National Cooperative Highway Research Program

RESEARCH RESULTS DIGEST

Review and Improvement of Existing Processes and Procedures for Evaluating Cultural Resource Significance

This digest summarizes the findings of NCHRP Project 8-40, "Evaluating Cultural Resource Significance Using Information Technology." The project (a) identified current methods used nationwide to manage and organize cultural resource inventory data and historic contexts, (b) determined whether information technology (IT) applications have been useful in developing resource inventories and historic contexts, and (c) provided recommendations regarding IT and non-IT applications to improve the development and use of resource inventories and historic contexts as tools for determining resource significance. This digest is based on a draft final report prepared by Terry H. Klein, Mark R. Edwards, Daniel F. Cassedy, and Rebecca L. Peer of URS Corporation and other members of the research team.

INTRODUCTION

This digest describes information-technology solutions designed to improve the development and use of resource inventories and historic contexts as tools for determining resource significance.

A conference sponsored by the Transportation Research Board (TRB) identified the most critical research needs associated with environmental stewardship and the nation's transportation programs. Conference participants met in working groups to identify and prioritize the research needs for various environmental issues, including cultural resources. Each group proposed and outlined a research project that would address these research needs. The Cultural Resource Working Group identified "Review and Improvement of the Existing Processes and Procedures for Evaluating Cultural Resource Significance" as the highest research priority for historic preservation and transportation projects. The working group noted that the "[m]ost important and critical problem faced by state and local transportation agencies is how to determine the significance of cultural resources."[1]

The TRB Cultural Resource Working Group noted that evaluations of cultural resource signifi-

cance are generally addressed in a piecemeal manner and in the context of a specific transportation project or group of projects, which at times results in conflicts, project delays, and increased cost. The solution to these problems is to establish a framework and tool kit for making clear and defensible resource evaluation decisions separate from specific project activities. The TRB Cultural Resource Working Group noted that the use of computerized cultural resource databases might bring consistency and clarity to significance evaluations.

In November 2000, the National Cooperative Highway Research Program contracted with URS Corporation (URS) to implement this research priority, but with a focus on the use of information technology (IT) in evaluating cultural resource significance. The first project task involved a literature review on the research topic, followed by a national survey of cultural resource practitioners, including state historic preservation officers (SHPOs), tribal historic preservation officers (THPOs), state departments of transportation (DOTs), the Federal Highway Administration (FHWA), and various federal land-managing agencies. The survey examined current practices involving cultural resource significance decision making and asked the survey participants about possible mechanisms to improve decision making. The results of these two tasks were then used to develop a range of options and solutions for improving current decision-making

[1] Transportation Research Board of the National Academies, "Environmental Research Needs in Transportation." *Transportation Research Circular Number 469* (1997).

procedures. Several of the proposed solutions involve the use of existing technology to enable historic preservation specialists and transportation managers to share information on cultural resources, particularly cultural resource inventories and historic contexts.[2]

LITERATURE REVIEW

URS discovered few published articles or volumes on cultural resource information management practices in the United States. The best sources of information on this topic are individual agency websites (including sites maintained by SHPOs, state DOTs, and federal agencies).

Many SHPOs have implemented computer databases that store, retrieve, and analyze data for cultural resource management purposes. Some of the programs that URS reviewed for this study include the following:

- New Mexico Cultural Resource Information System (NMCRIS),
- Wyoming Cultural Records Office Site and Project Database,
- Texas Historic Sites Atlas,
- Maryland Historical Trust Geographic Information System,
- Minnesota Department of Transportation Mn/Model: Statewide Archaeological Predictive Model, and
- Florida's Efficient Transportation Decision-Making (ETDM) Process.

URS also reviewed a variety of National Park Service Internet websites, including websites for the National Historic Landmarks Program, the National Register of Historic Places, Heritage Preservation Services, and the Ethnology and Archaeology Program. To gather more information about how the National Park Service uses historic context information and manipulates it through IT systems, a number of general management plans (GMPs) from large-acreage parks located in different geographic regions of the United States were analyzed. URS also examined how historic contexts were used with and in select state historic preservation plans. State plans were selected from a sample of regions across the country.

Many department of defense (DOD) agencies care for and manage historic properties under Section 110 of the National Historic Preservation Act of 1966 and have devel-

oped detailed historic contexts to evaluate historic properties, especially properties from the recent past (1940s and 1950s). Several DOD agencies have developed or are in the process of developing computerized mapping and management systems using a variety of geographic information system (GIS) programs. For example, the U.S. Air Force's *Cultural Resources Geospatial Data Integration, Air Combat Command (ACC)* is a model GIS and database that will be implemented through an internet interface for the ACC. The database is designed to store, analyze, and generate reports on a wide variety of cultural data: cultural resources (whether single or aggregate resources, such as districts), site features, cultural resource history, cultural resource surveys and studies, portions of surveys where particular methods were employed, specific test locations, probability zones, undertakings, and management areas.[3]

URS's literature review yielded the following findings about historic contexts:

- Despite excellent national guidance regarding historic contexts (e.g., National Register Bulletins 16a and 16b), most federal and state agencies, SHPOs, and THPOs have not completed development of a standard set of historic contexts for their jurisdiction.
- In the majority of cases, historic contexts that are developed are not easily accessible; unfortunately, historic contexts that are accessible cannot be accessed and manipulated through IT systems to answer basic questions to assist in evaluating resource significance.

URS's literature review yielded the following findings about National Register significance evaluations:

- Despite excellent national guidance on the process of evaluating historic properties for National Register eligibility (e.g., National Register Bulletin 15), few agencies have written policies and procedures that describe how this evaluation is actually carried out. Other than when National Register nominations and formal determinations of eligibility are prepared, there is a lack of written, systematic processes that allow eligibility determinations to be evaluated or decisions tracked. For example, many "consensus determinations"—where agencies and an SHPO or THPO concur that a given historic resource is eligible for listing in the National Register, pursuant to 36 CFR 800.4(b)(2)—are not captured within any IT system, but only in paper format. Thus, when the Section 106 process for a project is completed, these evaluation data are lost for future potential use. It is, therefore, difficult to build upon previous decision making using any systematic approach.

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[2]The *Secretary of the Interior's Standards for Historic Preservation Planning* defines a historic context as a "unit created for planning purposes that groups information on historic properties based on shared themes, specific time period and geographic area." Further, the secretary of the interior's standards state that "a single historic context describes one or more aspects of the historic development of an area, considering history, architecture, archaeology, engineering, and culture; and identifies significance patterns that individual historic properties represent…."

[3]Parsons Engineering Science, Inc., and Loyola Enterprises, Inc., *Functional Specification Document, Contract F44650-94-D005, Delivery Order 5027, Cultural Resources Geospatial Data Integration*, prepared for HQ ACC/CEVP, Langley AFB, Virginia, March 2000.

- Even when formal National Register eligibility information has been indexed in a computer database, as in the case of the National Register branch of the National Park Service, this information cannot be used in its current form to access historic context information. Furthermore, other types of National Register evaluation data (such as formal determinations of eligibility) are maintained by the National Park Service, but are not currently accessible by individuals outside of the National Register staff.

URS's literature review yielded the following findings about IT:

- Across the United States, there are multiple and often competing state, regional, and national efforts in terms of database development.
- Although progress has been made over the past decade in developing improved IT systems, many agencies still do not have ready access to systems that truly aid in the evaluation of National Register resource significance. While several agencies, SHPOs, and THPOs have initiated or expanded computerized mapping systems (e.g., GIS systems and inventories), many agencies and state or tribal governments still do not have the funds necessary to develop, expand, complete, or maintain such systems.
- It appears that the majority of these databases and IT systems were not developed (and, in most cases, not used) for the purpose of evaluating cultural resource significance. Most of these systems were built to provide information on the location of *all* recorded cultural resources, whether or not the resources are significant (though this information is often noted). This information is then used as part of project planning, working toward either placing a project on the landscape in a manner that has the least impact on cultural resources or defining the number and types of resources that would be affected by a project. The information is then used to define and plan for future survey and resource evaluation efforts.
- There are tools within some systems that generate data useful in developing historic context statements. For example, many of these systems allow the user to query a given database to provide helpful, but still basic, information, such as the number of historic property types previously identified and their spatial location within a given geographic area. The fact that some of this information is managed using IT systems is important because it means that some data needed to generate determinations of historic property significance and historic contexts have already been collected and stored digitally.
- There is currently no nationwide mechanism (e.g., IT system) whereby multiple federal and state agencies can easily share cultural resource, historic context, and property significance and/or National Register eligibility information.

RESULTS OF NATIONWIDE SURVEY

The primary goal of the nationwide survey was to gather information on the procedures and information management systems currently used by state and federal agencies. The survey examined both cultural resource inventories and historic contexts and asked the survey respondents how these two tools were used in making decisions on cultural resource significance. The survey also asked agency staff about possible procedures and tools that could improve decision making on resource significance.

The content of the survey instrument was based in part on information obtained from the literature review and direct consultation with key federal and state personnel. The survey content was also based on three regional focus group meetings with SHPO, DOT, THPO, and federal agency staff. The purpose of the focus groups was to obtain input from potential survey participants regarding the content and design of the survey instrument. Focus group meetings were held in the Northeast, upper Midwest, and Southwest regions of the country. It was felt that these regions would highlight the different needs and parameters of the agencies involved in cultural resource significance decision making across the United States.

The survey was sent to all STHPOs, as well as all state DOTs and FHWA state division offices in each state. The survey was also sent to regional offices of the Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service. Other federal agencies either did not respond to URS's inquiries as to whether they wanted to participate in the survey or informed URS that they did not have the time to participate in the survey.

A total of 223 surveys were mailed to the various agencies. As of August 21, 2001, 100 responses had been received (45%). However, the returns for DOTs (74%) and SHPOs (69%), the critical agencies for this study, were relatively high. The SHPOs are the primary repository for resource inventories and historic contexts, and the DOTs are the primary agencies that actually implement Section 106 in the context of transportation programs. The number of responses from FHWA was relatively low because FHWA staff members usually rely on the state DOTs for actions involving resource inventories and historic contexts.

After analyzing the results of the survey, several interesting points emerged concerning how existing computerized inventories were structured and how historic contexts were used. GIS programs from Environmental Systems Research Institute, Inc. (ESRI), are the most popular software used. Together, ArcView and ArcInfo are used by more than half of the agencies with computerized cultural resource databases. MS Access is the next most popular software and is used by 30–40% of the agencies. Oracle and dBASE are

less common. In practice, many agencies are using more than one software package and may have migrated their databases one or more times.

Eighty-nine percent of the SHPOs and 51% of the DOTs had computerized archaeological inventory files. However, only 70% of SHPOs and 40% of DOTs with computerized inventories also had the resource locations computerized. The historic structures inventories showed similar percentages, but historic bridges and landscapes are less likely to be computerized. Of the agencies with computerized inventories, only 60% of the SHPOs and 40% of DOTs had historic bridges and landscapes computerized.

The concept of a "digital divide" has become common in the popular media, and, to some extent, the survey results indicate such a divide among agencies in their progress toward computerizing cultural resource inventories. In particular, most of the SHPOs have made either substantial progress (more than 75% of the inventory computerized) or little progress (less than 25%).

When survey participants were asked the question "If there is no computerized resource inventory, what was the number one impediment to the development of this inventory?" the most frequent response was lack of personnel and lack of funds. Lack of time was the third most common answer, and "not an agency priority" ranked fourth. When asked the question "Should there be a national clearinghouse (with Internet access) listing all existing computerized inventory database and historic contexts?" approximately two-thirds of all respondents said "Yes." The states, however, are wary of national database efforts for two main reasons: First, they perceive problems with previous federal attempts at centralized data collection, particularly the National Park Service's National Archaeological Database (NADB) project. Second, many question the utility of national systems to address local and regional issues, and they do not want to see database queries being passed off as a substitute for thorough background studies for projects.

One of the surprising results of the nationwide survey is the indication that historic contexts are rarely consulted for significance evaluations and are not frequently updated, even though the survey respondents noted that they considered historic contexts to be useful tools in determining resource significance. The DOTs and most federal agencies responded that they rely most heavily on consultants' reports for significance decision making, and SHPO staff members rely mostly on their personal experience. Historic contexts were ranked fourth and fifth in the decision-making process by DOTs and SHPOs. Further, only 14% of the SHPOs and 22% of the DOTs report using historic contexts 100% of the time in significance determinations. In addition to problems of infrequent use, the linkages between contexts and resource inventories are poor and hard to access. While 60% of the SHPOs report some kind of linkages, only 20% report computerized linkages.

To further explore the trends noted in the survey responses, follow-up questions were developed and emailed to all SHPOs and DOTs that responded to the original survey. Ten SHPOs and nine DOTs answered these follow-up questions. The received comments suggest that even in states where contexts are reported as being used regularly, the decision-making process is rarely systematic and formalized. These additional responses also supported observations that contexts are not used because they are out of date (or never developed) and often do not provide specific guidance relevant to the kinds of resources commonly encountered in Section 106 compliance projects. To deal with the day-to-day requirements for making significance decisions, agencies fall back on staff experience and knowledge and assess each resource on a project-by-project basis.

PROPOSED SOLUTIONS AND OPTIONS

Using the findings of the literature review and nationwide survey, URS developed a range of options and solutions for improving current approaches to cultural resource decision making, in addition to examining the consequences of a "do nothing" alternative. The options included both IT and non-IT approaches.

"Do Nothing" Alternative

If nothing is done to improve current practices of evaluating cultural resource significance, evaluations will continue to be done on a piecemeal, project-specific basis, providing no relief to the project conflicts and costs that often result from this approach. This process also may come under greater scrutiny and criticism in the context of meeting congressional mandates to streamline the environmental review process associated with the federal transportation program. Finally, many of the highly experienced SHPO and DOT staff members responsible for evaluating significance are likely to retire within the next 5–7 years or are leaving to work for the private sector. Because these senior staff members have had to rely largely on personal experience for significance evaluations, the staff members' departures from the agencies may exacerbate the problem by lessening the overall professional experience of the agency staff.

Non-IT Solutions

Training

This study has shown that that many agency personnel and cultural resource management consultants, as a result of several problems and issues, generally have decided not to use existing resource inventories or historic contexts. Several states, however, have overcome these problems and do use these tools as part of their decision making. These states can be used as examples of "best practices" that can be shared with others through training efforts or other types of information exchanges. In addition, the survey showed that

Research Topics	DATA REQUIREMENTS (see details below)							
	1	2	3	4	5	6	7	8
Adaptation	x	x	x	-	-	-	-	-
Chronology	x	x	x	-	-	-	-	-
Technology	x	x	-	-	-	-	-	-
Exchange/trade	x	x	-	-	x	-	-	-
Settlement system	x	x	x	x	x	-	-	-
Subsistence system	x	x	x	x	-	-	-	-
Socio-political organization	x	x	x	x	-	-	-	-
Human biology	x	x	x	-	-	x	-	-
Belief system	x	x	x	-	-	-	x	-
Environmental change	-	x	-	-	-	-	-	x

Data requirements for a site to address the respective research topics:
1. Site contains items, deposits, and/or surfaces that can provide inferences about relevant past activities.
2. Site contains items or deposits that can identify the site time period.
3. Site possesses spatial relationships among items, deposits, and/or surfaces that can be reconstructed.
4. Site contains deposits with floral, pollen, faunal, or other botanical and zoological data.
5. Site contains items whose potential source area(s) can be identified.
6. Site contains the remains of at least one inhumation sufficiently preserved to permit analysis of diet, health, pathologies, or demographic data or contains evidence of at least one cremation.
7. Site contains non-utilitarian items or deposits that can provide inferences about past beliefs.
8. Site contains natural or cultural items or deposits or surfaces with data pertinent to paleo-environmental reconstruction (including past vegetation, fauna, landscape, water sources, or climate) of the local or larger region.

Figure 1. Vermont's prehistoric site evaluation matrix.

some states do not take advantage of and are not even aware of available historic context formats that other states have found to be extremely useful (e.g., National Register Multiple Property Submissions). Therefore, it may be useful to remind agency personnel and cultural resource management consultants about the utility of these tools and formats and how they can be used to make resource significance evaluations more effective and defensible. This goal can be accomplished through training programs, workshops, or seminars.

Increased awareness of existing guidance and the utility of historic contexts and resource inventories may improve the significance evaluation process practiced within agencies that currently do not use these tools. The problems and issues identified by this study, however, will still remain. Training, therefore, would be at best only a partial solution.

Guidelines and Procedures

Vermont has developed a set of working guidelines to provide practical assistance in evaluating the significance of archaeological sites found in that state. The value of Vermont's approach is that it makes explicit how inventory data, historic contexts, research questions, integrity, and so forth are to be used in evaluating resource significance. Though the guidance addresses only archaeological resources, the concepts used are applicable to other resource categories.

Following the Vermont guidelines, for example, a prehistoric site would be considered meeting National Register Criterion D if it had certain characteristics and could address important research questions.[4] Whether a site can address important research questions is assessed through the use of a matrix of data requirements based on the state's historic context for prehistory (see Figure 1).[5]

One option, then, is for agencies to develop guidance and a process similar to Vermont's. Such an approach is not complicated, but does involve the use of historic contexts and research guidelines and a consensus among parties in terms of what types of resource categories are considered important.

Vermont's guidelines involve concepts and approaches similar to the National Register's multiple property submissions guidelines. The survey showed that some SHPOs and DOTs liked the multiple property submission format because of the inclusion of specific criteria for evaluating resource significance. Thus, another option is to use the general guidelines presented in National Register Bulletin 16b, *How to Complete the National Register Multiple Property Documentation Form,* to provide a clear framework to assess

[4]*Draft Archaeology Guidelines: Evaluating Site Significance* (Montpelier, VT: State Historic Preservation Office, May 2001).
[5]See note 3 above.

resource significance.[6] This option would not require the actual completion and submission of forms to the National Register, but would use the components of this documentation process to organize data, ideas, research issues, significance criteria, resource characteristics, and so forth. There may be other formats, frameworks, and guidelines that can also serve as models for developing a clear and defensible process for evaluating resource significance. Regardless of the framework that is used, the objective of this solution is to make the process visible, replicable, and consistent. It also provides an explicit baseline for future decision making.

As with training, the use of these frameworks for evaluating resource significance may improve the evaluation process within agencies. The problem associated with this approach is the need to develop the components required to implement these procedures and frameworks, such as historic contexts. Compilation of these components takes time, personnel, and a commitment of resources. Also, this approach does not address the need to have ready access to the information contained within the documents that would be created by implementing this solution.

IT Solutions

The IT solutions fall into three categories:

- Improvement of data collection and management (inventories, databases, and documents),
- Improvement of data accessibility (search and retrieval, web search engines, GIS applications, and database search engines), and
- Development of knowledge management and/or decision-support tools.

These categories are hierarchical: a knowledge management system requires information retrieval functions that, in turn, require data collection and management systems to be in place. Each IT solution addresses some facet of the NCHRP study's objectives, can be developed independently of the other solutions (subject to the hierarchical requirements), and can be combined to create more complete solutions. Figure 2 illustrates the relationships between these individual solutions.

Improvement of Data Collection and Management

Many SHPOs have implemented some form of computer-based inventory for at least part of their data. The survey, however, revealed that while most agencies are collecting at least some of the information relevant to determining significance, the data are not always accessible. The link

from baseline data to historic context is almost never present, and therefore these data are not being used to evaluate historical significance. Also, because no standards are being used (for the database or the metadata), searching across all databases (with a single search) is difficult, if attempted. Four components (or options) are described here that could significantly improve the quality and quantity of data collected:

- **Component 1: Historic Significance Attribute Table(s).** Develop a simple MS Access database application using, for example, the Vermont Site Evaluation Matrix or a similar matrix as a framework. The database tables would hold the data required to score the matrix. The application would include a user-friendly interface, prompting the user to enter a value for each attribute. Then the user would click a button, and the system would use the rules and data entered by the user to measure significance. The system would generate a report documenting the results and the reasons for the decision. The system could allow the user to add his or her own requirements and rules, as long as those rules can be stated as true or false sentences. The system could also include a set of standard rules developed by a national organization or agency. The user could use one or both sets of rules to evaluate significance and compare the results.

  The specifications and the application would be distributed to all agencies with documentation and implementation recommendations. With adequate IT resources, agencies could (a) incorporate the tables into their existing database and link the application interface directly to their own database or (b) recreate the logic and forms in their own system. Agencies could also use the application as a stand-alone application and store the results of the process in their own database.

- **Component 2: Standardized Inventory Database.** For agencies that have no computer-based inventory or have outdated systems, a complete cultural resource inventory database application could be developed. The most efficient way to build this system is to start with an existing system (e.g., from another agency) and modify it to make it more useful for evaluating historic significance. The design of the system must consider individual agency needs while being general enough for everyone to use.

  This database would include the MS Access application and tables in Component 1. It should also include a way to link the data to historic contexts. The application would include a user-friendly interface with forms for data entry, reporting tools, and the ability to store exact locations so that the database could be used with an off-the-shelf GIS.

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[6]*National Register Bulletin 16b: How to Complete the National Register Multiple Property Documentation Form* (Washington, D.C.: 1991).
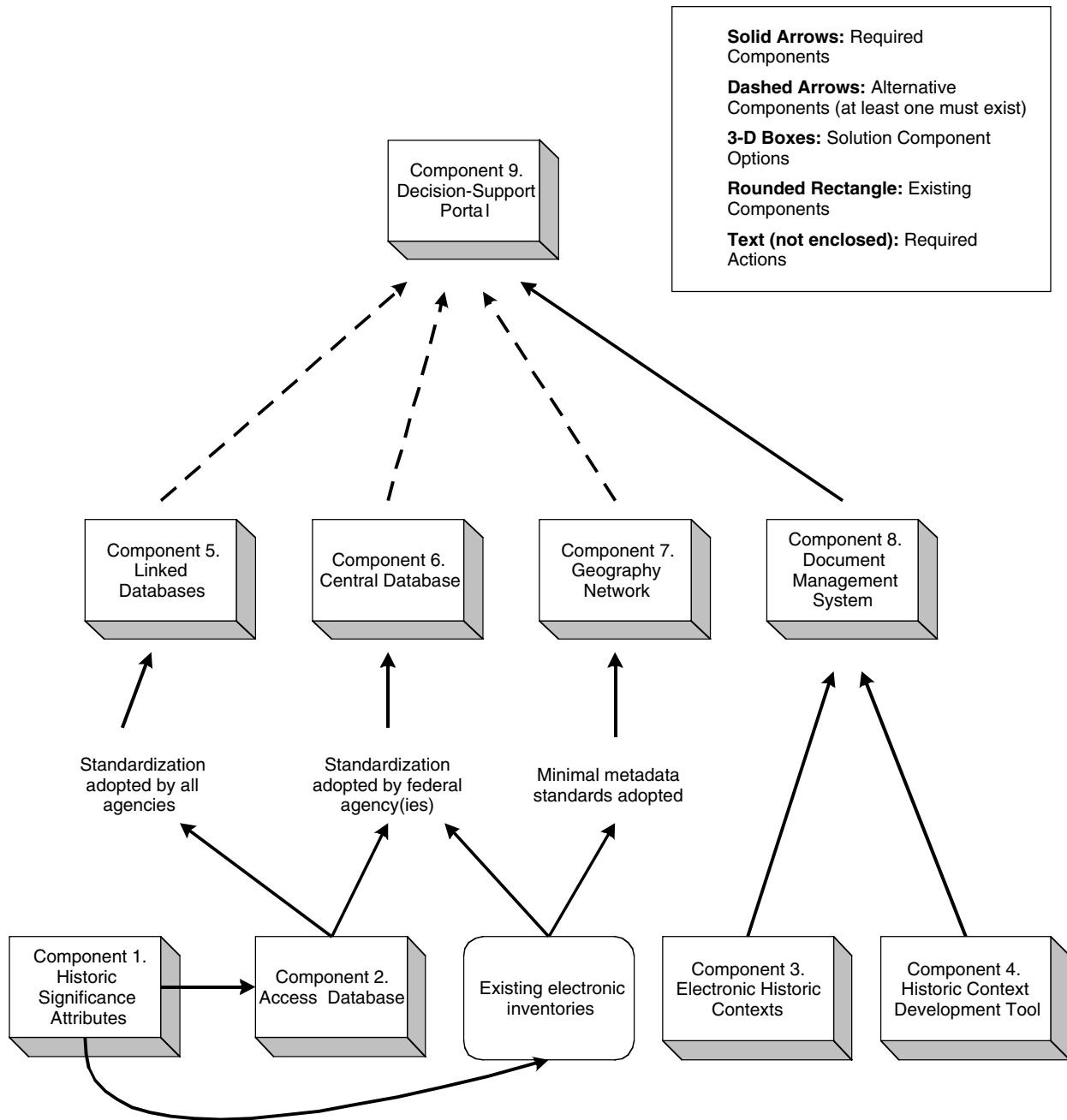
Figure 2. Solution component hierarchy.

- **Component 3: Electronic Historic Contexts and Related Documents.** The purpose of this component is to convert all existing historic contexts, National Register nomination forms, formal determination-of-eligibility documentation, and consensus-of-eligibility documents into a common electronic format. Most documents exist only in hard copy (i.e., paper) form, although word-processing files should be available for some. This information is currently managed as unstructured data (i.e., hard-copy or electronic documents).

Paper copies of existing documents would be scanned and indexed. The attributes by which a document is to be stored and retrieved are identified, such as a document control number, author, title, date created, issuing agency, funding agency, or similar items. Key words or themes may also be used. These attributes become fields in a database, and each document's location (i.e., path name) is stored in the database as well. Documents would be distributed on CDs or DVDs. If electronic versions of contexts were available, they

would be included on the CD or DVD. The disks would include some type of software that facilitates search and retrieval of the documents.

- **Component 4: Historic Context Development Tool.** This component is a simple desktop, stand-alone tool that would ensure development of contexts in a consistent, electronic format. The format would be based on an existing standard such as the National Register multiple property submission standard. Certain elements could be defined as drop-down lists to improve consistency. The system would include some automation in order to import existing electronic contexts into this tool. The package (i.e., application, user guide, and examples) could be posted on existing websites or distributed on CD or DVD.

Improvement of Data Accessibility

The previous four components enable the collection, organization, and management of data, but do not ensure that data will be available to anyone other than the agency that collects it. The next four options are included to improve accessibility to data:

- **Component 5: Linked Databases.** This component is a website that provides the capability to search multiple organizations' databases with a single query. All participating organizations must adopt the same database standard (Component 2) and make their data accessible over the Internet. A website that links the databases would be established by the organization that is ultimately chosen to host the system. If all participants are using the standard database, users could search all participating agency databases with a single search. Other entities that choose not to adopt the standard could still participate by providing a link to their website.

- **Component 6: Central Database.** This component is also a website, but is built on a centralized database. Implementation of this component would result in consolidation of all relevant structured data in a single system accessible over the Internet. This option is basically the same database application as that described in Component 2, but is housed and maintained by a single organization. Each organization might still maintain its own database or even a website, but a copy of the data would be stored in the central system.

    In order to ensure maximum participation, data loaders specific to each participating database system must be developed. These data loaders would be used initially to map data from a contributing database into the central database and subsequently to load the data. After that initial population of the database, the data loaders would be used periodically to keep the central database updated. The central database does not neces-

sarily need to include all the data in each individual database. Only the information needed to answer questions about significance needs to be included. SHPOs, THPOs, and DOTs would not need to standardize their own databases, but would need to provide updates regularly to the central database.

- **Component 7: Geography Network.** This is the least-cost option for making data available via a single Internet site. This option assumes no standardization of databases and no establishment of a new central website. States, however, would participate in the geography network either by establishing their own GIS website (i.e., as a publisher) or by making static maps and data available (i.e., as a contributor). Some standardization of metadata elements is recommended.

- **Component 8: Document Management System.** This component establishes a web-based document management system that would allow access to all electronic historic contexts, National Register documents and files, consensus of eligibility documents, and similar documents. Off-the-shelf document management software would be purchased and installed on an Internet server. The documents could reside on one server or on multiple servers (similar to the system for databases described in Components 5 and 7).

    The document management system would allow users to search by index fields to retrieve a list of documents that meet specified criteria. The system would possess the ability to load new documents. The tool described as Component 4 could be added to the website as a downloadable file, as a built-in function of the website, or both.

Development of Knowledge Management and/or Decision-Support Tools

Implementing any of Components 5 through 8 will make it easier for users to access information. The next step is to make that information easier to use and to interpret. A single component—a web portal—is recommended, even though this component has many variations:

- **Component 9: Historic Significance Decision-Support (HSDS) Portal.** The advantage of a portal is that in addition to providing access to information, portals help users make sense of the information retrieved. The portal structures how information is presented by filtering out irrelevant search results, by providing one place to go to for information, and/or by providing decision-support tools and applications that help interpret or organize the information. The HSDS portal could link inventory data to historic contexts. If the required components are in place (see Figure 2), the portal could include a powerful search engine that would search both

the inventories and the document management system (Component 8) for criteria that the user specifies. The portal might also include a table that is used to relate (i.e., link) historic contexts to related datasets (and vice versa). Every time a determination of significance is made, this table would be updated to record critical information: name and location of the property, related historic contexts or other documents, and the datasets used to support the decision (how this information would be maintained has yet to be determined). The portal could also include collaborative tools, links to other websites, and useful tools for download (such as Components 1 and 2).

IT Solution Costs

The estimated costs for the components (and different combinations as depicted in Figure 2) are shown in Table 1. For components that include training or work on-site at individual agencies, participation by 50 agencies requiring 50 different site visits was assumed. These costs are preliminary and consider only the labor costs involved to scope, prototype, refine, and develop each component. They do not include hardware and most software costs (except where noted). They also do not include the cost of collecting and entering data or other costs or payments in kind that each participating agency will contribute. In general, the least centralized options push more of the costs back to the agencies (Components 5 and 7). The most centralized solution (Component 6) is actually much less expensive overall, but may require that most of the cost be borne by one or a few organizations or agencies.

Evaluation of IT Solutions

It is important to note that any IT solution designed to aid decision making on cultural resource significance will need to link historic contexts and other documentation on resource significance (e.g., consensus eligibility documentation) with the resource inventories. The first four components are important for collecting and managing the data needed to evaluate historic significance, and they make the information more searchable by the owners of the data. Components 5, 6, and 7, however, meet an additional objective to share inventory data. Sharing of the information found in documents is met by Component 8. While this objective is partially met by distributing CDs or DVDs (Component 3), keeping these libraries of documents up-to-date will be difficult.

Component 9 provides all the benefits of Components 1–8 and adds at least one additional key function: it links the data in the inventories to the historic contexts. It can also serve as a centralized knowledge base for the entire community of cultural resource experts and transportation managers by enabling the sharing of knowledge and experiences through collaborative tools.

As seen in the survey results, the primary obstacles to agencies developing and maintaining IT systems or developing historic contexts in any form are money, personnel, and priorities. Also, while IT initiatives appear to be

TABLE 1 Estimated costs of components (shown in thousands of dollars)

Component	Cost Range of Component	Per-Agency Costs	Dependencies	Cumulative Cost *	Annual Maintenance Costs
1. Historic Significance Attribute Tables	25–45				
2. MS Access Database	50–75	2–4	Component 1	175–320	
3. Electronic Contexts	20–30	5–10		270–530	
4. Historic Context Developer Tool	20–40			20–40	
5. Linked Databases	100–200		Component 2	275–520	15–30
6. Central Database	1,000–2,000		Component 2	1,175–2,320	80–160
7. Geography Network	15–30		Component 1	40–75	
8. Document Management System	300–400		Component 3 (4 is optional)	570–930	30–50
9. HSDS Portal (w. Component 5)	200–500		Components 4, 5, and 8	1,065–1,490	60–120
9. HSDS Portal (w. Component 6)	200–500		Components 4, 6, and 8	1,765–3,290	100–180
9. HSDS Portal (w. Component 7)	200–500		Components 4, 7, and 8	630–1,045	50–100

*Calculated by summing low end of range for component cost + (50 * per-agency costs) + cumulative cost of dependent components; then by repeating process using high end of range for component cost.

generally welcomed, many respondents to the survey show a skepticism born of past attempts that have not met expectations. The survey results indicate skepticism of centralized, national database efforts for inventories or historic contexts (Component 6). Any advancement of national or regional IT systems for historic contexts and cultural resource inventories (Components 5–9) must (a) be prepared to clearly articulate why and how these systems will improve decision making at the local level and (b) address the concerns noted above.

The survey also demonstrated a skepticism and reluctance to "buy into" data standards. As noted above, Components 5 and 6 involve developing national data standards for inventories that address the needs of making decisions on resource significance. It is important to solicit and carefully consider input from everyone, but in the end the key participants in this effort simply need to select an action that the majority agrees makes sense. Those who do not like the resulting standards may or may not participate.

Institutional-Individual Leadership for Advancing Recommended Solutions

The key agencies and organizations that must take leadership roles in promoting the application of any of the recommended options include the FHWA, state DOTs, the American Association of State Highway and Transportation Officials (AASHTO), SHPOs, and THPOs. Another key player will be the National Park Service, particularly the National Register. Other organizations that can assist in the promotion of the proposed options include the National Conference of State Historic Preservation Officers (NCSHPO), TRB, the National Association of Tribal Historic Preservation Officers (NATHPO), and the Cultural Resource Subcommittee of AASHTO's Standing Committee on the Environment. Finally, the agency or organization that would serve as a national clearinghouse, or repository, for the databases that would be developed under Components 6, 8, and 9 would clearly have a key role in advancing these options. Possible options for the clearinghouse are the National Park Service or one of the university transportation centers located across the country.

All of the above agencies will need to jointly fund an option if selected. Decisions on the level of funding from each agency will have to be part of the future implementation effort. It is also recommended that other transportation agencies and nontransportation agencies be involved in this funding effort. If any of the proposed solutions are implemented (except for the "do nothing" option), they will not only benefit managers within the FHWA, state DOTs, SHPOs, and THPOs, but also benefit other agencies that are required to comply with the requirements of Section 106 and Section 110 of the National Historic Preservation Act.

NEXT STEPS

Regardless of which options are proposed, it is critical to obtain feedback on the proposed options. It is important to know which agencies are interested in advancing the proposed options and to collect recommendations on any changes to the options. The use of a focus group or steering committee is strongly advised to expedite the process. It will be very productive to select a team of people who are enthusiastic about the project, can represent the needs of the users, and will champion the selected options.

Using the results of this outreach and feedback, the focus group or steering committee will identify agencies for a pilot study of the selected options. Depending on which options are selected, the agencies chosen may be agencies that already have existing resource inventories and completed historic contexts and/or agencies that have complete and comprehensive paper files and maps of resource inventories and contexts, but have not computerized these data. The agencies chosen should also have the willingness and ability to support any IT solution implemented in the future. Finally, any project has a greater chance of success if it has a champion, especially with IT projects. The optimal choice for the pilot is an organization that has someone who is enthusiastic about IT and will promote the use of the IT solution within his or her agency.

FINAL REPORT

The agency's final report is available for loan on request to the National Cooperative Highway Research Program, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001.

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