NCHRP PROJECT 20-5 - SYNTHESIS TOPIC 38-02

IT BEST PRACTICES FOR PROJECT DESIGN AND CONSTRUCTION

Prepared by
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The University of Southern Mississippi

For Presentation to
AASHTO Highway Subcommittee on Construction
2007 Summer Meeting - July 31, 2007
Agenda

0. Scope of the Project

1. Literature Review

2. Survey of IT practices by Functional Area

3. Selected case studies

4. Data Flow Process diagrams

5. Summary
0. Scope of the Project

- The synthesis series reports on current knowledge and practice, in a compact format.

- Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.
0. Scope of the Project

- **Problem:** Electronic data generated during different phases of the project delivery lifecycle are *not always complete, consistent, preserved, fully understood, transmitted to customers, or otherwise meet the needs of the users.*

- **Objective:** Identifying existing best practices (e.g., procedures, guidelines, software types, hardware, and human factors) for the seamless **sharing of information** throughout all phases of the project delivery process is the focus of this report.
0. Scope of the Project

- Does your state **successfully transfer data** from one phase to another?
  - Names of engineering software packages used in one or more phases of the project delivery lifecycle
  - When they are used
  - How they integrate into the next phase and/or the overall project delivery lifecycle

- **Identify gaps in integration** and those that have solved the integration gap challenge.
  - Effective and persistent use of data “enters it once, uses it over and over”
  - Data sharing problems and gaps
  - Current applications and published case studies of the use of interoperability
  - Current research in interoperability
0. Methodology

1. Literature Review
   - DOT Information Technology
   - Interoperability

2. Survey of IT practices by Functional Area

3. Selected case studies

4. Data Flow Process diagrams
1. Literature Review

- DOT Information Technology
- Interoperability
2. Survey of IT practices by Functional Area

SECTION 1: IT for PLANNING FUNCTION

What U.S. State is your DOT? __________________________ Official Functional Unit Name: _______________________

Name of Survey Respondent: __________________________ Respondent's Job Title: ___________________________

Respondent's email address: __________________________ Respondent's phone number: ______________________

IN WHICH FORMAT IS DATA **PRIMARILY RECEIVED** FROM OTHER UNITS?

- Most always digital-Most never paper
- Frequently digital-Seldom never paper
- Approximately equal amounts of digital & paper
- Frequently paper-Seldom digital
- Most always paper-Most never digital

IN WHICH FORMAT IS DATA **PRIMARILY PROCESSED/GENERATED** INTERNALLY?

- Most always digital-Most never paper
- Frequently digital-Seldom never paper
- Approximately equal amounts of digital & paper
- Frequently paper-Seldom digital
- Most always paper-Most never digital
2. Survey of IT practices by Functional Area

Identified 5 DOT ‘Functional Areas’

- PLANNING
- DESIGN
- PROCUREMENT
- CONSTRUCTION
- OPERATIONS & MAINTENANCE
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2. Survey of IT practices by Functional Area
2. Survey of IT practices by Functional Area

CURRENT STATUS: INITIAL SURVEY COMPLETE

![Bar chart showing the distribution of IT practices by functional area.](chart.png)
2. Survey of IT practices by Functional Area

CURRENT STATUS: INITIAL SURVEY COMPLETE

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2. Survey of IT practices by Functional Area

CURRENT STATUS: INITIAL SURVEY COMPLETE
### 2. Survey of IT practices by Functional Area

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3. Selected case studies

- FLORIDA DOT
- KENTUCKY TRANSPORTATION CABINET
- MINNESOTA DOT
- NEW YORK STATE DOT
- NORTH CAROLINA DOT
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3. Selected case studies

- FLORIDA DOT
- KENTUCKY TRANSPORTATION CABINET
- MINNESOTA DOT
- NEW YORK STATE DOT
- NORTH CAROLINA DOT

MAY NEED OTHERS!
4. Data Flow Process diagrams (IDEF0)

- **INPUT**
  - Constraint
  - Survey Data Points

- **DATA PROCESS TASK**
  - Mechanism
  - Application: Microstation

- **OUTPUT**
  - Data Filetype
  - Digital Terrain Model Created
4. Data Flow Process diagrams (IDEF0)
4. Data Flow Process diagrams (IDEF0)
5. Summary *(Current Status)*

- ✓ CASE STUDY INTERVIEWS UNDERWAY
- ✓ MAPPING UNDERWAY
- ✓ LITERATURE REVIEW COMPLETE
- ✓ 2ND DRAFT DUE EARLY OCTOBER
5. Summary  *(Preliminary Conclusions)*

- STANDARDIZATION OF TERMS (ONTOLOGY)
- STANDARDIZATION OF DATA/FILE TYPES
5. Summary  *(Possible Solutions: Further Research)*

COMMON DATA LANGUAGE:

SCHEMA-LAND/xml, TRANS/xml

BIM: INDUSTRIAL FOUNDATION CLASSES (IFC)

COMMON DATA/FILE TYPES

MAPPING CAPABILITIES (DATA SHARING)

INTELLECTUAL PROPERTY ISSUES (DATA SHARING)

VERSION TRACKING (DATA SHARING)

REPOSITORY ISSUES (DATA SHARING)
5. Summary  (Possible Solutions: Further Research)

DATA SHARING

- ACROSS FUNCTIONAL AREAS
- BETWEEN PROJECT/CONTRACTUAL STAKEHOLDERS

STANDARDIZATION STARTS SOMEWHERE

International Organization for Standardization (ISO)?

International Alliance for Interoperability (IAI)?

AASHTO: Joint Technical Committee(s)?
5. Summary  (Possible Solutions: Further Research)

PROJECT LIFE-CYCLE WITH FEEDBACK LOOP

- PLANNING
- DESIGN
- PROCURE
- CONSTRUCT
- OPERATE MAINTAIN

DOT Functional Areas
5. Summary  (Possible Solutions: Further Research)

TIM not BIM

DTM (3D)  DDM (3D)  TIM (3D,4D,5D)  TIM (4D,5D,6D)  TIM (3D-nD)

DTM=Digital Terrain Model  3D=x,y,z digital model
DDM=Digital Design Model  4D=3D + schedule
TIM=Transp Information Model  5D=3D + estimate
TIM not BIM  6D=3D + work progress
SPECIAL THANKS TO 38-02 SYNTHESIS PANEL MEMBERS

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Senior Program Officer  
Transportation Research Board
Thank You for Having Us!

QUESTIONS?

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