GTCM Update – Goal 2.2.1

RODNEY D. JACKSON

CO-PI, GEOTECH CENTER

RODNEY_JACKSON@DAVIDSONCCC.EDU

GIS as a Profession

- The Department of Labor Employment & Training Administration (DOLETA) has worked with industry and education leaders to develop a comprehensive competency model for Geospatial Technology.
  - Model is designed to evolve along with changing skill requirements
  - Model frameworks are based on the competency model building blocks
    - GTCM approved by DOL, 2010
    - GMCM approved by DOL, 2012

GTCM: Prior Work

2000-2003:
Original GTCM

2005-2006: Industry
Definition Workshops
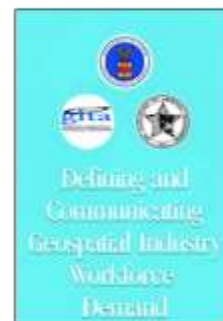
2004-2006: *GIS&T*
Body of Knowledge

2008: Skills in
Professional Geography

2008-2010: New GTCM

GIS&T: Body of Knowledge

- Body of Knowledge for GIS&T
  - Created by the University Consortium for Geographic Information Science
  - Distributed by the Association of American Geographers

- Body of Knowledge describes what topics relate most to GIS
  - Knowledge Area: Two letter code and description
  - Unit: Number and title with a brief description
  - Topic: Unit number and individual number and descriptive title

GIS&T: Body of Knowledge

- Knowledge Areas
- Analytical Methods (AM)
- Conceptual Foundations (CF)
- Cartography and Visualization (CV)
- Design Aspects (DA)
- Data Modeling (DM)
- Data Manipulation (DM)
- Geocomputation (GC)
- Geospatial Data (GD)
- GIS & T and Society (GS)
- Organizational and Institutional Aspects (OI)
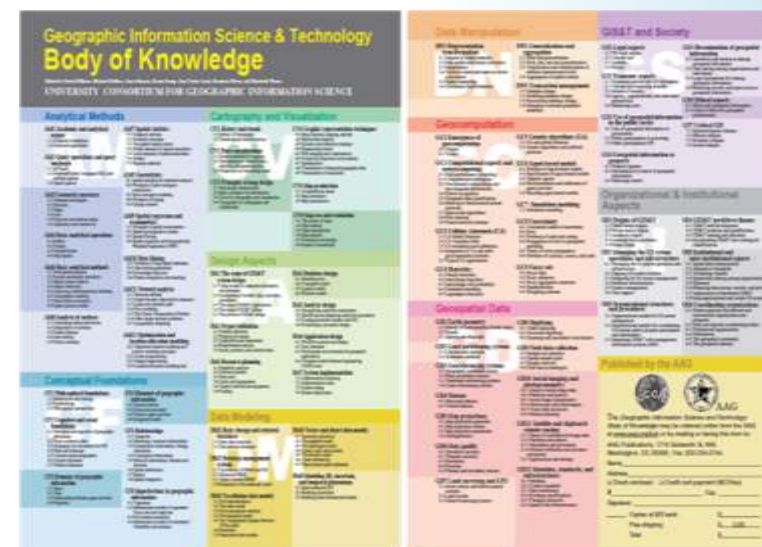
GIS&T: Body of Knowledge

GTCM and the Body of Knowledge (BoK)

- Relationship between the GTCM and the Geospatial BoK
  - The Geospatial BoK is an exhaustive listing of formal educational objectives related to geospatial information science
  - The GTCM is more generalized and tries to focus on those competencies and tasks that a geospatial professional may encounter over the span of a career
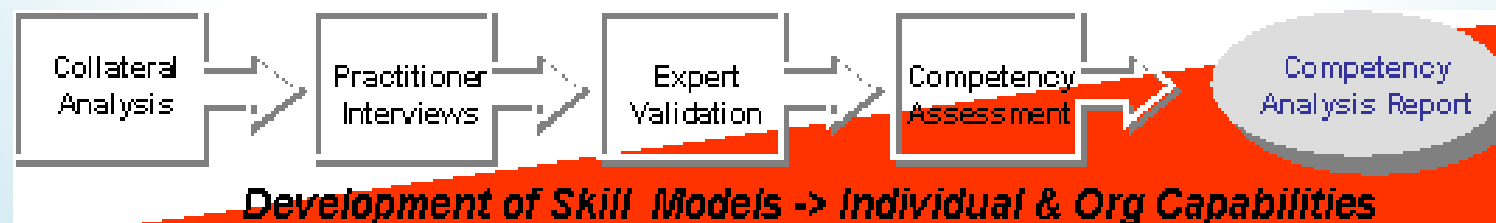
Competency Model Foundation

- Competency Defined
  - *Competencies are behaviors that encompass the knowledge, skills, and attributes required for successful performance that enable a person to deliver superior performance in a given job, role, or situation.*

- Competency Modeling
  - *Competency modeling is the activity of determining the specific competencies that are characteristic of high performance and success in a given job.*
    - * Maggie LaRocca, Learning Program Manager, Hewlett-Packard

Collateral Analysis → Practitioner Interviews → Expert Validation → Competency Assessment → Competency Analysis Report

Development of Skill Models -> Individual & Org Capabilities

DOLETA Competency Modeling Process

- Steps to Build an Industry Competency Model
  - Gather background information
  - Develop draft competency model framework
  - Gather feedback from industry representatives
  - Refine the competency model framework
  - Validate the competency model framework
  - Finalize the model framework

  - PMRI, Inc. (2005). Technical Assistance Guide for Developing and Using Competency Models—One Solution for a Demand=Driven Workforce System. http://www.careeronestop.org/competencymodel/Info_Documents/TAG.pdf

The Value of a DOLETA Model

- Provides a federally-approved approach to defining an industry

- Widely recognized in private industry and government
  - Relies on industry experts to define the contents of the model
  - Vetted widely through industry and professional organizations

- Allows repeatable results across any technology-based industry
  - Well researched methodology
  - Can be refined with further DACUM research

Competency Model

- Description
  ◦ Tool that identifies the competencies needed to operate in a specific role in job, occupation, organization, or industry

- Attributes
  ◦ Accessible
  ◦ Comprehensive
 ◦ Industry-defined building blocks

Competency Model Tiers
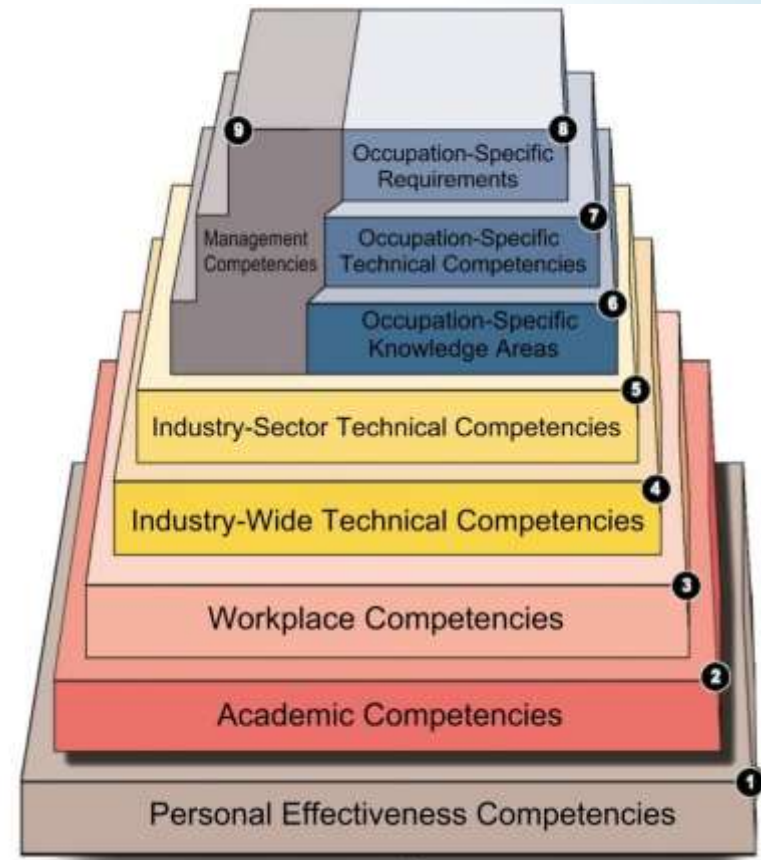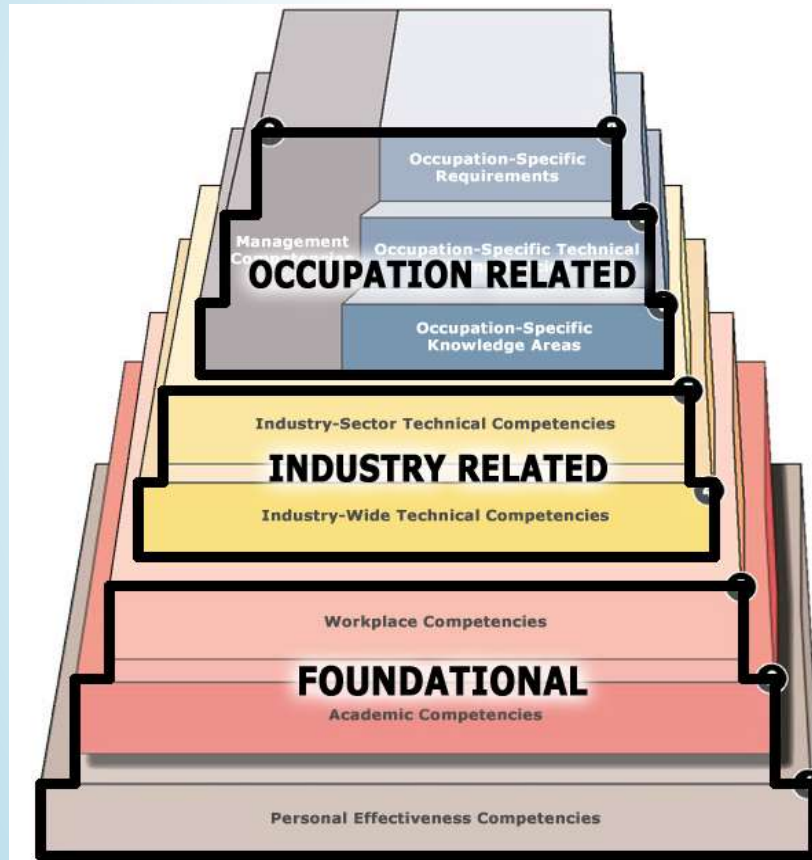
Geospatial Technology Competency Model (GTCM)

- Department of Labor Employment & Training Administration (DOLETA)
  - The GTCM consists of five initial "tiers" of industry competencies
  - Portrays "geospatial" as an interdisciplinary field
  - Industry-specific geospatial expertise is built upon a foundation of more generally applicable competencies
  - The GTCM defines the core competencies and skill sets that every person working in the geospatial profession should possess

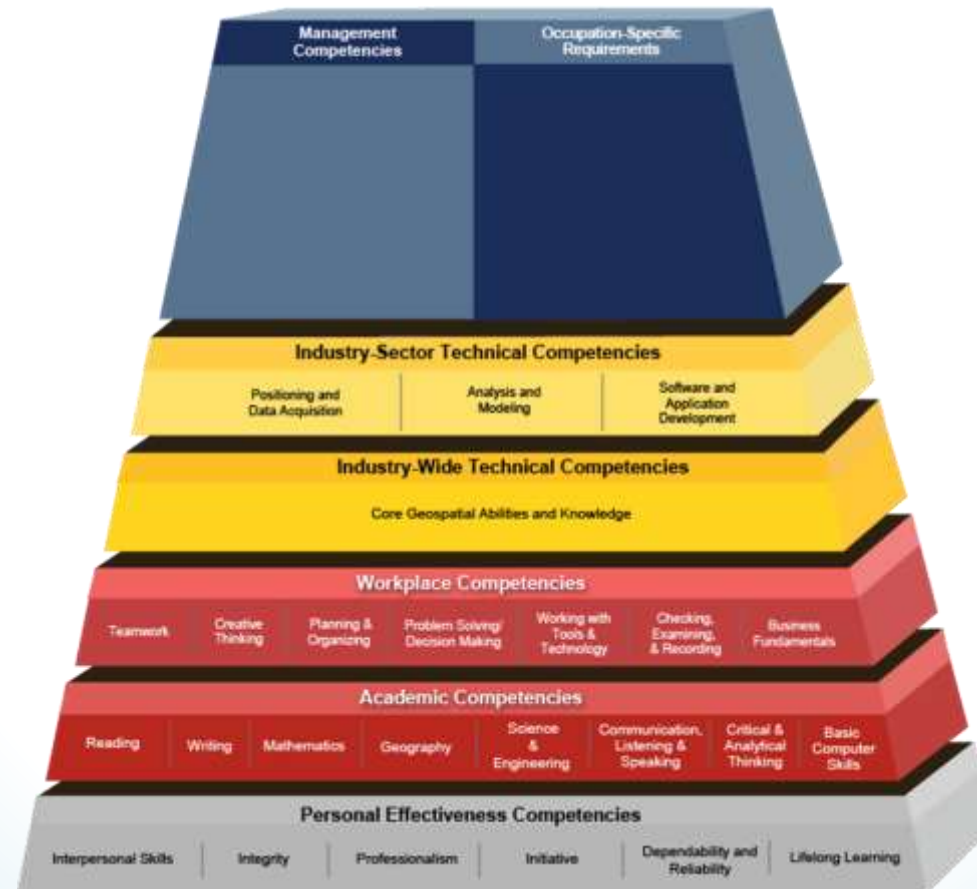# A Competency Model is Composed of 3 Major levels

- Occupation Related
  - Tier 9 -- Management Competencies
  - Tier 8 -- Occupation-Specific Requirements
  - Tier 7 -- Occupation-Specific Technical Competencies
  - Tier 6 -- Occupation-Specific Knowledge Competencies
- Industry Related
  - Tier 5 -- Industry-Specific Technical Competencies
  - Tier 4 -- Industry-Wide Technical Competencies
- Foundational Competencies
  - Tier 3 -- Workplace Competencies
  - Tier 2 -- Academic Competencies
  - Tier 1 -- Personal Effectiveness
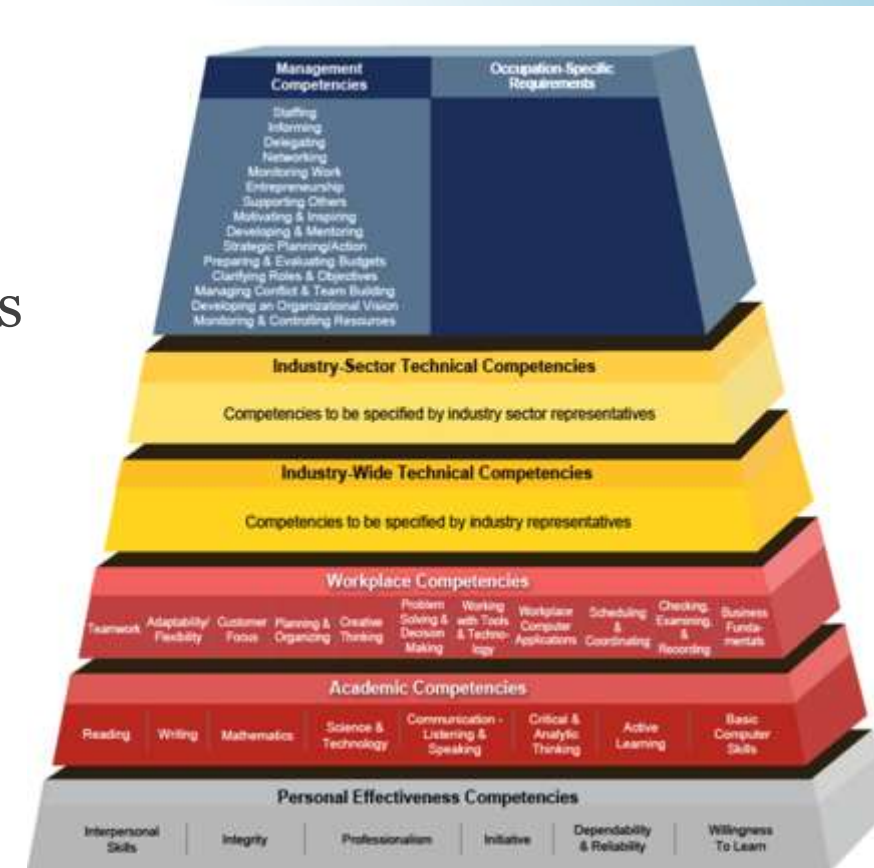
Geospatial Technology Competency Model (GTCM)

- On June 18, 2010 DOLETA released an updated GTCM
  - Geospatial professionals completed the GTCM begun by DOLETA in 2008
  - An earlier GTCM, prepared by the University of Southern Mississippi with support from DOLETA and NASA, laid the foundation for recent efforts
  - The GTCM culminates more than a decade of work to formally characterize the nature of geospatial expertise

Geospatial Technology Competency Model

Geospatial Technology Competency Model

DOLETA O*NET OnLine

Building Block Descriptions – or download a PDF

Beyond the scope of the current GTCM

- Occupation Related Competencies
  - Tier 6 -- Occupation-Specific Knowledge Competencies
    - Knowledge areas associated with particular occupations - O*NET
  - Tier 7 -- Occupation-Specific Technical Competencies
    - Technical competencies associated with particular occupations - O*NET
  - Tier 8 -- Occupation-Specific Requirements
    - GIS Certification Institute publishes certification requirements
- Tier 9 -- Management Competencies
  - Geospatial Management Competency Model

GTCM Update - Goal 2.2.1

- Work with DOL to convene two panels of geospatial experts to review, update & approve GTCM

1. Identify Participants for review and update
2. Conduct review of current GTCM with both panels
3. Conduct workshop for selected GTCM geospatial experts to recommend updates from results of the practioner survey
4. Validate recommendations from combined workforce panels
5. Final Report to DOL

GTCM Update – Defining Participants

- Identify Participants for review and update
  - Distribute letter through professional societies/networks, government agencies and industry soliciting for two GTCM review panel nominations
    - Solicit participation for members of both panels
    - Determine and invite members for both panels
  - Develop Panel of at least 50 geospatial Participants from diverse backgrounds to serve on a GTCM panel
  - Select Panel of 8-10 GTCM geospatial experts

GTCM Update – Geospatial Participants

- Distribute separate surveys for Tiers 1-5 geospatial participants
  - Close survey (two - three weeks lag time)
    - Tier 1: Personal Effectiveness Competencies
    - Tier 2: Academic Competencies
    - Tier 3: Workplace Competencies
    - Tier 4: Industry-wide Technical Competencies
    - Tier 5: Industry-specific Technical Competencies
  - Compile and distribute survey results

Geospatial Participants – Tiers 1-5

- Compile and distribute survey results
  - Tier 1: Personal Effectiveness Competencies - 266
  - Tier 2: Academic Competencies - 223
  - Tier 3: Workplace Competencies - 219
  - Tier 4: Industry-wide Technical Competencies - 208
  - Tier 5: Industry-specific Technical Competencies – 207

- Geospatial Technology Competency Model

SME Review of Competency Scores

- Conduct online meetings for a panel of subject matter experts (SMEs)
  - Facilitate preliminary meeting with GTCM SMEs
    - Distribute survey results and report initial findings
  - Create surveys based upon findings of the initial survey
    - Separate survey for Tiers 1-5
- Conduct follow-on online workshops to discuss proposed edits
  - Distribute SMEs survey results and comments
- Hosts online editing platform for competencies within each tier
  - Collects results for edits and distribute to workforce panel

SME Review of Competency Scores (Tier 1)

- No competencies were deemed to lack relevance

SME Review of Competency Scores (Tier 2)

2. How important are the following Academic Competencies: Science and Engineering - Subject-specific Engineering Knowledge?			
Answer Options	Not Important	Somewhat Important	Very Important
Architecture and Architectural Engineering - design and construction of buildings	5	2	1
Civil Engineering - design and construction of public and private works, such as infrastructure (roads, railways, water supply and treatment), bridges, and buildings	4	2	2
Environmental Engineering - application of science and engineering principles to improve the environment	3	3	2
Landscape Architecture - design of outdoor and public spaces	3	4	1

SME Review of Competency Scores (Tier 3)

4. How important are the following Workplace Competencies: Business Fundamentals?			
Answer Options	Not Important	Somewhat Important	Very Important
Cost and Pricing of Products	4	2	2
Fundamentals of Accounting	5	3	0
Profit and Loss	5	2	1
Supply/Demand	6	1	1
Practice sustainability by using processes that are non-polluting, conserving of energy and natural resources, economically efficient, that use local materials, and safe for workers, communities, and consumers	4	3	1
Explain the entrepreneurial process, including discovery, concept development, resourcing, actualization, harvesting	5	2	1

SME Review of Competency Scores (Tier 4)

1. How relevant are the following competencies?

Answer Options	Not Relevant	Somewhat Relevant	Very Relevant
Differentiate the several types of resolution that characterize remotely-sensed imagery, including spatial, spectral, radiometric, temporal, and extent	1	4	6
Explain the distinction between GNSS data post-processing (such as U.S. National Geodetic Survey's Online Positioning User Service) and real time processing (such as Real-Time Kinematic)	2	6	3
Acquire information needed to compare the capabilities and limitations of various sensor types in the context of project requirements	2	5	4
Explain the difference between active and passive remote sensing, citing examples of each	1	7	3
Plan a GNSS data acquisition mission that optimizes efficiency and data quality	2	6	3
Use the concept of the "electromagnetic spectrum" to explain the difference between optical sensors, microwave sensors, multispectral and hyperspectral sensors	1	6	4

SME Review of Competency Scores (Tier 4)

1. How relevant are the following competencies?			
Answer Options	Not Relevant	Somewhat Relevant	Very Relevant
Compare differential GNSS and autonomous GNSS	4	6	1
Identify and describe characteristics of inertial measurement systems and other geospatial measurement systems	5	6	0

SME Review of Competency Scores (Tier 5)

1. How relevant are the following competencies?

Answer Options	Not Relevant	Somewhat Relevant	Very Relevant
Design a questionnaire and interview protocol for acquiring georeferenced socio-economic data	3	6	2
Explain the concept of "bit depth" and its implications for remotely-sensed image data	3	6	2
Diagram the sequence of functions involved in producing georeferenced textual information harvested from social media sites and the World Wide Web	1	8	2
Describe the components and operation of an aerotriangulation system	4	7	0

SME Review of Competency Scores (Tier 5)

1. How relevant are the following competencies?

Answer Options	Not Relevant	Somewhat Relevant	Very Relevant
Make and justify a choice between Real time Standard Positioning Service (SPS) and Real time Precise Positioning Service (PPS) for a given objective	5	5	1
Define the sampling theorem in relation to the concept of spatial resolution of remotely-sensed imagery	5	5	1
Compare characteristics and appropriate uses of geospatial modeling techniques, such as neural networks, cellular automata, heuristics, agent-based models, and simulation models such as Monte Carlo simulation	5	5	1

SME Review of Competency Scores (Tier 5)

1. How relevant are the following competencies?

Answer Options	Not Relevant	Somewhat Relevant	Very Relevant
Assess the current state of the art in coupling predictive models and simulations with GIS software	5	4	2
Make and justify a choice between Real time Standard Positioning Service (SPS) and Real time Precise Positioning Service (PPS) for a given objective	5	5	1
Explain how an online real estate site acquires and integrates public information about nearly 100 million property parcels in the U.S.	6	4	1
Define the sampling theorem in relation to the concept of spatial resolution of remotely-sensed imagery	5	5	1
Compare how land records are administrated in the U.S. in comparison with other developed and developing countries	6	4	1
Explain the Modifiable Areal Unit Problem in relation to the "ecological fallacy"	7	2	2

GTCM Update – Workforce Experts

- Report to Workforce Experts
  - Discuss workforce comments
    - Distribute survey results and proposed edits \ additions
  - Incorporate edits and distribute report for industry approval
    - June 12, 2014 (Louisville, KY)

GTCM Update - Validation

- Validate recommendations from Workforce panels
  - Distribute workforce report to larger geospatial community
    - Collect questions/comments/feedback
  - Facilitate discussions with GeoTech PIs and Workforce
    - Respond to comments and create final GTCM update
  - Send out final draft, review comments and request approval

GTCM Update - Goal 2.2.1

¿Questions?

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