GIS in Transportation

The Federal Highway Administration (FHWA)
GIS in Transportation Program presents on…

State DOT Organizational Assessments and Capability Maturity Models for GIS

Thursday, April 14, 2017

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Overview

- Background & Goals of Peer Exchange

- Introduction to Organizational Assessments and CMMs

- Past State DOT Evaluations

- Current State DOT GIS Needs and Gaps

- Lessons Learned

- Q&A

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BACKGROUND AND GOALS

FHWA GIS in Transportation Program

- Capacity building program for practitioners and users of geospatial tools and technology
- Goal is to advance transportation planning and coordination in planning efforts through the use of GIS and geospatial tools by coordinating:
  - Quarterly Webinars and Newsletters
  - Peer Exchanges
  - Case Study Reports
  - Workshop and Presentations (Like this one!)

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Peer Exchange Goals

- To define what an organizational assessment is and what it entails

- Highlight the role that organizational assessments can or have played in developing a comprehensive GIS strategy

- Share experiences between State DOTs that have undergone organizational assessments and State DOTs that have limited experience with, or have not undergone, an assessment

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INTRODUCTION TO ORGANIZATIONAL ASSESSMENTS AND CAPABILITY MATURITY MODELS

What are they?

- A CMM is an application of an organizational assessment, which aims to asses the overall maturity of an organization given a set of metrics

- Usually involves:
  - Ranking software and administrative processes in how well they are detailed and followed
  - Defines tasks by "maturity scale" using a numerical ranking system

Levels of Maturity

1. Undisciplined	• Poorly maintained data
2. Reactive	• Addresses problems as they arise
3. Proactive	• Ability to avoid risk and uncertainty
4. Governed Data	• Improved decision making and results

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Preparing for an Organizational Assessment

- Assessments are time and resource intensive at first

- Duration of an assessment depends on the level of detail

- Requires coordinating within GIS Division and with related departments to identify the necessary data

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Benefits from Organizational Assessments

- A tool to assess an organization's ability to accomplish a defined task or set of tasks

- Identifies strengths, weaknesses in GIS services at an agency

- Results in actionable short-term and long term items

- Used to motivate investment from executive team

Peer Exchange Common Themes

- Importance of GIS Awareness in Management
- Building and Organizing GIS within an Agency
  - Centralized v. Decentralized
  - Short-term Staffing
- Data Management

STATE DOTS WITH ORGANIZATIONAL ASSESSMENT EXPERIENCE

Peer Example: ADOT

- Has undertaken four GIS evaluations since 2001:
  - 2001 Assessment: Assessed overall GIS capability by working with ESRI and found a lack of internal knowledge
  - 2003 Assessment: Worked with Trans LTD and found an Inappropriate level of staffing and compensation and Lack of in house technical skills
  - 2010 Assessment: Worked with ARCADIS and found that hey needed an Additional staff needed (programmer)
  - 2012 Assessment: Worked with Cambridge Systematics and found that they had missing documentation

Peer Example: ADOT Results

- 2001 Assessment led to Investment into GIS hardware/software (ArcSDE), Central GIS Data Server, LRS maintenance and HPMS done in house
- 2003 Assessment led to updated capabilities of the Photo Log, New Highway Log, and Updated process to maintain ATIS
- 2010 Assessment led to Updated database structure, Creation of ADOT's online tool – APLAN, and Hired an HPMS coordinator
- 2012 Assessment led to a Position reclassification into Planning grouping, Better documentation standards, and Hiring of 3 new staff members

Peer Example: IDOT

- Has undertaken three GIS evaluations since 2004:
  - 2004 Assessment: IDOT assessed its current status with respect to six different measures, scoring each based on a level of maturity.
  - 2015 Assessment: Reassessed the maturity of the organization based on the same categories.
  - 2016 Assessment: Across four categories there was a drop in rating and across the remaining two categories, the scores went up.

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Peer Example: IDOT Results

- IDOT's data governance falls between "reactive" and "proactive"
- Experiences gaps such as not having the location of all IDOT projects and appropriate right-of-way information in their databases
- There exist duplicate data governance efforts with the same goals, which are a result of top down initiatives
- CMMs resulted in better organized data and more efficient organizational restructuring

Peer Example: Ohio DOT

- Has undertaken two GIS evaluations since 2002:
  - 2002 Assessment: First assessment to involve individuals across the GIS and IT divisions
  - 2014 Assessment: Follow-up assessment looking at Ohio DOT's enterprise architecture

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Peer Example: Ohio DOT Results

- 2002 assessment resulted in
  - Greater GIS awareness across agency, IT integration and support within GIS projects
  - More GIS training
  - Contributed to the formation of a GIS committee
- 2014 assessment resulted in:
  - Enterprise Architecture assessment report
  - Reaffirmed importance of internal and external GIS marketing

STATE DOT ORGANIZATIONAL ASSESSMENT NEEDS AND GAPS

Importance of GIS Awareness in Management

- Challenge of "selling" the value of GIS to upper management

- Not being able to see the direct applications of GIS tools and practices

- Misaligned goals between middle and upper-management

Source: XKCD

Importance of GIS Awareness in Management – NCDOT Example

- At NCDOT, value of GIS is clear and understood by upper management

- Biggest challenge is prioritizing what GIS features should be invested in and communicating why
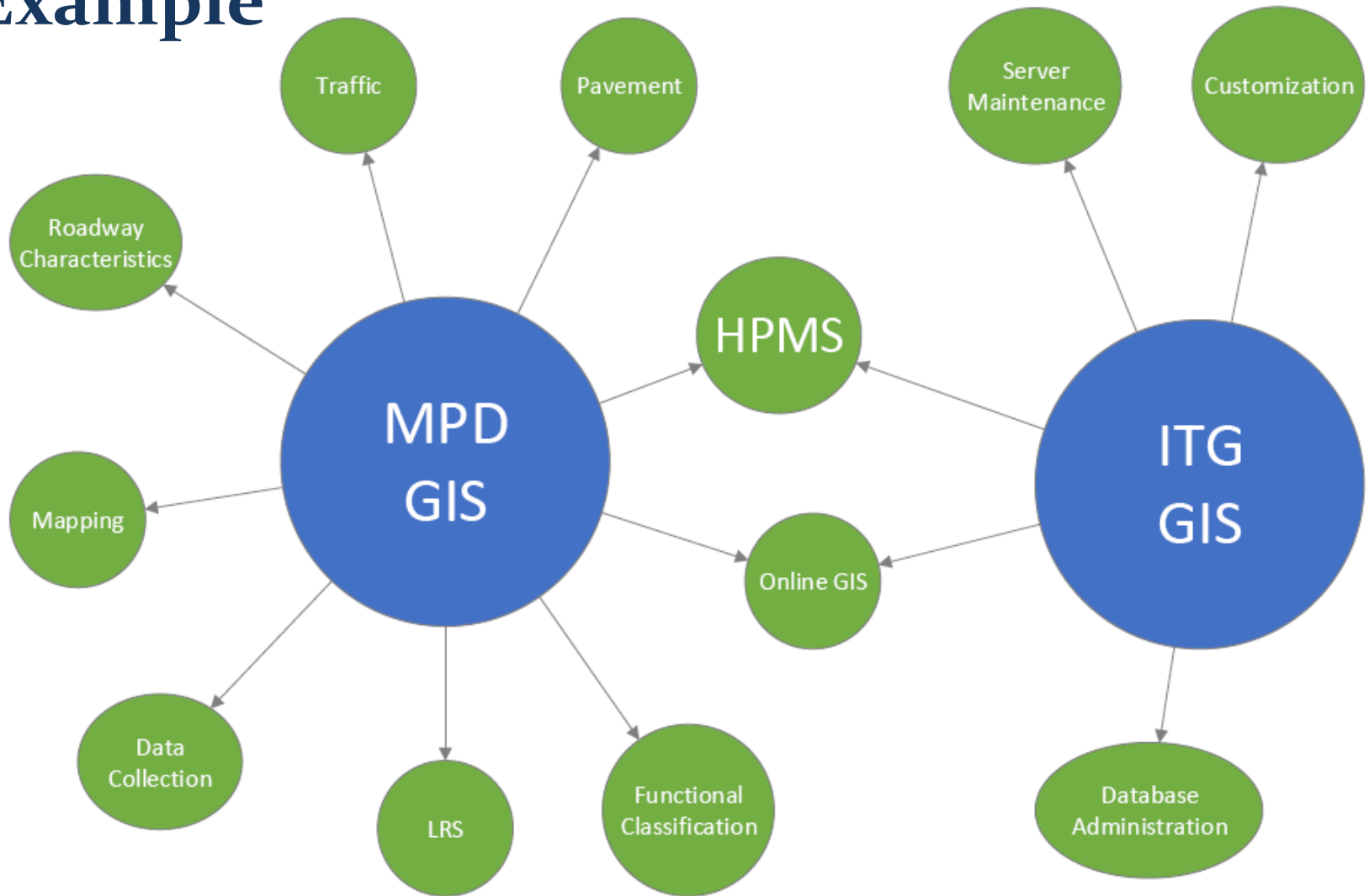
Importance of GIS Awareness in Management – Ohio DOT and Oregon DOT Examples

- Management awareness is essential to increase general knowledge of GIS within an organization

- In Oregon, there is no direct mandate as to how GIS software should be housed or used

Building and Organizing GIS within an Agency – Centralized v. Decentralized

- Each organization has different staffing needs, resources, and technical knowledge, therefore a one-size-fits-all organizational model is not feasible

- Two general organizational models prevail:
  - Centralized GIS department
  - Decentralized model

- "Two sides" of GIS:
  - System Data Management
  - Analysis & Planning

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Centralized v. Decentralized – ADOT Example

Source: "Borrowed" from ADOT Presentation

Centralized v. Decentralized – NCDOT Example

- Historically, greatest challenge was the duplication of data, effort, and services
- Developed a Strategic Plan
- Created a GIS Unit, which is located within the IT Department
  - Consists of multiple subgroups that work directly with other departments
  - Unit is responsible for the agency's GIS Strategic Plan

Centralized v. Decentralized – IDOT Example

- Follows a centralized GIS administration model
  - Two full-time staff and two consultants
  - Office coordinators and GIS experts
- GIS group is in charge of asset management and strategic communication
- IDOT's goal is to create a central authoritative database that is software neutral

Building and Organizing GIS within an Agency – Long-Term v. Short-Term Work

- Contractors are often a solution to staffing challenges

- Contracting process can be limiting and provides only a short term solution

- Long-term contracting can be too resource-intensive for some agencies

Source: XKCD

Long-Term v. Short-Term Work – ADOT Example

- Contractors perform a large portion of the GIS-related work

- Contracting generally has higher upfront costs but less long term training costs

- Greatest challenge is finding a balance between in-house capabilities and outsourced capabilities

  – CMM can help identify in-house capabilities

Long-Term v. Short-Term Work – TDOT and MDOT Examples

- Both State DOTs have a system for limited service/on-call contractors by using Federal IDIQ (Indefinite Delivery, Indefinite Quantity) contracts.

- Utilize the General Services Administration (GSA) schedule to ensure competitive rates.

Long-Term v. Short-Term Work – Oregon DOT Example

- Uses a GIS steering committee to review all projects that require 200+ hours

- All other smaller projects are subject to "short-burn" resourcing

- About 30% of total hours worked pertain to small projects

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Data Management

- Lack of data management policies and systems is a common problem

- State DOTs aim to have structured data architecture and practices

- Unstructured data can result in:
  - Scattered through an agency
  - Stored in siloes
  - Conflicting standards

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Data Management – NCDOT Example

- Too much information tends to be held at the top of an organization
- Need detailed documentation process
  - Can be done through a data governance expert
  - Process ensures continuity by reducing knowledge loss from the turnover

Data Management – TDOT Example

- Worked with a contractor for an evaluation of its GIS data management
  - Found that the same data can be located in up to six different locations
  - Aims to fix this with an Enterprise system

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Data Management – Ohio DOT Example

- Created a Transportation Asset Management Plan in 2016
  - Includes three tier process for project prioritization
  - Also includes a four-stage technical review that determines if it is more cost-effective to carry out a project in-house, or to create a Request-for-proposal (RFP) and outsource it
  - Technical review takes about four months

Data Management – ADOT Example

- Maintains GIS knowledge and training through a "living document" of knowledge management

- Available to anyone within the organization

- Breaks down barriers to retrieve data

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LESSONS LEARNED

Lessons Learned

- **CMMs and scaled assessments are critical to developing GIS departments**
  - Assessments can take from five to twelve months based on previous experiences of DOTs
- **Identifying an efficient organizational structure of GIS, IT, and Planning departments within an agency is critical**
  - Foster an equal-footing relationship between IT and the GIS/Planning offices

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Lessons Learned (cont.)

- **Define GIS and its role within the agency**
  - Clearly defining GIS's features and applications within agencies is important in order for upper management to understand its value
- **Collaborate with Human Resources to develop staffing solutions**
  - Foster growth within entry-level positions with training and adequate compensation if possible
  - Important create specific classifications of positions, and have GIS departments develop job descriptions

Lessons Learned (cont.)

- **Set up data management policies and getting all staff members on the same page**
  - Creating detailed and periodically maintained documentation will break down barriers for employees
  - Establishing clear review processes will reduce costs improve project prioritization efficiency
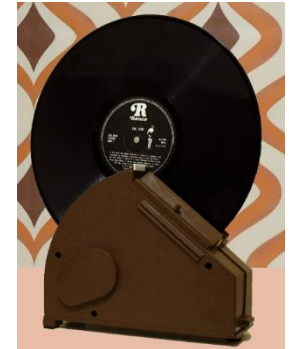
QUESTIONS AND ANSWERS

Q&A

Peer Agencies:
- ❑ Arizona DOT
- ❑ Iowa DOT
- ❑ Michigan DOT
- ❑ North Carolina DOT
- ❑ Ohio DOT
- ❑ Oregon DOT
- ❑ Tennessee DOT

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