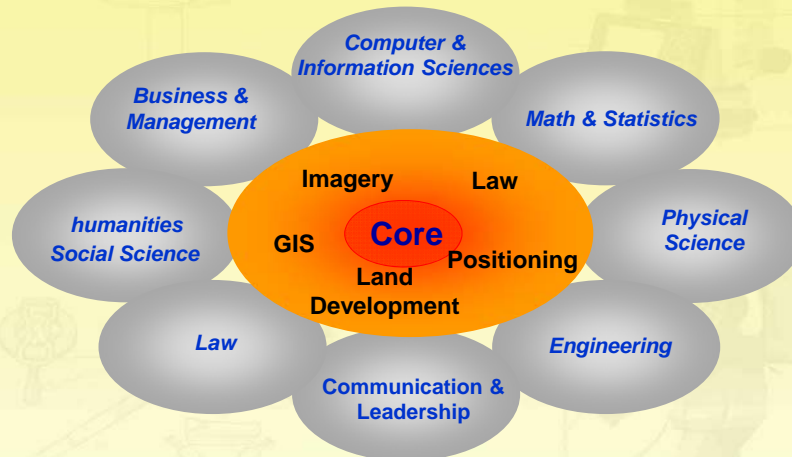
## FIG Definition of the Functions of the Surveyor

8. The study of the natural and social environment, the measurement of land and marine resources and the use of such data in the planning of development in urban, rural and regional areas.
9. The planning, development and redevelopment of property, whether urban or rural and whether land or buildings.
10. The assessment and management of property, whether urban or rural and whether land or buildings.
11. The planning, development and management of construction works, including the estimation of costs.



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## Surveying body of knowledge



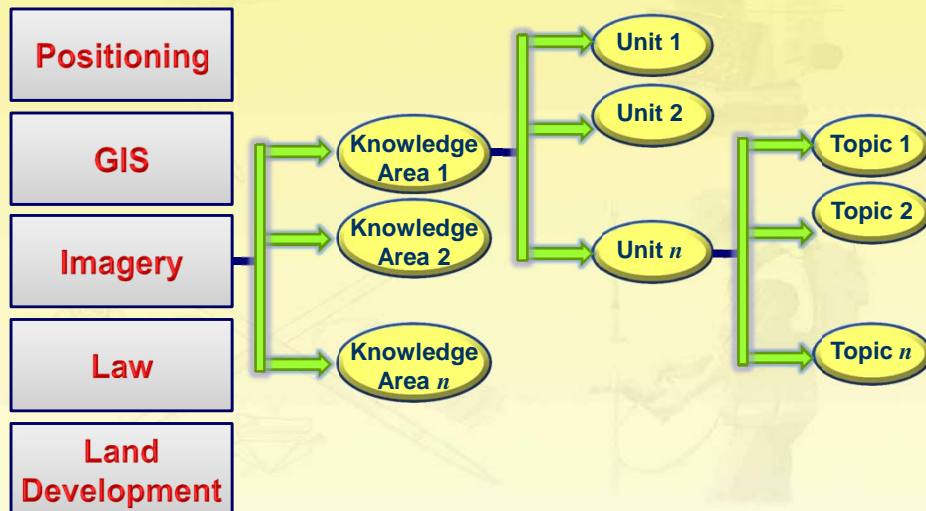
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## The components of the Micro Level Surveying Body of Knowledge

- **Positioning** BoK – including Geodesy, GPS and other field surveying data collection
- **GIS** Bok – including mapping and cartography
- **Imagery** BoK – including photogrammetry, remote sensing and other image/sensor based technologies such as LiDAR and laser scanners
- **Law** BoK – including boundary, real property and business law (Cadastral ?)
- **Land Development** BoK – including construction, planning and developing and urban/rural/regional areas

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## The Structure of the Micro Level Surveying Body of Knowledge



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## The Positioning Body of Knowledge



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## Positioning BoK for Surveying

### Knowledge Area: Measurements

Core  
Specialist  
Scholar

Situational Analysis	U	U	A
Technology and Measurement Regimen Selection	A	A	U
Systematic Error Analysis	A	A	U
Application of Mathematical Models for Data and Information Representation	A	A	A
Designing or Applying Survey Control	A	A	A
Field Survey	U	A	A

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## Positioning BoK for Surveying

### Knowledge Area: Data Analysis and Management

Core  
Specialist  
Scholar

Examine Data for Completeness	A	A	A
Post-processing for Systematic and Random Error Reduction and Evaluation	A	A	A
Analyze Data for Precision; Draw Conclusions About Accuracy	A	A	A
Determine if Additional Measurements are Required	A	A	A
Integrate Data from Various Sensors into a Homogenous Database	U	U	A

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## Positioning BoK for Surveying

### Knowledge Area: Adjustments

	Core	specialist	Scholar
Apply Different Adjustment Procedures for Data Processing	A	A	A
Apply Statistical and Adjustment Tools to Improve Quality of Information Being Reported	U	A	A
Calculate Integrity of Networks and Other Geometries	U	A	A
Apply Principles of Geodesy	R	A	A

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## Positioning BoK for Surveying

### Knowledge Area: Coordinate Geometry

	Core	specialist	Scholar
Apply 2-D and 3-D transformations	U	A	A
Determine projected coordinates	U	A	A
Determine geodetic coordinates	R	A	A
Determine positions of surveyed points	A	A	A
Determine position or configuration of designed points, lines, surfaces and volumes	A	A	A
Determine areas and volumes	A	A	A

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## Positioning BoK for Surveying

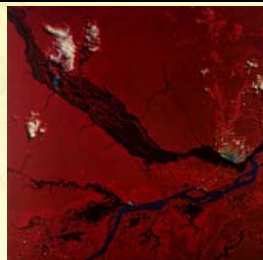
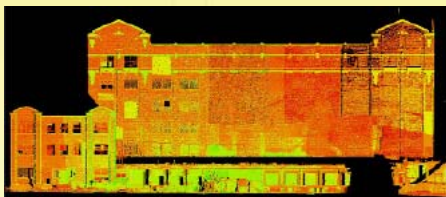
### Knowledge Area: Information Extraction

Core  
specialist  
Scholar

Report positions, lines, surfaces and volumes	A	A	A
Report conclusions, deductions and inductions	A	A	A
Create maps and reports that are project and “consumer-specific”	A	A	A
Use CAD/GIS to generate user products	A	A	A

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## The Imagery Body of Knowledge



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## Imagery BoK for Surveying

### Knowledge Area: Cameras and Photography

Core  
specialist  
Scholar

Metric versus non-metric cameras	U	U	A
Calibration	U	U	A
Camera geometry and characteristics	R	U	A
Spatial resolution	U	U	C

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## Imagery BoK for Surveying

### Knowledge Area: Radiometry, Detection, and Sensing

Core  
specialist  
Scholar

Optics:	R	U	A
Aperture, shutter, radiometry	R	U	A
Image motion compensation	R	U	A
Detector		U	A

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## Imagery BoK for Surveying

### Knowledge Area: Frame Geometry

Core  
specialist  
Scholar

Perspective geometry, pinhole camera	U	U	A
Graphical solutions using perspective		U	A
Scale, field of view:	U	U	A
Relief displacement:	U	U	A
Tilt displacement	U	U	A
Interior, exterior orientation	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Image Measurements

Core  
specialist  
Scholar

Reference coordinate system	R	U	A
Systematic errors and correction:	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Stereoscopy and Parallax

Core  
specialist  
Scholar

Depth perception and parallax:	U	U	A
Base – height ratio and vertical exaggeration	U	U	A
Stereoscopes and environments for stereo perception	U	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Mathematical Modeling and Analytical Photogrammetry

Core  
specialist  
Scholar

Mathematical modeling of frame ray projections: collinearity	R	U	A
Image pairs: coplanarity	R	U	A
Object space coordinate systems, coordinate transformations	A	A	A
Image resection	R	U	A
Space intersection	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Mathematical Modeling and Analytical Photogrammetry (Cont')

*Core  
specialist  
Scholar*

Bundle block adjustment: simultaneous resection and intersection	R	U	A
Relative and absolute orientation	R	U	A
Independent models	R	U	A
Strip formation and adjustment by polynomials	R	U	A
Platform and trajectory modeling	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Computer Vision

*Core  
specialist  
Scholar*

Homogeneous coordinates	R	U	A
Fundamental and essential matrices		U	A
Eight point algorithm		U	A
Visualization, synthetic image generation	R	U	A
High level feature extraction		U	A

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## Imagery BoK for Surveying

Knowledge Area: Estimation, Adjustment, Statistics, and Error Propagation

Core  
specialist  
Scholar

Measurements and errors	A	A	A
Objective functions and adjustment	A	A	A
Functional and stochastic models	A	A	A
Techniques of least squares	U	A	A
Constraints	U	A	A

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## Imagery BoK for Surveying

Knowledge Area: Estimation, Adjustment, Statistics, and Error Propagation (Cont')

Core  
specialist  
Scholar

Hypothesis testing, error propagation, confidence regions	A	A	A
Unified least squares	U	A	A
Sequential estimation and kalman filter	R	U	A
Robust estimation	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Stereo Restitution

Core  
specialist  
Scholar

Analytical projection	R	U	A
Digital stereo workstation	U	U	A
Pairwise rectification	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Rectification and Resampling

Core  
specialist  
Scholar

Interpolation and aggregation		U	A
Nyquist sampling theorem and aliasing		U	A
Simple rectification (tilt correction only)	U	A	A
Ortho rectification (tilt and terrain correction)	U	A	A
True ortho rectification (tilt, terrain, and building correction)	U	A	A

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## Imagery BoK for Surveying

### Knowledge Area: Mapping and Cartography

Core  
specialist  
Scholar

Enlargement factor versus contrast and spatial resolution		U	A
Map projections and reference coordinate systems	A	A	A
National map accuracy standards	A	A	A
National map series	A	A	A
Urban and project oriented mapping	A	A	A
Software environments	A	A	A

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## Imagery BoK for Surveying

### Knowledge Area: Topography and Digital Elevation Modeling

Core  
specialist  
Scholar

Grid/raster collection	U	A	A
Unstructured point collection	A	A	A
TIN processing	A	A	A
Breakline processing	A	A	A
Profile and cross section interpolation, road design	A	A	A

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## Imagery BoK for Surveying

### Knowledge Area: Digital Photogrammetry

*Core  
specialist  
Scholar*

Epipolar resampling, image normalization		U	A
Image matching	R	U	A
Surface reconstruction, DEM generation	U	U	A
Automated relative orientation		U	A

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## Imagery BoK for Surveying

### Knowledge Area: Project Planning

*Core  
specialist  
Scholar*

Requirements for accuracy	R	U	A
Control point requirements	U	A	A
GPS/INS supported imaging	R	U	A
Flightline layout	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Close-Range Photogrammetry

Core  
specialist  
Scholar

Use of non-metric cameras	R	U	A
Self calibration, zoom optics	R	U	A
Fixed baseline setup		U	A
Structured light and texture		U	A

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## Imagery BoK for Surveying

### Knowledge Area: Satellite Photogrammetry

Core  
specialist  
Scholar

Orbit mechanics		U	A
Quasi-inertial versus earth fixed coordinate systems and transformations	U	A	A
Time systems	U	A	A
Projection models		U	A
Ephemeris and support data	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Remote Sensing

Core  
specialist  
Scholar

Spectral coverage		U	A
Classification	R	U	A
Change detection	R	U	A

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## Imagery BoK for Surveying

### Knowledge Area: Active Sensing with Visible/IR: LIDAR

Core  
specialist  
Scholar

Acquisition platforms	A	A	A
Point cloud processing	U	A	A
Feature extraction	R	U	A
Mobile data acquisition	U	A	A
Standards and quality issues	A	A	A

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# Imagery BoK for Surveying

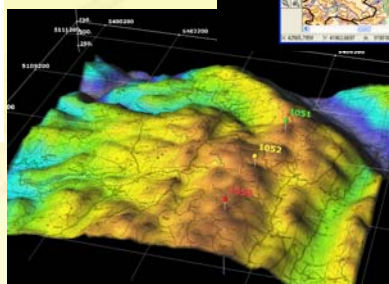
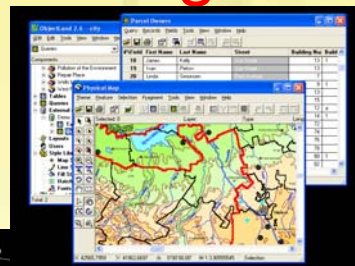
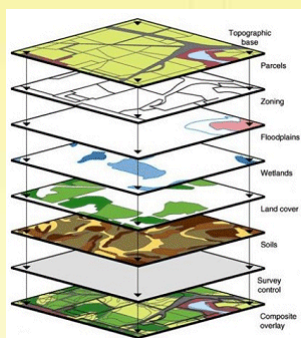
## Knowledge Area: Applications

Core  
specialist  
Scholar

Mapping	A	A	A
Resource inventory	U	A	A
3D object reconstruction	U	A	A
Medical applications		U	A
GIS database population	A	A	A

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# The GIS Body of Knowledge



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## Objectives of the surveying GIS body of knowledge

- Be consistent with the GIS&T body of knowledge
- Not be prescriptive in terms of how GIS should be taught
- To communicate to the surveying community what GIS is (it's more than a CAD with a database)
- To communicate to the GIS community what is the role of surveyors in GIS

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## The Surveying GIS Body of Knowledge

A process based sequence:

- Conceptual Foundations
- Data Modeling
- Design Aspects
- Geospatial Data
- Data Manipulation
- Analytical Methods
- Cartography and Visualization
- Legal and Ethical aspects of GIS
- Management and Organization Aspects

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## GIS BoK for Surveying

### Knowledge Area: Conceptual Foundations (CF)

*user*  
*specialist*  
*Scholar*

Philosophical foundations	U	U	A
Cognitive and social foundations	R	U	R
<b>Domains of geographic information</b>	U	A	A
<b>Elements of geographic information</b>	A	A	A
Relationships	U	A	A
Imperfections in geographic information	U	A	A

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## GIS BoK for Surveying

### Knowledge Area: Data Modeling (DM)

*user*  
*specialist*  
*Scholar*

Basic storage and retrieval structures	A	A	A
<b>Database management systems</b>	U	A	A
<b>Tessellation data models</b>	R	U	A
<b>Vector and object data models</b>	A	A	A
Modeling 3D, temporal, and uncertain phenomena	R	U	A

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## GIS BoK for Surveying

### Knowledge Area: Design Aspects (DA)

*user*  
*specialist*  
*Scholar*

The scope of GIS&T	U	A	A
system design	R	A	A
Project definition	R	A	A
Resource planning	R	A	A
<b>Database design</b>		A	A
Analysis design		A	A
Application design		A	A
System implementation		A	A

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## GIS BoK for Surveying

### Knowledge Area: Geospatial Data (GD)

*user*  
*specialist*  
*Scholar*

<b>Earth geometry</b>	A	A	A
Land partitioning systems	A	A	A
<b>Georeferencing systems</b>	A	A	A
<b>Datums</b>	A	A	A
<b>Map projections</b>	A	A	A
<b>Data quality</b>	A	A	A
<b>Land surveying and GPS</b>	A	A	A
Digitizing	A	A	A
Field data collection	A	A	A

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## GIS BoK for Surveying

### Knowledge Area: Geospatial Data (GD)

*user  
specialist  
Scholar*

Aerial imaging and photogrammetry	A	A	A
Satellite and shipboard remote sensing	A	A	A
Metadata, standards, and infrastructures	U	A	A

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## GIS BoK for Surveying

### Knowledge Area: Data Manipulation (DN)

*user  
specialist  
Scholar*

Representation transformation	A	A	A
Generalization and aggregation	R	U	A
Transaction management of geospatial data	R	R	A

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## GIS BoK for Surveying

### Knowledge Area: Analytical Methods (AM)

*user  
specialist  
Scholar*

Query operations and query languages	U	A	A
<b>Geometric measures</b>	A	A	A
<b>Basic analytical operations</b>	A	A	A
<b>Basic analytical methods</b>	A	A	A
Analysis of surfaces	A	A	A
Spatial statistics	U	U	A
Geostatistics	R	U	A
Spatial regression and econometrics	R	R	R

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## GIS BoK for Surveying

### Knowledge Area: Analytical Methods (AM)

*user  
specialist  
Scholar*

Data mining		R	U
Network analysis		U	U
Optimization and location-allocation modeling		R	A

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## GIS BoK for Surveying

### Knowledge Area: Cartography and Visualization (CV)

*user*  
*specialist*  
*Scholar*

History and trends	A	A	A
<b>Data considerations</b>	U	A	A
<b>Principles of map design</b>	A	A	A
Graphic representation techniques	A	A	A
Map production	U	A	U
<b>Map use and evaluation</b>	A	A	A

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## GIS BoK for Surveying

### Knowledge Area: Geocomputation (GC)

*user*  
*specialist*  
*Scholar*

Emergence of geocomputation	R	U	A
Computational aspects and neurocomputing			A
Cellular Automata (CA) models			A
Heuristics			A
Genetic algorithms (GA)			A
Agent-based models			A
Simulation modeling			A
Uncertainty		R	A
Fuzzy sets			A

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GIS BoK for Surveying		Knowledge Area: GIS&T and Society (GS)		
		<i>user</i>	<i>specialist</i>	<i>Scholar</i>
Legal aspects		A	A	U
Economic aspects		R	U	U
Use of geospatial information in the public sector		R	U	U
Geospatial information as property		A	A	U
Dissemination of geospatial information		U	A	U
<b>Ethical aspects of geospatial information and technology</b>		R	A	U
Critical GIS				U

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GIS BoK for Surveying		Knowledge Area: Organizational and Institutional Aspects (OI)		
		<i>user</i>	<i>specialist</i>	<i>Scholar</i>
Origins of GIS&T		R	U	U
Managing GIS operations and infrastructure		R	A	U
Organizational structures and procedures			A	U
GIS&T workforce themes			U	R
<b>Institutional and inter-institutional aspects</b>			A	R
Coordinating organizations (national and international)			A	

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# The Law Body of Knowledge



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## Law BoK for Surveying Knowledge Area: Legal Systems

Core  
Specialist  
Scholar

Legal Methods and Processes	R	U	U
Court Systems	R	U	U
Civil Procedure	R	U	U
Evidence and Procedures			
a) Forms of Evidence	A	A	A
b) Rules of Evidence	U	U	A

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**Law BoK for Surveying**  
**Knowledge Area: Legal Resources**

	<i>Core</i>	<i>specialist</i>	<i>Scholar</i>
Legal Research	A	A	A
Courthouse Research	A	A	A
Statutory Law	U	A	A
Administrative Law	U	A	A
Judicial Decisions and Common Law	U	A	A
Executive orders	R	U	A

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**Law BoK for Surveying**  
**Knowledge Area: Law and Business**

	<i>Core</i>	<i>specialist</i>	<i>Scholar</i>
Writing and Communication			
a) Written communication skills	A	A	A
b) Oral communication skills	A	A	A
c) Physical presentation skills	U	A	U
Contracts			
a) Nature and types of contracts, elements of contracts	R U	U A	A A
b) Contractual obligations	R	A	A
c) "Limitation of Actions" statutes	R	A	A
d) Breach of contract			

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## Law BoK for Surveying

### Knowledge Area: Law and Business (Cont')

*Core  
specialist  
Scholar*

<b>Torts</b>			
a) Torts and remedies	R	U	U
b) Negligence	U	A	A
c) Standards of care	U	A	A
<b>Copyright Law</b>	R	U	A
<b>Business Formation</b>			
a) Business entities	R	U	R
b) Agency and partnership relationships	R	U	R
c) Business formation	R	U	R

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## Law BoK for Surveying

### Knowledge Area: Law and Business (Cont')

*Core  
specialist  
Scholar*

<b>Business Management and Operation</b>			
a) Employer/employee relationships	R	A	U
b) Special site requirements	U	A	A
c) Record keeping	R	A	U
d) Electronic and digital records	R	U	U
e) Tax laws	R	U	R
<b>Budgeting and Finance</b>	R	A	U
<b>Professionalism and Ethics</b>	U	A	A

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## Law BoK for Surveying

### Knowledge Area: Law and Business (Cont')

*Core  
specialist  
Scholar*

9. Liability			
a) Professional liability	R	A	U
b) Limitations on liability	R	A	A
c) Standard of care	U	A	A
d) Certifications	U	A	A
e) Errors and omissions	R	U	U

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## Law BoK for Surveying

### Knowledge Area: Law and the Practice of Surveying

*Core  
specialist  
Scholar*

The practice of surveying			
a) Licensure laws	U	A	A
b) Standards of practice	U	A	A
Land Use and Land Management Law			
a) Land use and land management law	U	A	A
b) Environmental law	U	A	A

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## Law BoK for Surveying

### Knowledge Area: Law and the Practice of Surveying (Cont')

Core  
specialist  
Scholar

	Core	specialist	Scholar
Real Property Law			
a) Estates, title, and interests in real property	R	A	A
b) Creation and termination of real property estates and interests	U	A	A
c) Deeds and descriptions	U	A	A
d) Conveying real property estates and interests	R	U	A
e) Notice	R	U	A

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## Law BoK for Surveying

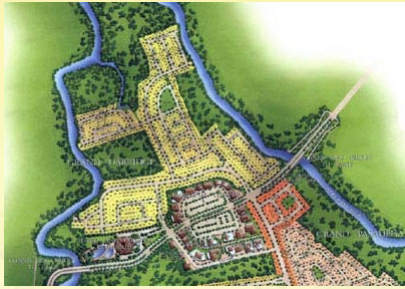
### Knowledge Area: Law and the Practice of Surveying (Cont')

Core  
specialist  
Scholar

	Core	specialist	Scholar
Real Property Law			
f) Easement law	U	A	A
g) Boundary law	A	A	A
h) Disputes between adjoining interest holders	U	A	A
i) Water law	U	A	A
Expert Witness Testimony and Reports	U	A	A

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# The Land Development Body of Knowledge



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## Land Development BoK for Surveying Knowledge Area: Communication skills

Core  
Specialist  
Scholar

Analytical skills			
a. Situational analysis	R	U	A
b. Logic	U	A	A
c. Objective reasoning	R	U	A
Oral expressive skills			
a. Clarity of expression	A	A	A
b. Command of language	U	A	A
c. Physical presentation	R	U	U
d. Ability to adapt explanations	R	U	U

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## Land Development BoK for Surveying

### Knowledge Area: Communication skills (Cont')

Core  
specialist  
Scholar

	Core	specialist	Scholar
Writing skills			
a. Clarity of expression	A	A	A
b. Command of language	U	A	A
c. Presentation skills	R	U	A
Soft or "people" skills			
a. Listening skills	U	A	U
b. Negotiation skills	R	U/A	U
c. Engage in reasoned debate	R	A	A

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## Land Development BoK for Surveying

### Knowledge Area: Site design and resource management

Core  
specialist  
Scholar

	Core	specialist	Scholar
Development design, patterns, and principles			
a. Identify existing balance of human and environmental factors	R	U	U
b. Evaluate present and future general site context, physical relationship between site and adjacent land, human cultural data, and environmental data	R	U	U

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## Land Development BoK for Surveying

### Knowledge Area: Site design and resource management (Cont')

Core  
specialist  
Scholar

	Core	specialist	Scholar
Development design, patterns, and principles (Cont')			
c. Familiarity with existing and evolving development patterns	R	U	U
d. Incorporation of sustainability principles into site design and development	R	R	U

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## Land Development BoK for Surveying

### Knowledge Area: Site design and resource management (Cont')

Core  
specialist  
Scholar

	Core	specialist	Scholar
Land use development and management programs			
a. Identification of a given site's resources	U	A	A
b. Familiarity with concept of sustainability	R	R	U
c. Familiarity with different approaches to preserve various resources during site development	R	R	U
d. Familiarity with design trends and concepts	R	A	A

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## Land Development BoK for Surveying

### Knowledge Area: Site design and resource management (Cont')

Core  
specialist  
Scholar

Immediate and cumulative effects of site design			
a. Immediate and cumulative impacts of development on humans and nature	R	U	A
b. Interdependence of humans and the natural world	R	U	A
c. Limitations of design	U	U	A

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## Land Development BoK for Surveying

### Knowledge Area: Site design and resource management (Cont')

Core  
specialist  
Scholar

Legal requirements for site development			
a. Federal laws and regulations affecting site development	R/U	A	U
b. State laws and regulations affecting site development	R/U	A	U
c. Local ordinances affecting site development	U	A	R
d. Interrelationship of legal requirements	R	A	A

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## Land Development BoK for Surveying

### Knowledge Area: Site constraints

Core  
specialist  
Scholar

Assess site suitability for a given plan or design			
a. Familiarity with the concept of natural and societal resources	U	U	A
b. Ability to identify and objectively evaluate a specific site's resources	U	U	A
c. Ability to match site resources, including location, to an appropriate design	R	U	A
d. Recognition of legal guidelines and restrictions	U	A	U

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## Land Development BoK for Surveying

### Knowledge Area: Site constraints (Cont')

Core  
specialist  
Scholar

Balancing legal and natural land use restrictions			
a. Identification of potential specific impacts (positive and negative) from proposed development	U	A	A
b. Ability to evaluate changes in natural values and human values (positive and negative) resulting from development, in relation both to the site and to the larger community	R	U	A

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## Land Development BoK for Surveying

### Knowledge Area: Project management and administration (Cont')

Core  
specialist  
Scholar

Project administration			
a. Contractual responsibilities	U	A	R
b. Legal responsibilities	R	U	R
c. Professional responsibilities	U	A	R
Project management and supervision			
a. Estimation of time, staffing, equipment, and materials needed	R	A	R
b. Project phasing and scheduling	R	U	R
c. Time management	U	A	U
d. Staff supervision	R	A	R

## Land Development BoK for Surveying

### Knowledge Area: Project management and administration (Cont')

Core  
specialist  
Scholar

Project management (technology and procedures)			
a. Principles of measurement, imaging, positioning	U	A	A
b. Assessment of a project's technical needs	U	A	U
c. Assessment of project's procedural requirements, including timing	R	A	R

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## Land Development BoK for Surveying

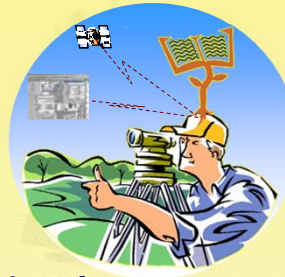
### Knowledge Area: Project management and administration (Cont')

Core  
specialist  
Scholar

Project management (technology and procedures)			
d. Identification of strengths and weaknesses of various technical approaches in seeking the most appropriate one or combination	R	U	U
e. Assessment of staffing abilities and needs	R	A	R

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## What's next?



- Receive feedback on the body of knowledge findings
- Streamline all five parts of the body of knowledge to a consistent document
- Lobby national and state societies to adopt and implement the body of knowledge.

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## What's next?

- Tempus IV (2007-2013)



- Ask FIG commissions to revise the respective BoKs?



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If you are interested in becoming involved send  
an email to:

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