

APERÇU DE PROJETS DE CONSTRUCTION D'AUTOROUTES AUX ÉTATS-UNIS

Dr Anthony Kane, Directeur

Services techniques et d'ingénierie

American Association of State Highway and Transportation Officials [*association américaine des autoroutes d'état et des représentants des transports*]

(AASHTO), Washington D.C. États-Unis

akane@ashto.org

King W. Gee, Administrateur associé de l'infrastructure

Federal Highway Administration [*Administration fédérale des autoroutes*]

U.S. Department of Transportation [*Ministère américain des Transports*], Washington D.C.
États-Unis

king.gee@fhwa.dot.gov

RESUMÉ

En 2005, le programme de construction d'autoroutes aux États-Unis a coûté 75,2 milliards de dollars, pour tous les niveaux du gouvernement. Les dépenses d'investissements représentent environ la moitié des dépenses totales pour les autoroutes. Le reste couvre l'entretien routinier, les services de circulation, le service de la dette et l'administration. En 2005, le gouvernement fédéral a dépensé 33 milliards de dollars pour les routes, soit environ 40 % des dépenses totales en capital pour ce secteur. Le programme d'aide fédérale à la construction des routes fournit la mise de fonds par l'intermédiaire des State Departments of Transportation [*les départements d'état des transports*] qui ont géré en 2005 environ 55 milliards en mises de fonds. Le présent document traite de la volonté du gouvernement fédéral et des états de s'assurer que cette importante dépense publique soit, dans la mesure du possible, exempte de gaspillage, de fraude et d'abus.

Le programme de construction d'autoroutes américain a évolué au cours des années en s'appuyant de plus en plus sur le secteur privé pour les divers aspects de la réalisation des projets. Alors que la construction a presque toujours été traitée par des entrepreneurs du secteur privé, au cours des 25 dernières années les études de planification, les analyses environnementales, la conception préliminaire et finale et l'ingénierie de la construction ainsi que la gestion générale de la construction ont été en grande partie soumises à la sous-traitance. Parallèlement, des changements ont également eu lieu dans les spécifications de construction, des spécifications de méthodes aux spécifications basées sur les résultats en passant par les résultats finaux. On note également une plus grande utilisation de nouvelles méthodes de contrats : contrats de conception-construction, mesures incitatives/dissuasives, contrôle et assurance de la qualité, garanties, etc. Les préoccupations du secteur public concernant la surveillance se sont intensifiées en raison de la pression imposée par la réduction du personnel du secteur public, incluant la perte des connaissances découlant du départ à la retraite de la main d'œuvre du secteur public. Ceci exige une meilleure diligence de la part du secteur public, le besoin pour le secteur privé de fournir une meilleure assurance de ce rôle et un besoin de nouveaux outils permettant d'assurer que l'argent public est dépensé de manière appropriée.

Le présent document souligne les différents types de fraude et de corruption détectés au cours de ces dernières années dans le programme d'aide fédérale aux autoroutes et énonce les types de techniques de prévention qui ont permis de réduire les abus relatifs au programme. Des cours de formation, des documents d'orientation, des ateliers de

travail entre homologues et des logiciels d'analyse de soumissions de construction figurent parmi les moyens de réduction et de détection de la fraude et de la corruption. Une des principales méthodes de dissuasion de la corruption est l'interdiction formelle d'exercer imposée aux entrepreneurs par la Federal Highway Administration et l'on note de récents exemples dans ce domaine.

Conformément à la loi fédérale, les projets d'aide fédérale aux autoroutes de plus de 500 millions de dollars, appelés grands projets, doivent avoir reçu l'approbation du Federal Department of Transportation. Actuellement, environ 40 grands projets sont en cours, mais dans les prochaines années, ce nombre aura vraisemblablement doublé car, avant 2005, un grand projet devait représenter plus d'un milliard de dollars. D'autres outils de gestion des projets permettant d'assurer une gestion efficace des projets à grande échelle incluent l'utilisation de la série de logiciels de gestion des projets de transport, les concepts de gestion du risque pour l'estimation des coûts/le contrôle des coûts et la gestion financière, le contrôle et l'assurance de la qualité auprès des entrepreneurs de la construction et l'analyse de la valeur des techniques de conception et de construction.

Le document conclut par d'éventuelles leçons au profit d'autres nations.

Texte en anglais

1. INTRODUCTION

1.1 Paper focus---fraud, waste, and abuse

Highway programs typically have more needs than available funds. This reality and good public stewardship call for proper oversight of the programs to assure that the best value for money is obtained to support economic vitality and social activity. Additionally, public works programs like highways often have social and policy goals that likewise must be implemented for the common good. Waste, fraud and abuse are the three areas of malfeasance that defeat or work against program goals. All three types of wrong-doing cause resources to be diverted from their intended purposes and they typically arise from intentional misrepresentation of various kinds for wrongful personal gain. In recent years, the United States of America (USA) has taken more active steps to deal with fraud, waste and abuse of the highway program. This paper reviews the constructive measures commonly used to provide good management of the program, especially with shifts in institutional roles, and remedial actions to correct for wrong-doing to strengthen the highway program.

1.2 Overview of the US highway capital construction projects

1.2.1 Highway System Extent, Population and Travel

The United States has a current population of about 300 million people with an estimated increase of almost 50% to 440 million in the next 50 years. The majority of the growth will take place in the south and west. Auto travel will grow at about 2% per year and freight/truck travel will grow at about 3% per year. The current road system of almost 4 million miles of roads is about 80% percent paved---a percent that has stayed roughly constant since 1985. The Interstate Highway System has only 1% of the total road miles but has 24% of all travel. The Interstate System has had its 50th birthday and the future will see the reconstruction of the system as well as expansion---many, many billion dollar construction projects.

The highway capital construction program in the United States in 2005 was \$75.2 billion by all levels of government. Capital expenditures are approximately half the total expenditures for highways. The rest is for routine maintenance, traffic services, debt servicing and administration. The federal government spent \$33 billion for roads in 2005, or about 40% of the total road capital outlays. The federal-aid highway program provides capital funding through the State Departments of Transportation which in 2005 administered about \$55 billion in capital outlays. [1]

1.2.2 Trends in the Delivery of Projects

Project delivery has become one of the most important issues related to the future of the US highway system. If needed construction and reconstruction do not take place in a timely fashion, the consequences to the economy and to our quality of life are detrimental and long-lived. And State DOTs are continually being pressed to do more with less, go faster than before, and impact the customer as little as possible.

The traditional low-bid system of project procurement has served the public well, but it has not always optimized the overall quality of the final product and it is not necessarily the most efficient way to procure services for all types of highway contracts. Thus, engineers

are continually investigating new ways to shorten construction time, reduce work zone congestion, and better serve motorists through improved quality.

Performance Contracting and Alternative Contracting. A major paradigm shift in contracting methods is currently taking place within the highway construction industry – from “method-based” contracting, where the contractor is given a recipe for building a road, to “performance” contracting, where the contractor is simply told how the road should perform. Performance contracting allows the agency to define specifically what they want to achieve in their construction projects (such as smoothness, strength, durability, etc.), while allowing the private sector to implement innovations to accomplish these goals while saving time and money. The methods used by the private contractor to accomplish the work are left up to them.

However, the shift from method-based to performance contracting has been gradual, since decades of industry practice and concerns regarding liability must be overcome. In the meantime, agencies are using other contracting techniques that have shown promise in other countries, as well as in other industries. The Federal Highway Administration’s Special Experimental Project (SEP) 14, *Alternative Contracting*, allows the State DOTs to evaluate non-traditional contracting techniques on federal contracts on a project-by-project basis. Some of these innovative contracting practices, such as A+B (cost plus time) bidding, lane rental, warranties, and design-build, have become common practice within the US and are used routinely.

A sampling of additional techniques being used in various places around the country include the following [2]:

- **Best Value Contractor Selection** – Several states have awarded construction contracts based on a combination of price and “other factors,” which can include such things as time to complete the job. These contracts often use a weighted scoring system that accounts for both the price and the technical qualifications of the proposals to determine the “best value” for the public.
- **Construction Manager at Risk** – A few states, including Arizona, Florida, and Michigan, have begun to evaluate this project delivery system, which is relatively common in the vertical building industry. A construction manager is selected to provide construction expertise and contract management, and to be contractually responsible for price, schedule, and quality during construction. The *CM at Risk* firm also provides preconstruction advice to the owner concerning constructability, pricing, scheduling, staging, value engineering, and other areas related to the construction of the project. During the design process, the contracting agency and the *CM at Risk* firm agree on a “guaranteed maximum price” for construction, at which point the *CM at Risk* firm begins to function like a general contractor and is responsible for completing the work on schedule at the guaranteed price.
- **Incentives/Disincentives** – Many states have incorporated the use of incentives/disincentives on roadway projects to expedite construction timelines. Benefits include reduced construction time and the potential for lower contract administration costs.
- **“No Excuse” Incentives** – Florida and Vermont have used the “No Excuse” Bonus method on Federal-aid projects, which gives the contractor a “drop-dead date” for completion of a phase or the entire project. If the work is completed ahead of

schedule, the contractor receives a bonus. No excuses are allowed for any reason, though exceptions may be provided for catastrophic events such as hurricanes. This technique has been used on projects that must be open by a critical date, such as a major sporting event.

- Indefinite Delivery/Indefinite Quantity (ID/IQ) – In an ID/IQ contract, contractors bid on unit work items with the location to be determined under future work orders. An estimate of the total work over the life of the contract is provided in each contract. This method can provide greater flexibility in the construction program and quicker turn-around time in procuring contracts.

Outsourcing. Outsourcing is another shift that has been occurring to a greater and greater degree over the past two decades in the US highway construction industry. As State DOTs are pressed to reduce staff size, they are forced to hire outside contractors to accomplish the work they used to do on their own. In addition, the past three federal transportation bills have substantially increased funding for transportation, which adds to the States' need to push work out to the private sector in order to continue to deliver services to the public. However, it should be noted that while outsourcing has increased dramatically in many segments of the DOTs' work, most States are reluctant to outsource 100% of any given activity. This reluctance is due to the need to retain a certain amount of expertise within the DOT to oversee and review projects, as well as to conduct the required work during times of lower production. [3]

Public-Private Partnerships. Public-private partnerships (PPPs) are a newer method of project delivery that is gaining popularity among the State DOTs. PPPs are agreements formed between a public agency and private sector entity that allow for greater private sector participation in the delivery of transportation projects. Traditionally, private sector participation has been limited to separate planning, design, or construction contracts on a "fee for service" basis, based on the public agency's specifications. Expanding the private sector role allows public agencies to tap into private sector technical, management, and financial resources in new ways to achieve greater cost and schedule certainty, supplement in-house staff, utilize innovative technology applications, increase specialized expertise, or access private capital. In return, the private partner can expand its business opportunities for assuming the new or expanded responsibilities and risks. [4]

In October 2004, FHWA initiated SEP-15, *Public Private Partnerships*, an experimental program to allow contracting agencies to explore alternative and innovative approaches to the overall project development process, such as public-private partnerships, with the goal of improving the efficient delivery of transportation projects. This program encompasses subject areas including compliance with environmental requirements, right-of-way acquisition, and project finance.

Currently, 21 states have enacted statutes that enable the use of various PPP approaches for the development of transportation infrastructure. With the continued solvency of traditional transportation funding sources currently in question, new partnerships must be sought out to ensure that the investment in our infrastructure continues to provide the benefits needed to drive the US economy.

2. FRAUD

2.1 Major areas of potential fraud and corruption : recent trends in the United States

While the highway construction program is relatively corruption-free, the very magnitude of the program presents many opportunities for fraud, waste and abuse. Even a small number of such cases can rob the program of scarce resources and more importantly, rob the public agencies of the trust and confidence of the public. Since 2000, the FHWA in collaboration with the states and law enforcement agencies have stepped up vigilance and action in overseeing the highway construction program.

Just as FHWA increased its vigilance, the law enforcement agencies also increased their willingness to prosecute road-related fraud cases. While certain types of wrong-doing may be evident to the project personnel, program agencies must rely on the law enforcement agencies to conduct the fact-finding and bring legal charges before we can definitively assert wrong-doing. Since 2000, the United States Department of Transportation, Office of the Inspector General, the law enforcement and investigative agency of the USDOT, brought almost 300 individual indictments which have resulted in 190 convictions.

In the last seven years, The FHWA has seen the following types of fraud, waste and abuse cases, some of which could have included situations where corrupt activities like bribery and kick-backs were also involved:

- False statements or misrepresentation of facts;
- Materials-related – substandard substitution or non-specification materials;
- Program goal obstruction, especially Disadvantaged Business Enterprise (DBE) goals – see following description;
- Bid-rigging and price fixing;
- False claims for work never performed; and
- Falsification of records, usually on quality testing results (Quality Control /Quality Assurance).

The USA has a Disadvantaged Business Enterprise (DBE) program to remedy past discrimination against minorities in the contracting process. The DBE program usually has a percent participation goal for DBEs. Seven cases of DBE fraud were uncovered during this period where non-minority companies surreptitiously performed the work of DBE firms and obstructed the purpose of the DBE program.

A single fraud case may involve multiple individuals. Each case diverted funds or blocked program goals from being achieved and thus reduces the number of projects that can be accomplished. To increase the public agencies' effectiveness at preventing non-responsible firms from working in the highway sector, an interstate, inter-agency web site was developed to share suspension and debarment actions across jurisdictional lines. Called TOPNET, it is available online on the Internet. [5]

2.2 Remedies—Debarment of contractors

It is in the courts that guilt is determined, penalties are assessed for crimes committed, and restitution is collected for losses to the agency or for correcting a material defect in the facility under construction. However, the public executive or administrative agency is responsible for assuring the work is performed by responsible individuals and companies.

Individuals and companies who have been charged with or convicted of crimes are assumed to have responsibility issues. Thus, since 2001, the FHWA has suspended individuals and companies who have been indicted, or charged with a crime, from being able to bid or be in responsible charge of a project until the legal matters have been resolved so as not to put any new projects at possible further risk. Should a court find an indicted party guilty of a crime, FHWA may debar the individual and companies for a period of time, typically no more than three years – this prevents such a company from bidding on other federal highway projects and all procurements throughout the Federal government.

The suspension and debarment process is intended to protect the integrity of the Federal programs. Participation in the Federal-aid Highway Program is not a fundamental civil right. Therefore, the integrity of the program comes before an entity's ability or right to participate in the program. The period of debarment is intended to give the individual or company time to correct any deficiencies or weak processes that led to the wrong-doing. The process is not intended to "punish" the errant individuals or companies; however, the process may also be used to obtain further restitution to make the project whole. [6]

2.3 Prevention and Detection Techniques

The Federal government and State DOTs use a variety of methods to prevent and detect possible fraud and corruption in highway projects including publishing guides, convening public sector managers at workshops and at an annual major conference, the development of and running of training courses and the development and maintenance of software for a range of project letting and management activities.

An important project management suite of software that has been jointly developed by the State DOTs under the AASHTOWare program is the Trnsport suite of 14 modules [7]. Each Trnsport module addresses the needs of the transportation agency during a particular phase in the construction life cycle, beginning with project definition through the archival of final contract information and beyond, by providing access to it for use in decision-making and reporting. Generic releases of the Transport modules are available to provide operational support as well as appropriate analysis reports in easy-to-understand formats. The generic approach provides an efficient and flexible computer operating environment and user interface, with integrated tools for adding new or modified reports, extending the database with agency specific data, and conducting ad hoc analyses. The current releases offer significant capability to tailor Trnsport to each agency's individual needs, through the use of system installation options, report templates and generic fields in the database. Currently Trnsport is licensed by 41 State DOTs, one toll authority, two Canadian provinces and the Philippines as part of a major World Bank loan support.

The key module for providing the information and analysis capability for the detection of fraud at the bidding stage is the BAMS/DSS module. (See Figure 1)

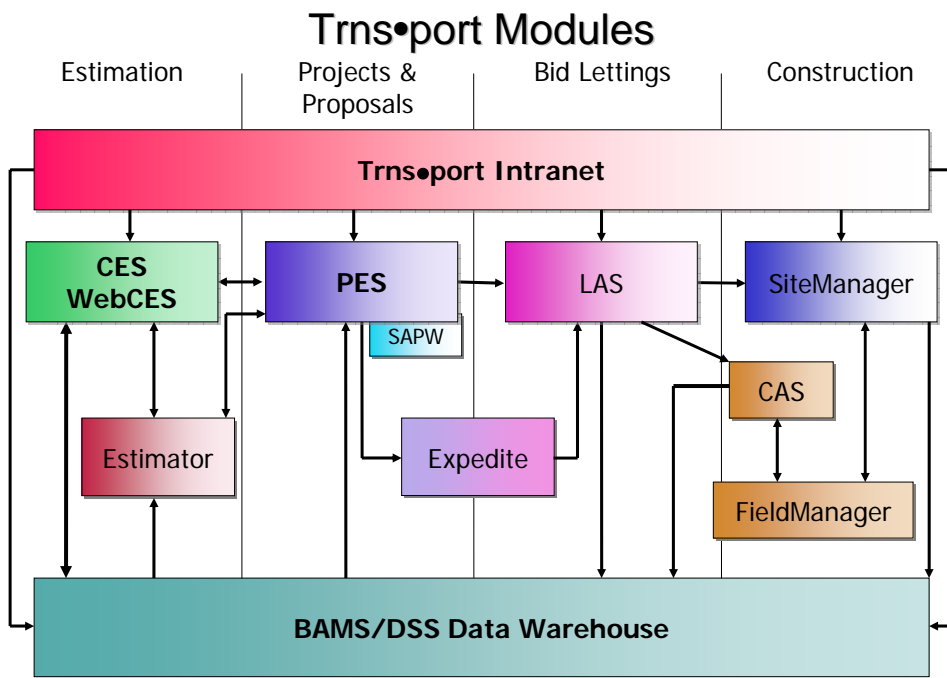


Figure1

Transport BAMS/DSS provides a complete Transport historical data warehouse specifically designed to provide decision support in the areas of bid monitoring and evaluation, vendor (contractor, subcontractor, and DBE) and market analysis, item price estimation, and the planning and budgeting process. Because of the collusion detection aspects, BAMS/DSS has previously been restricted only to Member and Associate-International Member agencies. A Standard Analysis Version of BAMS/DSS based on the BAMS/DSS version is available for licensing to governmental transportation agencies who are not AASHTO Members or Associate-International Members. The Standard Analysis Version has a reduced set of defined data analysis and reporting modules but still provides a powerful, full-featured product responsive to the data analysis and reporting requirements of qualified agencies that are not Members or Associate-International Members. Example uses of the software to detect possible corruption include the analysis of asphalt paving bids by the Florida DOT using line item profile plots of a bid item (not the total bid) to detect how a certain contractor had thrown an overall bid where the firm's overall unit price fell within a reasonable range on a regression plot of overall bid price per ton of asphalt pavement vs. quantity using historical data of all statewide bids for all projects.

In another example, Florida DOT was able to detect collusion by plotting market shares over time to observe market rotation. (See Figure 2)

DYNAMIC MARKET SHARE Florida - Market Rotation

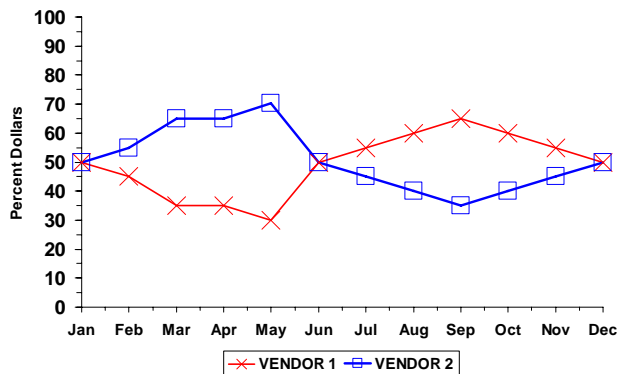


Figure 2

The DOTs in Colorado, Indiana, Florida and others have used regression plots of historical statewide bids to represent a competitive model from which damages can be determined for a contractor found to have been awarded a contract with a fraudulent winning bid. (See Figure 3)

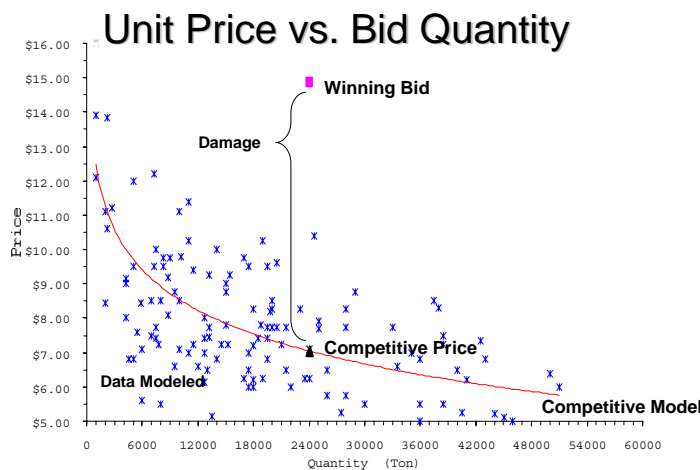


Figure 3

BAMS/DSS has the capability to allow transportation agencies to uncover the following types of possible collusion red lights: stable market shares, predictable win patterns, territorial allocation of winning contracts, complementary bidding, rotation of markets, vendor affiliations/joint ventures, aberrant pricing, and, prices above competitive levels. An agency can use this tool not only for collusion detection but as a litigation aid as well.

3. MANAGEMENT OF MAJOR PROJECTS

Typically, project performance is gauged by how well a project does in maintaining the schedule, staying within budget, and delivering a quality product. In recent years, it has been acknowledged that public trust and confidence in an agency is another crucial measure of performance and indicator in the public's willingness to entrust further funds to an agency. Program-wide efforts are routinely taken to maintain vigilance in managing the

program and in catching wrong-doing. While the previous section dealt with fraud, this section deals with sound management practices to make sure the public's funds are wisely invested. The emergence of major projects, projects that cost more than \$500 million, has re-focused the need to practice good project administration. In many ways a major project is like a small program of multiple highway project contracts. The principal difference is the magnitude of the negative impacts, either financially to the rest of the program, or publicly to the agency in the loss of public trust and confidence. Thus for major projects, the FHWA requires the public agency to have three specific management elements: a project management plan; an initial and subsequent financial plan; and increased sophistication in cost estimation.

A project management plan presents the project management structure to be used, the philosophical approach to resolving problems, scope creep, etc. The financial plan must have realistic cost estimates with realistic revenue projections to ensure that the funding is indeed available to complete what was started. Finally, more sophisticated cost estimating techniques must be used to avoid fixing an unrealistically optimistic cost figure in the public's mind, to recognize that cost inflation is real for major projects that take many years to complete, and to cover contingencies that are likely to arise because of the complexity of major projects. Through experience with these management tools for major projects, it is expected that the good practices will be used for the whole program, and not just restricted to major projects. [8], [9], [10]

The AASHTOWare Transport suite of software described earlier has a very important project management role to effectively estimate the costs of projects, prepare project proposals, manage the lettings, and, most important, manage the projects through their construction phase. The BAMS/DSS module is used for all phases—it is a decision support system that enables a highway agency to run its business. Benefits of the decision support system to a transportation agency include:

- Better Understanding of the Agencies' Markets
- Evaluate Effect of Market and Vendor Capacities on Cost
- Better Understanding of Supplier and Subcontract Markets
- Improved Project Sizing and Scheduling
- Enhanced Estimation Procedures
- Provides Assessment of Vendor Competition
- Assists Information Exchange Among Relevant Agencies
- Protection of Taxpayers' Money

4. LESSONS LEARNED FOR USE BY OTHER COUNTRIES

4.1 Lessons applicable for other nations

This paper illustrated the changing nature of the construction industry in the United States, both with regard to contracting models as well as the changing role of the government agencies. Newly developing countries need to be aware of the importance of the potential for waste, fraud and abuse as well as the need to provide oversight of major construction projects to see that the public's money is spent as efficiently and effectively as possible. Developed nation's, such as the United States, also need to remain continually vigilant as the nature of the business becomes more complex, as projects get more expensive and sophisticated, as the public sector staff sizes continue to shrink, and, as the public's

expectations rise for good government. Successful public sector agencies in the USA are those who deter, detect and prosecute corruption and who are transparent and effective in their business practices of large scale public works projects. Such agencies will continue to get new resources to reconstruct existing infrastructure and build new infrastructure so vitally needed for the sustained economic growth of the country.

4.2 Closing

The subject matter of this paper is one that PIARC might continue to explore among member countries through technical committees, work shops and peer to peer meetings.

REFERENCES

- [1] USDOT, FHWA, *Highway Statistics 2005*
- [2] *Primer on Contracting for the Twenty-first Century*, AASHTO, Fifth Edition, 2006
- [3] NCHRP Synthesis 313, *State DOT Outsourcing and Private Sector Utilization: A Synthesis of Highway Practice*, Transportation Research Board, 2003
- [4] From <http://www.fhwa.dot.gov/PPP/sep15.htm>
- [5] TOPNET - <http://topnet.gov/StateDebarmentLinks.jsp>
- [6] FHWA Construction Program Guide - Suspension & Debarment (April 2003) <http://www.fhwa.dot.gov/construction/cqit/suspensi.htm>
- [7] See the Trnsport suite described in the AASHTOWare catalogue at www.aaashtoware.org
- [8] “*MegaProjects*” Are You Ready for One? – Public Roads, July/August 2004
- [9] FHWA Major Projects Guidance website (January 2007) - <http://www.fhwa.dot.gov/programadmin/mega/>
- [10] FHWA Project Cost Estimation Guidance (January 2007) - <http://www.fhwa.dot.gov/programadmin/mega/cefina1.cfm>