

# **Task 2 Working Paper**

**to the**

**National Cooperative Highway Research Program  
(NCHRP)**

**on Project 03-77  
Guide to Contracting ITS**

LIMITED USE DOCUMENT

This Working Paper is furnished only for review by members of the NCHRP project panel and is regarded as fully privileged. Dissemination of information included herein must be approved by the NCHRP.

**June 21, 2004**

***Edwards***  
**AND *Kelcey***

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## BACKGROUND

The successful acquisition of Intelligent Transportation Systems (ITS) has proven to be a challenge for state and local transportation agencies alike. The challenge has been more institutional than technological in nature. Many of the institutional challenges standing in the way of deploying ITS can be attributed to ITS procurement. The American Association of State Highway and Transportation Officials (AASHTO) through the National Cooperative Highway Research Program (NCHRP) has initiated the development of a Guide to Contracting ITS Projects (Project 03-77). The scope-of-work (SOW) associated with the development of this guide is outlined below<sup>1</sup>:

- Task 1 – Review of Transportation and Technology Literature
- Task 2 – Look at Other Industries
- Task 3 – Categorize ITS Projects
- Task 4 – Systems Engineering Process
- Task 5 – Recommend Contract Types
- Task 6 – Prepare a detailed Outline of the Guide
- Task 7 – Prepare the Guide
- Task 8 – Submit Final Report

This working paper provides a summary of the work completed for tasks (1) and (2). This paper also presents results and recommendations that will be carried forward to future tasks.

## INTRODUCTION

Tasks (1) and (2) involve the review of relevant transportation and technology literature. It is the intent of these tasks to consider literature relating to both the contracting and deployment of ITS by public transportation agencies, as well as the contracting and deployment of non-ITS information technologies by both the public and private sectors (non-transportation industry). An NCHRP Review Panel is overseeing the entire project. The review panel consists of ITS and contracting professionals from both the public and private sectors. Task (2) requires the delivery of this working paper for review by the NCHRP panel.

As a supplement to the literature review, the research team was asked to conduct a survey of state and local Departments of Transportation to obtain information regarding current ITS procurement and contracting practices.

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<sup>1</sup> A detailed SOW for this NCHRP project is included in the proposal.

## PROCESS

Several transportation and non-transportation sources were used to identify literature relevant to this project. A special emphasis was placed on non-transportation sources with hopes that other industries would suggest procurement approaches not yet used within the transportation industry. The sources searched for the literature review are presented below:

- Transportation Sources
  - Transportation Research Board
  - JPO Electronic Document Library
  - Institute of transportation Engineers (ITE)
  - ITS America (including State Chapters)
  - State Departments of Transportation
  - American Association of State Highway Officials (AASHTO)
  - ITS Cooperative Deployment Network (ICDN)
- Non-Transportation Sources
  - US Department of Defense
  - State and Federal Procurement Regulations
  - National Association of State Information Resource Executives
  - National Association of State Directors of Administration and General Services
  - The Performance Institute
  - US Department of State
  - National Association of State Purchasing Officials
  - AcqNet
  - US General Accounting Office
  - USDA Graduate School

In order to effectively manage the findings of the literature review, an Access database was developed<sup>2</sup>. References were entered into the database via the form presented in Figure (1). The form structure is based on a format presented in other NCHRP reports.

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<sup>2</sup> The Access database can be accessed via the project website at <http://www.nchrproject03-77.com>.

**Microsoft Access - [Guide to Contracting ITS - Literature Search Results]**

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MS Sans Serif 8 B I U Source

ID	Author (Last, First, MI)		
7	Tanner, VL		
Title	METRO RAIL PROJECTS RACING TO FIND UNCERTAIN FUTURE		
Publisher	McGraw-Hill Companies, Incorporated		Date
			9/1/2003

This resource contains information on the following categories:

<input type="checkbox"/> Contractor/Consultant	<input type="checkbox"/> Award Method	<input type="checkbox"/> Contract Type	<input type="checkbox"/> Other Considerations
<input type="checkbox"/> Design Consultant	<input type="checkbox"/> Low-Bid	<input type="checkbox"/> Fixed Price	<input type="checkbox"/> IP Rights
<input checked="" type="checkbox"/> Design-Build	<input type="checkbox"/> Negotiated	<input type="checkbox"/> Cost Reimbursement	<input type="checkbox"/> Cancellation Clauses
<input type="checkbox"/> System Manager	<input type="checkbox"/> Sole Source	<input type="checkbox"/> Time_Materials	<input type="checkbox"/> Contract Limits
<input type="checkbox"/> System Integrator	<input type="checkbox"/> Other	<input type="checkbox"/> Penalties/Incentives	<input type="checkbox"/> Licenses
<input type="checkbox"/> Commodity		<input type="checkbox"/> Other	<input type="checkbox"/> Insurance
<input type="checkbox"/> Services	<input type="checkbox"/> Contract Form		<input type="checkbox"/> Disputes
<input type="checkbox"/> Other	<input type="checkbox"/> Task Order	<input type="checkbox"/> Purchase Order	
Summary	<input type="checkbox"/> Other	<input type="checkbox"/> Phased	

The article describes elements of each of the three projects and shows how the design-build approach permitted collaboration between contractors and the agency that resulted in efficiencies and cost savings.

Source: TRIS Online Procuring Agency: Regional

Figure (1) Literature Search Results Form

The form allows for the categorization of each reference based on the *procurement components* the reference addresses. The *procurement components* used to categorize the references are presented in the graphic below.

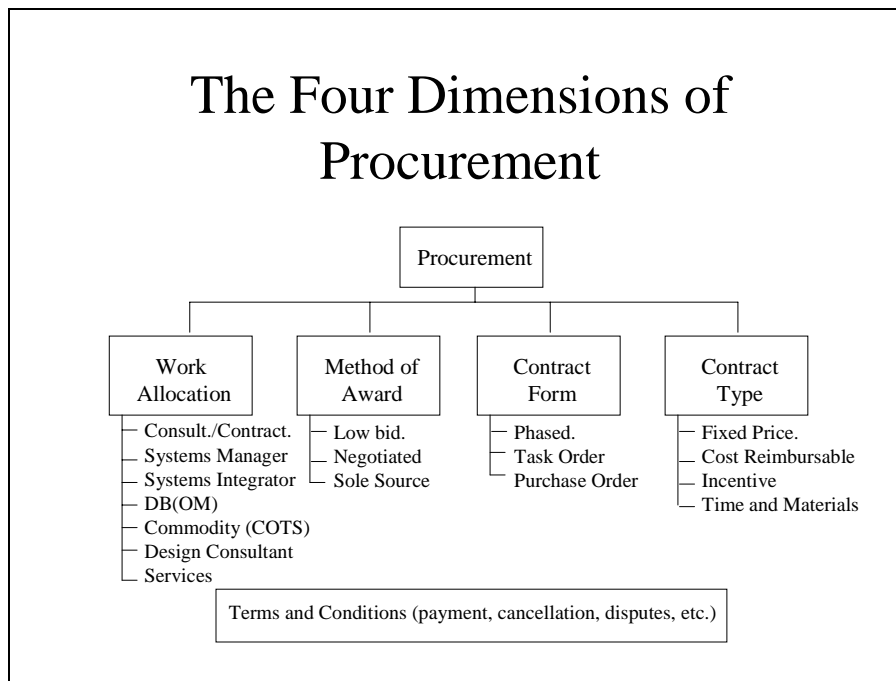


Figure (2)

The procurement components identified in Figure (2) will provide a baseline for analysis throughout the research project.

In anticipation that the literature review would yield a great number of references, criteria were established to identify references that merit in-depth review. The criteria are as follows:

- 1) Novelty (with respect to the ITS industry)
- 2) Evaluations of (or Lesson Learned from) Procurement Approaches
- 3) Consideration of each Procurement Component (outlined earlier in the report)

As mentioned in the Introduction, Task (1) calls for a survey of state and local departments of transportation to obtain information regarding current ITS procurement and contracting practices. The intent of this work is to provide the basic material required by the overall project in order to:

- 1) Identify unique contracting approaches that might be applicable to ITS procurements.
- 2) Obtain information related to ITS procurement successes and failures that have been experienced by operating agencies.
- 3) Attempt to relate the types of procurement currently in use to the characteristics of the project and agency for which they are being applied.

## **RESULTS**

As indicated in Figure 3, the literature review yielded 112 references, and of those 112 references 34 were identified for further review. The breakdown of references is presented in the chart on the following page. All of the references considered are presented in NCHRP format in Appendix A. A list of the references recommended for further review could be found in Appendix B.

There is an extensive bibliography of references describing both ITS and general IT procurements. As might be expected, many of these references address specific experiences without referencing the success or failure of their application. For this reason, they were not included in the list of recommended references. In addition, while there are many more non-transportation related references than transportation (ITS) related references, many were not included because they were not applicable to the ITS industry and the public-sector procurement constraints.

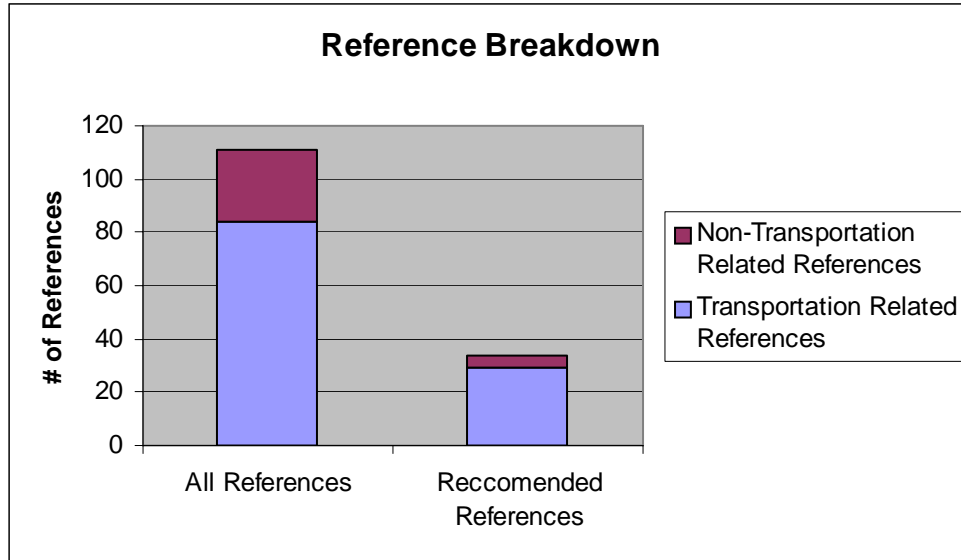


Figure (3) Summary of Literature Search Results

## CONCLUSIONS & RECOMMENDATIONS

Based on the results of the literature review, there is a wealth of references addressing the procurement of information technologies. Various innovative contracting methods/ procurement approaches were revealed.

### Innovative Contracting Methods/Procurement Approaches

Procurement components are combined to form a procurement approach based on project goals and objectives. Innovative procurement approaches are combinations of [new or established] procurement components to produce a novel procurement approach. The literature review produced both novel procurement components and procurement approaches.

#### *Pre-Qualification and Negotiation*

The literature review indicated that the pre-qualification of vendors is becoming increasingly popular among state and local government agencies, the fundamental premise being that the pre-qualification of vendors streamlines the procurement process. Government agencies can use the pre-qualification process to either short-list vendors for a particular procurement or to identify vendors to contract for “indefinite quantities”. Through pre-qualification, state and local government agencies are not burdened with reviewing the multitude of responses to solicitations for services and/or goods. Therefore, state and local government agencies can utilize more of their resources on negotiations with respect to the scope-of-work and other considerations. This streamlined process produces a positive effect on the project outcome. Procurement approaches that incorporate this streamlined process include:

- Indefinite Quantities Contracts (IQC)/Indefinite Delivery Indefinite Quantities (IDIQ) Contracts
- The Information Technology Omnibus Procurement (ITOP) Program
- Invitation to Negotiate (ITN)

#### *Invitation to Negotiate (ITN)*

The ITN procurement process/approach used throughout the State of Florida provides a novel approach for procuring ITS. An overview of the activities involved in the ITN procurement approach is outlined below:

- Step 1) FDOT develops and releases an ITN.
- Step 2) Interested vendors respond to the ITN.
- Step 3) Interested vendor responses are reviewed and either ranked or included in a next iteration of the ITN scope. The next iteration of the ITN scope will be only distributed to a “short-list” of best-qualified vendors based on the responses to the initial ITN.
- Step 4) Once the ITN scope has been finalized and re-distributed, then vendors are ranked according to their final responses.
- Step 5) The highest ranked vendor is selected for the procurement.

The ITN procurement approach has been chosen for several ITS deployments by the Florida Department of Transportation. FDOT utilizes the ITN procurement approach when they intend to procure technologies that are at their infancy stage of development. This is done in recognition of the fact that procurement of “cutting edge” technologies is hard to scope and therefore, introduces a lot of risks. The ITN procurement approach mitigates these risks.

#### *Performance-Based Contracting*

Performance-based contracting is a good option for select ITS procurements. A performance-based contract specifies the final outcome of a task or project and leaves the method used to reach the final outcome up to the contractor/consultant. The task or project objectives are translated into measurable/quantifiable specifications. Successful completion of the task or project is gauged by these measurable/quantifiable specifications. The use of performance-based contracts produces the following benefits<sup>3</sup>:

- Enhances relationship between contractor and client
- Motivates the development and implementation of new ideas
- Innovative ideas, methods to keep quality high while reducing cost
- Direct relationship between performance and pay
- Creates greater ownership, commitment and accountability by the contractor
- Provides for greater management attention to the project
- Improves project execution, data collection and management
- Contractor assumes some associated risks

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<sup>3</sup> Based on project reference ID: 53, *Guideline to Managing Performance Based Operations and Maintenance Contracts*.

### *Design-Build*

The design-build work allocation method has long been identified as a tool for successful procurement of ITS as several innovative permutations and variations of the design-build work allocation method have been established. For instance, the design-integration work allocation method is gaining popularity in other industries.

The Connecticut Department of Transportation (ConnDOT) utilized a unique variation of the design-build work allocation method to procure an advanced traffic data collection system. ConnDOT inserted a proof step in between the design and build steps. The proof step required the contractor to develop and test a prototype of the proposed system. Additionally, the contractor was required to conduct a system demonstration test. The proof step identified problems areas sooner, which made field-testing easier. The test also reduced the risk of incurring multiple change orders during the integration phase of the project.

References dating back to the early 1990s recognize the challenge of procuring ITS and have suggested alternative procurement methods such as design-build. Since alternative procurement methods have long been identified and the challenge of procuring ITS still exists today, then it can be surmised that the present challenge in procuring ITS can be attributed to the institutionalization of these alternative procurement methods at state and local transportation agencies. Most of the research done to date on this topic has focused on identifying alternative procurement methods. Now that alternative procurement methods have been identified and tested, it is now time to re-focus the industries research efforts to the institutionalization of these alternative procurement methods. The first step to institutionalization is education.

Options, with respect to procurement approaches, are constrained by federal and state laws, grant terms and agency regulations and practices. The ultimate goal of this resource should be to provide a systematic approach to identify and consider relevant federal and state laws, grant terms and agency regulations and practices when planning to procure ITS.