A Remarkable Public-Private Partnership: A Case Study - Part I [1]

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Abstract

The Oregon Transportation Investment Act (OTIA) III State Bridge Delivery Program was a comprehensive public–private partnership between the Oregon Department of Transportation (ODOT) and a Fluor–HDR joint venture. The program established a model for sustainable infrastructure investment by simultaneously enhancing economic performance, mobility, and environmental stewardship while delivering a positive return on public expenditures.

During a period of significant economic stress, the program successfully managed more than $2.1 billion in funding ($1.3 billion in OTIA funds and $800 million in additional sources), achieving economies of scale and saving or avoiding in excess of $2 billion in costs. The program was completed on schedule and more than $45 million under budget. It is estimated to have created or sustained approximately 22,000 jobs, with 90% of expenditures directed to Oregon firms and residents, thereby providing substantial statewide economic stimulus. The program also recorded more than 3 million work hours without major safety incidents.

A suite of innovative delivery approaches contributed to savings exceeding $1 billion. These included:

1. advanced information technology systems that, according to a state-of-the-art public-sector cost–benefit analysis, generated a return of $2 for every $1 invested; among them, the Work Zone Traffic Analysis tool alone is estimated to have saved motorists more than $200 million in avoided delay;
2. a single environmental programmatic permitting framework that coordinated requirements across 11 state and federal agencies, avoiding an estimated $74 million in costs and preventing delays associated with conventional permitting; and
3. a design exception process that met ODOT and Federal Highway Administration standards while streamlining decision-making and avoiding nearly $700 million in costs.

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Collectively, these strategies enabled the OTIA III State Bridge Delivery Program to exceed its performance, cost, and schedule objectives and to demonstrate the potential of well-structured public–private partnerships to deliver large-scale transportation infrastructure with strong stakeholder and partner support.

Introduction/Summary

Routine bridge inspections in 2001 revealed expanding cracks in several highway structures, signaling an urgent need to modernize Oregon's aging transportation infrastructure. These deficiencies imposed load restrictions on major freight corridors, leading to delays, detours, and broader system inefficiencies. A subsequent study estimated that, over 25 years, failing to address the problem would cost the state approximately $123 billion in lost productivity and 88,000 jobs (ODOT, 2003).

Oregon has nearly 6,700 bridges, including 2,700 state-owned structures, with almost half constructed before 1960. Projections indicated that an average of 15 bridges per year would become structurally deficient. Without intervention, the situation was expected to deteriorate rapidly.

In 2003, the Oregon Legislature passed House Bill 2041 and established the Oregon Transportation Investment Act (OTIA) III State Bridge Delivery Program—the largest investment in Oregon's transportation infrastructure in more than 50 years. HB 2041authorized $1.3 billion to repair or replace 365 bridges statewide within a compressed schedule of just over a decade. The Legislature directed the Oregon Department of Transportation (ODOT) to outsource program management for this effort.

Engaging a private firm to manage the bridge program represented a historic shift for ODOT—from an organization that primarily designed and constructed projects to one that focused on managing the transportation system. The outsourced delivery model minimized the need to expand ODOT's permanent staff, while enabling the private-sector partner to scale staffing to meet program demands.

Following a rigorous competitive procurement, ODOT selected Oregon Bridge Delivery Partners (OBDP)—a 50/50 joint venture and separate operating company formed by Fluor Enterprises and HDR Engineering—as its program manager and owner's representative. OBDP was tasked with providing program management, construction management and inspection, engineering, and design services.

ODOT and OBDP organized their teams with mirrored positions, enabling counterparts in each organization to collaborate directly to identify, address, and resolve issues. This joint structure supported cohesive decision-making and seamless program delivery.

Beyond the core mandate to repair or replace 365 bridges, the program adopted five overarching objectives—known collectively as Context Sensitive and Sustainable Solutions (CS3)—and reported progress regularly to the Oregon Legislature, the Oregon Transportation Commission, and other stakeholders:

1. Stimulate Oregon's economy.
2. Employ efficient and cost-effective delivery practices.
3. Maintain freight mobility and keep traffic moving.
4. Build projects that are sensitive to their communities and landscape.
5. Capitalize on funding opportunities.

Given the program's length, scale, and complexity, its management demands extended well beyond those of traditional project-level assignments. Historically, ODOT directly managed all program activities and served as the principal interface with internal organizational units and external stakeholders. Under the OTIA III program management model, ODOT retained overall responsibility, accountability, and decision-making authority, but operated in a more executive, strategic-oversight role. OBDP assumed independent responsibility for managing day-to-day delivery activities, including the adequacy of processes, systems, procedures, controls, reporting, payments, performance management, comprehensive risk assessment, and overall budget control—while functioning as an integrated extension of ODOT.

From the outset, a key imperative was to ramp up rapidly by assembling a large, skilled, and diverse workforce that could apply industry best practices to meet ambitious cost, schedule, and quality targets. At its peak, this public–private partnership—encompassing ODOT, OBDP, consultants, and contractors—engaged more than 3,200 people in delivering the OTIA III State Bridge Delivery Program.

This paper synthesizes and summarizes the OTIA III program's public–private partnership model and outcomes, highlighting principal strategies, innovations, and lessons learned, while acknowledging that many operational details are beyond the scope of this case study.

Owner and Program Manager Roles

The Program Director, serving as the primary client interface, met regularly with ODOT leadership to address strategic issues, program change management, contract administration, dispute

resolution, and overall alignment. Comparable engagement occurred with key partners and stakeholders, and similar interactions were structured between ODOT–OBDP peer counterparts to maintain consistency and coherence across the program.

Clearly defining and maintaining owner and program manager roles and responsibilities—with minimal ambiguity—was essential. Role clarity was supported through formal documentation and reinforced by regular program- and project-level reviews conducted jointly by ODOT and OBDP staff.

The governing agreement explicitly articulated OBDP's responsibility to support ODOT in achieving maximum value from the program:

> "In performing the Services the Contractor must assist Agency with the management of Agency's OTIA III State Bridge Delivery Program and OTIA III Related Services to obtain the greatest long-term value for the State of Oregon and prudently expend public funds within the constraints of the OTIA III State Bridge Delivery Program, context, schedule and budget."
> *(Agreement to Agree, Exhibit G, Menu of Services)*

The Agreement to Agree (ATA) identified more than 30 program management services and 70 architecture/engineering services to be provided by OBDP. As program manager and owner's representative, OBDP delivered a comprehensive suite of services, comparable to those typically performed directly by state departments of transportation, including:

- Program management
- Application of the Context Sensitive and Sustainable Solutions (CS3) framework
- Life-cycle cost minimization and cost reduction
- Identification and leverage of additional funding sources
- Use of multiple delivery methods
- Support for economic stimulus objectives
- Environmental justice considerations
- Environmental management system development and implementation
- Environmental program management
- Financial management
- Information and monitoring systems
- Program administration (records, data management, budgeting, scheduling, invoicing, status reporting, coordination meetings, etc.)
- Development and tracking of performance measures

- Program cost containment and reduction
- Procurement support and proposal development
- Knowledge transfer and capacity building
- Occupational health and safety management
- Public involvement, outreach, and communications
- Quality assurance and quality control (QA/QC)
- Reporting to oversight bodies and stakeholders
- Risk management and risk avoidance strategies
- Schedule development, including cost-loaded program and project milestones
- Supply chain management
- Traffic management and construction staging strategies
- Preparation and maintenance of program management plans
- Definition of agency, contractor, and stakeholder roles and responsibilities
- Definition of decision-making processes and issue-resolution protocols
- Development of overall program delivery strategy
- Integration of program goals and objectives with delivery practices
- Identification and documentation of processes required for successful program development and delivery
- Definition of strategies to complete the program on schedule and within available financial resources
- Program closeout activities

All OTIA III projects, whether more directly managed by OBDP or by ODOT, benefited from this common framework of services.

Because the program management contract was held by a private entity, OBDP was able to prioritize the use of local firms to a greater extent than ODOT could under the Brooks Act. While this created new opportunities for Oregon-based businesses, it also introduced unfamiliar contractual terms and commercial practices for a local industry accustomed to working directly with a state agency. A deliberate governance structure was created to mitigate these challenges, increase transparency, and foster trust.

Key elements of this governance structure included:

- A stakeholder committee connecting back to organizations that had supported passage of the OTIA III legislation—such as the American Council of Engineering Companies (ACEC), Oregon Trucking Associations (OTA), American Automobile Association

(AAA), Associated General Contractors (AGC), and the Oregon Manufactured Housing Association—providing policy and industry perspective.

- A Bridge Oversight Committee (BOC) comprising ODOT financial, technical, and leadership representatives, the ODOT Motor Carrier Division, and the Federal Highway Administration (FHWA), served as the high-level oversight and decision-making body.
- A "DOT within a DOT" model whereby OBDP mirrored key ODOT positions, enabling direct peer-to-peer communication, coordinated problem-solving, and rapid issue resolution.

In addition to acting as owner's representative, OBDP personnel were co-located with and functionally integrated into ODOT teams, effectively augmenting agency capacity while remaining aligned with ODOT policies and objectives.

Throughout the program, regular joint meetings between ODOT and OBDP—initially in the form of BOC meetings and later as OTIA III update meetings—played a critical role in maintaining alignment on scope, schedule, budget, risk, and stakeholder expectations.

Program Mission or Purpose

Given the scope and complexity of the OTIA III State Bridge Delivery Program, a clear and shared mission was essential. The program mission statement was:

"To repair or replace 365 bridges on time and within budget while improving the economy, mobility, and the environment."

This mission provided a concise articulation of purpose and served as a touchstone for decision-making, performance measurement, and communication with stakeholders throughout the life of the program.

Sustainability

Sustainability served as the overarching framework within which the program sought to optimize benefits to society, the environment, and the economy while operating within fixed constraints. As with most large, complex engineering and construction programs, the OTIA III State Bridge Delivery Program had the potential to generate both positive and negative financial, social, and environmental impacts for the owner, affected communities, and stakeholders (Prieto, 2011). To address these risks and opportunities, the program adopted a context-driven approach to transportation engineering—Context Sensitive and Sustainable Solutions (CS3)—as its organizing

principle (Figure 1). Underwood and Richards (2013) provide a more complete discussion of the CS3 framework.

Figure 1. The OTIA III Program Context-Sensitive and Sustainable Solutions (CS^3) defined goals for success.

Sustainability is often described in terms of the "triple bottom line" (Elkington, 1998), comprising social progress, economic vitality, and environmental stewardship. The CS3 approach recognized that these dimensions are interdependent and that there is rarely a single "optimal" solution. Instead, program decisions were oriented toward identifying and implementing balanced, context-sensitive solutions that aligned with the relationships among stakeholders, systems, and outcomes, as illustrated schematically in Figure 2.

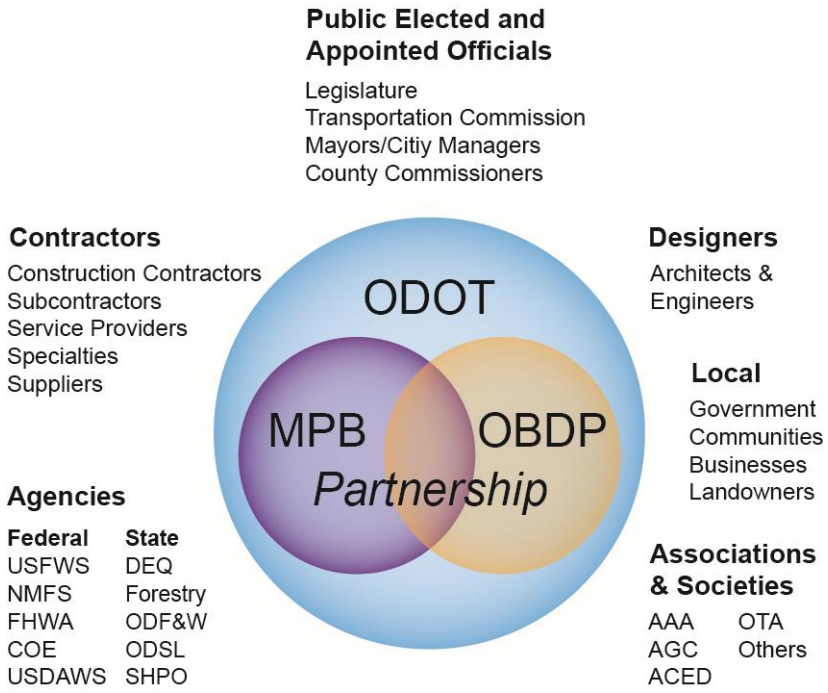

FIGURE 2. The nature of program relationships. Major Projects Branch (MPB) was the element of ODOT ultimately responsible for the OTIA III Program.

An essential component of CS3 was performance management. Program staff systematically measured performance, acted on feedback, and reported results in a continuous improvement cycle. This visible, data-driven approach to performance management and reporting, grounded in transparency and objectivity, strengthened credibility and trust with ODOT and external stakeholders and became one of the most critical success factors for the program.

OBDP implemented and oversaw innovative strategies to achieve the program's five goals using CS3 principles. The CS3 approach emphasized a structured decision-making process that explicitly considered the complex interrelationships associated with sustainability. It also provided criteria and measures to evaluate performance in achieving the program-wide goals:

1. Stimulate Oregon's economy
   - Maximize and diversify economic opportunities for the design and construction industry.
   - Encourage Oregon consultants, contractors, and suppliers to compete for project work.
   - Create and sustain employment opportunities, particularly for Oregon residents.

- Coordinate with other state agencies responsible for economic development and employment.

2. Employ efficient and cost-effective delivery practices
   - Implement change management and risk management strategies.
   - Streamline processes to meet design and construction schedules.
   - Reduce costs through innovative management and delivery practices.
3. Maintain freight mobility/keep traffic moving
   - Minimize the impact of construction activities on industry and the traveling public.
   - Facilitate efficient freight movement and reliable product delivery statewide.
   - Engage with the freight industry and respond to feedback via the Motor Carrier Transportation Division.
4. Build projects sensitive to their communities and landscape
   - Build partnerships among ODOT, the business community, community leaders, citizens, other stakeholders, and OBDP.
   - Incorporate local conditions and community priorities into design and construction.
   - Avoid and minimize adverse environmental impacts.
   - Promote sound environmental stewardship.
5. Capitalize on funding opportunities
   - Build partnerships among ODOT, the business community, community leaders, citizens, other stakeholders, and OBDP.
   - Ensure local conditions and influences are considered in project development to strengthen funding cases.
   - Pursue additional program funding opportunities.
   - Take advantage of favorable bond markets and interest rates.
   - Position Agency to attract alternative funding sources.

To institutionalize CS3, ODOT developed and used a CS3 Guidebook (ODOT, undated) that described how the bridge program was organized and delivered within this framework. The guidebook contained three primary sections: (1) program background; (2) implementation of CS3 in program development and organization; and (3) project delivery processes, including step-by-step descriptions of tools and methods used. It also documented processes for the two principal contracting methods—design–bid–build and design–build.

An appendix to the guidebook presented the CS3 Performance Measure Framework, which identified specific measures used to evaluate program goals and objectives and described the collection and review methodology for each metric. A companion document of the same name

further detailed the individual measures and methods. Program staff assessed CS3 performance using three types of measures: process, outcome, and indicator.

To assist designers in applying CS3 principles, program staff created a *Consultant Guide to the OTIA III State Bridge Delivery Program*. This guide provided background information and detailed descriptions of required tasks, activities, and deliverables. It clarified expected levels of effort and explained how to prepare scopes of work and fee estimates consistent with program standards. Design contracts incorporated explicit CS3 deliverables, including:

- A project-specific CS3 Plan, following a program template, describing how the design firm and construction contractor would achieve CS3 and support the five program goals.
- CS3 summary reports at key milestones, documenting progress toward the goals and updating the CS3 Plan.
- A CS3 decision matrix prepared during early design, including a narrative explaining the preferred bridge alternative and the primary factors influencing that decision, as well as the rationale for structural options, construction methods, and configurations that were not selected.

All design consultants were required to complete extensive CS3 training before being qualified to work on the program. This ensured a consistent understanding of requirements and expectations across firms and projects.

Program Management Office

Program Business Management

Given the scale and complexity of the OTIA III Program, the Program Management Office (PMO) was a critical enabling function. The PMO supported the Program Director and the broader management team by providing the information and administrative infrastructure required to manage schedules, budgets, scope, risk, and other core program control functions.

These program and project support activities—largely administrative and commercial rather than technical—did not directly produce physical bridge assets but were essential to effective delivery. In addition to senior leaders for design/engineering, construction, and public information/outreach/communication (PI/O/C), OBDP appointed a Business Manager (also referred to as the Deputy Program Manager for Administration) to lead the administrative and business functions. The Business Manager reported directly to the OBDP Program Director.

Many programs assign administrative and commercial duties to separate roles. In OTIA III, consolidating both into the Business Manager position enabled more efficient and integrated oversight of interdependent business functions. The Business Manager brought advanced commercial expertise to manage the prime contract and was responsible for:

- Contract administration, including change management, claims avoidance and management, and commercial risk management.
- Budget control and financial planning.
- Oversight of business process controls and integration across disciplines.
- Management of information technology and document control as they related to commercial and contractual requirements.

Although all professional staff were expected to have a working knowledge of the prime contract, and ultimate accountability rested with the Program Director, the Business Manager was the program's primary expert on contract interpretation and compliance. While various functional leads prepared work order contracts (WOCs), amendments, and change orders, the Business Manager maintained oversight of these actions, subject to final approval by the Program Director. Contract compliance, like safety, was emphasized as a shared responsibility.

The Business Manager also led development of program and project procedures for business disciplines—finance, accounting, accounts payable, project controls, purchasing, contracts, and materials management—ensuring they were optimized, integrated, and equipped with adequate checks and balances. The role included drafting commercial correspondence related to claims, contract changes, and other issues, and ensuring that staff followed established work processes to support full and timely compensation, protect against potential claims, and facilitate swift resolution of commercial matters.

Budgeting, cost reporting, financial reviews, and identification of profitability improvements fell under the Business Manager's remit. Reporting was designed to be appropriately granular, easy to consolidate, and accessible for management review, while providing early warning of cost deviations and supporting development of mitigation and recovery plans. The Business Manager also led commercial risk assessments of the program's risk register and maintained appropriate contingencies to guard against adverse financial impacts, including cost escalation and revenue reserves.

In practice, the Business Manager served as the central integrator of the PMO's commercial and administrative functions and was essential to effective program governance and delivery.

Contracts

The program ultimately comprised 71 work order contracts (WOCs) (Table 1): 14 program-level WOCs (six program management, three design management, two construction engineering and inspection management, one design–build management, one construction manager–general contractor, and one information systems), 20 specialty WOCs, and 37 design WOCs.

	Cost Plus Fixed Fee	Lump Sum	Time and Materials
Program	Nine (1, 2, 3, 3A, 5, 7, 7A, 7B, 7C, 10, 11, 13, 15)	One (4)	Five (3DB, 5A, 8, 9, 12
Design		37 (design)	37 (post-design)
Speciality			20

TABLE 1. Contract types. WOC numbers in parentheses. WOC 5 has both cost-plus fixed fee and time and materials components; however, the total number of WOCs remains at 71, with the same number of accompanying signed closeout agreements. In 2010, the remaining cost-plus fixed fee contracts (11 and 13) saw conversion to time and materials. WOC 6 (not shown) was the Delcan contract with ODOT. Most design contracts were lump sum, and converted to time and materials for post-design support during construction. However, the total design contracts remained at 37; three of these had two closeout packages each (for a total of six) submitted as deliverables. So OBDP submitted 43 design closeout packages. There was no WOC 14.

Project Controls was responsible for preparing and tracking all changes to contract scope, schedule, budget, and terms and conditions. When a change was anticipated, staff issued a "heads-up" Potential Deviation Notice (PDN) email, followed by a formal PDN, to ODOT whenever scope, schedule, or budget were affected. Staff maintained a log of PDNs and their status. Over the life of the program, nearly 800 PDNs, numerous task orders, and more than 250 contract amendments (including three amendments to the Agreement to Agree) were processed.

As owner's representative, OBDP was centrally involved in all contractual interfaces. Maintaining flexibility, composure, and a strong working relationship with ODOT was critical, particularly when addressing complex issues. Senior ODOT leadership modeled the same collaborative approach. Many issues—often arising under challenging circumstances—were resolved successfully because of the strong, trust-based relationship that had been established early in the program.

To improve financial visibility, OBDP implemented weekly leading indicators based on labor hours (earned value) rather than solely on invoiced dollars. These indicators were consolidated

into a weekly "Flash Report" and integrated into the controls system. Because invoices, once submitted, were processed through ODOT's TEAMS financial system with a lag that could extend four to five months from the time work was performed, relying only on invoiced data would have delayed decision-making. By contrast, timesheets and vehicle logs were available weekly. The Flash Report enabled the team to detect emerging cost and performance issues months earlier and to implement proactive corrective actions.

A formal, robust Change Management Request (CMR) process complemented the PDN system and provided accountability and discipline around changes to scope, schedule, and budget. Operational Notice 1 established the program-wide change management framework. Nearly 700 CMRs were documented through letters signed by both ODOT and OBDP leadership over the course of the program.

Schedule Management

Consistent with the program's CS3 objectives—economic stimulus, freight mobility, and environmental stewardship—the ODOT–OBDP team approached the constraints of scope, schedule, and budget in an integrated manner. Once the initial set of program bridges was identified, the partners developed the full program scope along with contingency options. With a fixed budget, the team prepared multi-year schedule "windows" that allowed for adjustments if economic or other external factors affected funding availability.

Program startup was an intense period of ramp-up for both organizations. Through facilitated workshops, the team decided to group projects into "bundles," each comprising multiple bridges and construction stages, rather than using a strict "worst-first" prioritization. Bundling projects enabled at least one major north–south and one east–west corridor to remain open while work proceeded on other routes. It also generated economies of scale through reduced mobilization costs, larger-volume material purchases, and reuse of temporary works and materials across bridges within the same bundle.

A baseline scope was developed using a budget and planning schedule tool, which allowed bundle-level cost estimation and resource leveling. The team used a rolling-wave planning approach to develop the program-level schedule, staggering bundles over a six-year design window to accommodate corridor strategy development. The rolling-wave schedule followed a bell-curve profile—initial ramp-up, peak workload (2008–2009), and ramp-down—so that at peak, major construction and major engineering were both underway but remained manageable.

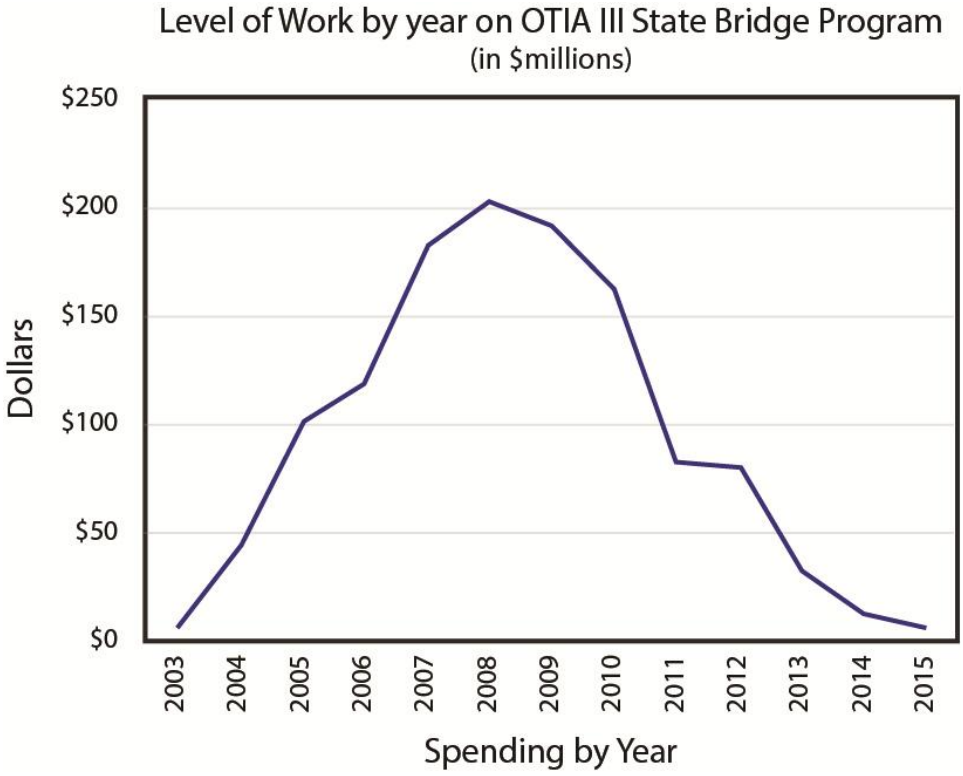

Figure 3. OTIA III schedule – by annual dollars spent

In addition to monthly updates of the rolling-wave plan, the team developed a customized Bridge Reporting System (BRS) to track and manage bundles. Each set of projects followed a defined, step-wise process from initiation through closeout (14 steps for design–bid–build, 12 steps for design–build). Each project's current phase was identified and updated monthly, providing early visibility into status and potential issues and enabling proactive mitigation rather than reactive problem-solving.

The team also produced a 13-month look-ahead schedule for management review, updated monthly, showing key milestones and variances from target dates. More detailed control-level (critical path method) schedules were maintained for each bundle, with work activities and deliverables rolled into time-scaled bar charts derived from logic networks. Project coordinators updated these schedules monthly, and schedule performance indicators were provided to management to highlight variances and trends.

Information technology played a central role in accelerating delivery and ensuring schedule discipline. The program team developed several customized applications, in addition to employing

commercial tools, to provide real-time status, analytical support, and reporting capabilities for internal use and stakeholder communication.

Collectively, these scheduling and control strategies enabled the program to be delivered on schedule (Figure 3).

Cost Management

Program budgeting was based on progressively refined cost estimates. In 2002–2003, the ODOT Bridge Strategy Task Force confirmed that Oregon faced a significant bridge deficiency problem requiring an estimated $4.7 billion to address fully. In 2003, the Legislature authorized $1.3 billion for OTIA III. ODOT's *Economic and Bridge Options Report* (EBOR), issued in August 2003, identified 365 bridges in critical need of repair or replacement and estimated program costs at approximately $1.337 billion. A January 2005 update estimated costs at approximately $1.3 billion, and a further update in late 2005 placed costs at $1.343 billion—exceeding the available OTIA III funding by at least $43 million. OBDP's role was therefore to manage scope, schedule, and delivery methods to remain within the $1.3 billion program budget.

With a fixed budget, the program could not absorb uncontrolled scope growth or significant schedule delays. The use of integrated planning, scheduling, and information technology tools was critical to maintaining schedule adherence and cost control, ultimately allowing the program to finish under budget and returning surplus funds to other high-priority transportation projects in Oregon.

Because OTIA III was funded by bond sales, the program was subject to high public and legislative scrutiny, particularly regarding financial stewardship. Early in the program, staff identified non-OTIA III transportation projects located near OTIA III bridges. To reduce community and traffic impacts, many of these non-OTIA III projects were added into OTIA III bundles. This approach delivered construction efficiencies and minimized disruption, but required careful tracking to ensure that OTIA III bond proceeds were used exclusively for legislatively authorized purposes. Existing ODOT policies and systems were not fully adequate for this level of financial segregation and reporting, so the program established additional processes and documented them in Operational Notice 1.

Through these and related efforts, the $1.3 billion OTIA III program leveraged more than $800 million in additional, non-OTIA III funding, resulting in management of more than $2.1 billion in total program-related expenditures and achieving significant economies of scale.

A uniform repair policy was implemented across all five ODOT regions, helping to control scope and avoid regional variability in solution standards and costs. A consultant guide provided explicit

direction on developing scope, schedule, and budget for each bridge and, together with training, supported "least-cost planning"—delivering necessary outcomes at minimum life-cycle cost.

To strengthen cost estimation, the team developed a cost-estimate forecasting tool using a customized regression model to produce triangular cost-point forecasts for each estimate. OBDP then applied a customized Estimate Validation Risk Analysis (EVRA) process (Figure 4), based on Monte Carlo simulation, to augment the initial estimates. EVRA was applied at three points in estimate development, with adjustments documented at each stage. This process refined estimates to a level that minimized the need for rebidding and associated schedule delays while supporting effective budget management at both bridge and bundle levels.

The team also developed an overall cost performance baseline and cost management plan, supported by earned value reporting that provided early warning of cost variances and enabled timely corrective action.

An innovative process was created to evaluate potential design errors and omissions in connection with 71 construction change orders. More than 100 potential issues were assessed and resolved without liability. The $1.3 billion program concluded with less than $3 million in construction change orders—under 0.3 percent of construction costs.

Additional notable cost savings included:

- Pre-purchase of steel for the Sandy River Bridge, saving an estimated $10 million.
- A design change from concrete to steel girders for the Sandy River Bridge, saving an estimated $20 million.
- Eliminating temporary work bridge piers, thereby avoiding an estimated $100 million in potential flood-related damage.
- Use of BRMF-based cost–risk analysis on the Willamette River Bridge, reducing projected overrun exposure by approximately $15 million.

Bundling and, where appropriate, unbundling bridges were used strategically to generate economies of scale, increase competitive bidding, and create opportunities for smaller contractors—particularly important during the recessionary years. These tactics also contributed to cost reductions.

OBDP instituted a Value Awareness Program to systematically identify and document cost savings and value-added innovations. Although OBDP staff viewed such efforts as part of their normal responsibilities, formal quantification and reporting helped ODOT understand the return on its program management investment and reinforced a culture of value and cost consciousness within OBDP. This was particularly important during periods of economic stress.

Overall, the $1.3 billion OTIA III State Bridge Delivery Program was completed more than $45 million under budget.

Risk Management

Managing risk across hundreds of geographically dispersed, multi-year projects presented significant challenges for the ODOT–OBDP team. Early risks, if unmanaged, could compound and amplify impacts later in the program. In addition to conventional project risks related to cost, scope, and schedule, the team faced programmatic risks associated with meeting legislative delivery goals and broader sustainability objectives—risks that are not easily captured in standard quantitative models (Prieto, 2012).

To address these challenges, the program employed five complementary methods of risk evaluation and management:

- **Program-level probability and impact matrix:** Using a Delphi technique at program outset, the team identified key risks to scope, schedule, and budget and assigned task leads (e.g., environmental, mobility, design, construction) to manage these broad-based risks.
- **Estimate Validation Risk Analysis (EVRA):** A custom Monte Carlo-based model was used to assess cost risks to individual projects between 2004 and 2008, during a period of high inflation in construction materials.
- **Fluor Business Risk Management Framework (BRMF):** This formal, systematic process was used to manage construction risks on major projects and programmatic risks not tied to a single project, employing Monte Carlo simulation to evaluate probable outcomes and inform mitigation strategies.
- **Multiple reporting tools:** A suite of dashboards and reports allowed the team to monitor progress toward statutory and program goals and to identify emerging risk trends.
- **Daily safety task assessments:** Mandatory use of a safety task assessment tool reinforced awareness of operational risks and contributed to more than 3 million safe work hours.

The EVRA model, for example, helped the team respond effectively to inflationary cost pressures. Although the program could not control market prices, EVRA enabled more accurate estimates and reduced the risk of having to rebid projects that exceeded engineers' estimates by more than 10 percent (a statutory threshold in Oregon). In one case, EVRA analysis supported the decision to pre-purchase structural steel, yielding an estimated $10 million savings on a single project.

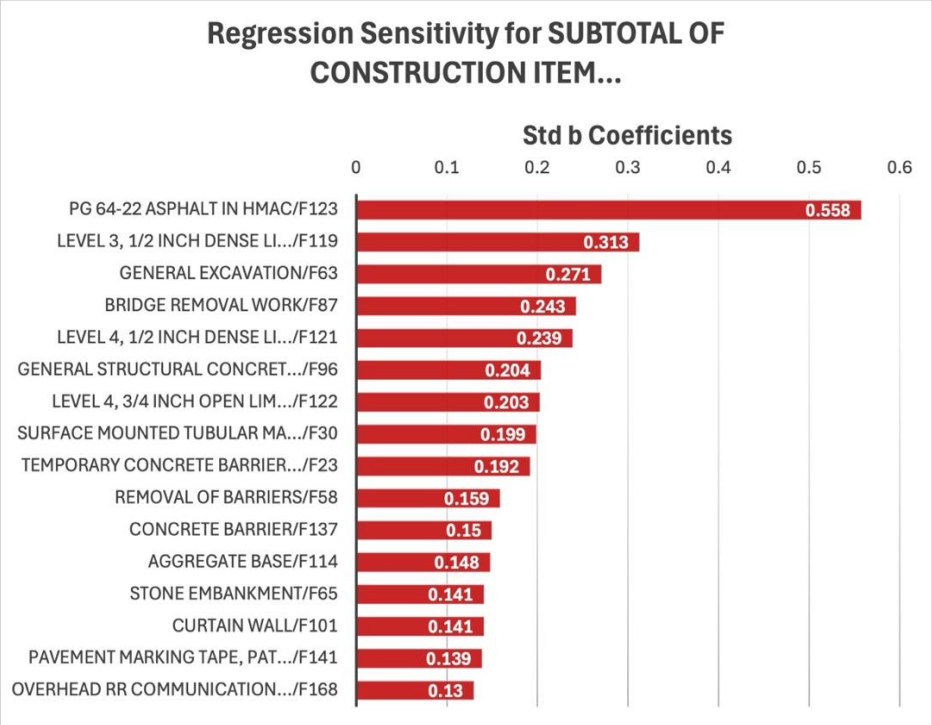

Figure 4. Results from Monte Carlo EVRA run on cost estimate.

BRMF was applied on larger construction projects to develop project-specific risk management strategies, including:

- Identifying and assessing risks that could prevent achievement of project objectives.
- Determining causes and likelihood of identified risks.
- Developing mitigation strategies and assigning risk managers.
- Evaluating the costs and benefits of risk responses and incorporating them into quantitative analyses.

Where risks could not be fully mitigated, they were included in Monte Carlo simulations, with probabilities and cost impacts modeled to inform contingency levels. On the Willamette River Bridge, for instance, initial analysis identified approximately $50 million in potential overrun exposure; after targeted mitigation through BRMF, this exposure was reduced to about $5 million prior to construction start.

Collectively, these methods enabled the program to anticipate, quantify, and manage risk in a way that supported on-time, on-budget delivery and alignment with CS3 objectives.

Financial Management

With the exception of construction contracts, all program elements invoiced through OBDP to ODOT, and Fluor and HDR in turn invoiced OBDP (Figure 5). Construction contractors, who were under direct contract with ODOT, submitted invoices that were reviewed and approved by OBDP project managers before being forwarded to ODOT for payment.

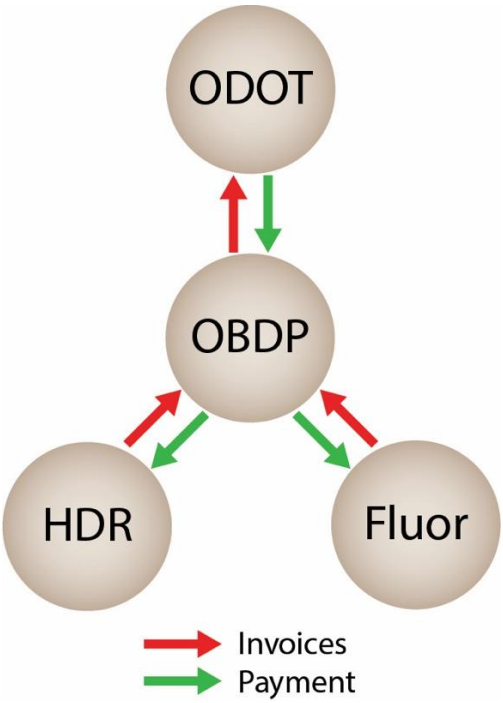

Figure 5. Flow of invoices and payments.

OBDP operated its own joint-venture financial system, supported by dedicated joint-venture accounting staff (including a non-billable JV accountant) and coordinated with the accounting systems of Fluor and HDR. This structure provided the flexibility and control needed to manage the complex flow of funds while maintaining compliance with ODOT and state requirements.

Document Management

Document management and records retention were essential components of program closeout and long-term accountability. From the outset, the program was organized "with the end in mind," establishing a records management and retention strategy aligned with applicable laws, regulatory

requirements, and partner expectations, and securing a management agreement as part of the overall program plan.

Document Control was responsible for submitting, tracking, and retaining deliverables and key documents. This included tracking incoming and outgoing correspondence, verifying that key documents from each discipline were captured, and ensuring they were stored in the Electronic Data Management System (EDMS). Document Control staff handled scanning, uploading, document tracking, deliverable quality checks, and training, and maintained consistent naming conventions. This supported delivery of a comprehensive electronic data archive documenting the program from initiation through completion.

By program end, the FileNet system housed more than 300,000 documents for long-term retention. Given the program's duration and staff turnover within both ODOT and OBDP, as well as changes among stakeholders and partners, meticulous documentation and written concurrence on decisions were critical. Many decisions were revisited over time, and the availability of clear, well-organized records was a key enabler of continuity and risk mitigation.

Document Control also tracked and screened deliverables from subconsultants, such as 246 load ratings, 211 as-constructed plan sets, and 179 calculation books, ensuring their completeness and compliance with program requirements.

IT / IS / GIS

OBDP developed much of its software, including the primary reporting dashboard, in-house. While this provided flexibility during development and implementation, it also meant that subsequent changes in technology and infrastructure were not easily accommodated, and some custom software became outdated toward the end of the program and was not readily transferable to other applications. In hindsight, using commercial off-the-shelf software with customized interfaces might have provided greater long-term adaptability and ease of integration.

Data consistency was recognized as critical to credibility with both internal and external clients. For example, budget and cost data were sourced consistently from Project Controls, ensuring a single "source of truth." Long-term support considerations were also important, particularly given that the Project Controls software was a customized, SAP-based system integrated with Fluor's enterprise tools.

Despite these challenges, OBDP developed a comprehensive suite of information technology tools that accelerated delivery and supported nearly every aspect of the program (Table 2). These tools directly advanced the goal of employing efficient and cost-effective delivery practices.

Tool	Total Cost* (in thousands)	Benefit-Cost Ratio**	Net Benefits (in thousands)
GIS Infrastructure (GIS)	$334	3	$1,002
Environmental Baseline Reporting Tool (EBRO)	$288	0.6	$173
EBRO Mobile Data Collection (MDC)	$22	0.7	$15
Electronic Drawing System	$190	-0.3	($57)
Electronic Data Management System (EDMS)	$217	6.1	$1,324
Bridge Reporting System (BRS)	$1,440	1.5	$2,160
Inspection Tool (CEI)	$515	1.6	$824
Pre-Construction Assessment Tool (PCA)	$101	7.7	$778
Work Zone Traffic Analysis Tool (WZTA)	$370	0.7	$259
TOTAL	**$3,477**	**2.1**	**$7,302**

TABLE 2. Return on investment of nine Information Technology Tools.

* Total cost includes hardware and software, development contracts, internal development and data migration.

** Benefit-Cost Ratio used is the most likely value developed using Monte Carlo statistical simulation methods.

An independent review concluded that the nine systems analyzed produced an aggregate benefit–cost ratio of 2.1, yielding approximately $7.3 million in net benefits on an investment of $3.5

million. Richard Mudge, Ph.D., former head of the transportation policy unit at the Congressional Budget Office and an internationally recognized economist, characterized the program's information technology evaluation as "state of the art in public sector cost–benefit analysis." OBDP also supported technology transfer of the Bridge Reporting System (BRS) to the State Radio Project (SRP) and to statewide reporting for the American Recovery and Reinvestment Act (ARRA).

The BRS, in particular, was designed to:

- Provide a single, authoritative dataset as of a defined cutoff date ("BRS button push").
- Preserve historical data used in initial program decisions.
- Document changes over time via monthly data "snapshots."
- Assign responsibilities for data updates, QA/QC, and approvals.
- Provide a web-based intranet interface for staff and management.
- Serve as the primary source for program and legislative reporting.
- Ensure data integrity through routine backup procedures.
- Facilitate client access to selected data and reports.
- Produce a final, comprehensive record of program data for historical and reporting purposes.

Procurement

Procurement played a central role in managing the program's extensive network of subcontracts, including 123 OBDP agreements with subconsultants (A/E and partner firms) and various service providers. As the program wound down, OBDP consolidated several additional responsibilities within Procurement, which ultimately was managed by a single staff member. These responsibilities came to include fleet management, safety coordination, document control oversight, and contracts administration for bridge bundles, among others.

At peak activity, OBDP leased office space in 12 locations statewide. Each office operated with dedicated lease agreements and was fully equipped—furniture, office equipment, telecommunications, high-speed data lines, computing equipment, and break-room facilities—while connected to the OBDP intranet and integrated with ODOT systems. As work in each location concluded and leases expired, assets were systematically returned to the funding entity (ODOT, Fluor, or HDR), sold, or donated to community organizations (such as schools) in accordance with program policies.

Technical Writing and Editing

A dedicated Technical Writer/Editor played an essential role in maintaining clarity, consistency, and quality across program documentation. This position supported the drafting and editing of nearly all major OBDP documents, including 123 Monthly Progress Reports (a sample is provided in Appendix B; the final comprehensive report is available (Lauer and Craig, 2015). Consistent, high-quality documentation was particularly important given the program's duration, visibility, and reliance on written records for governance, oversight, and institutional learning.

Summary

Part I primarily covers the scope, schedule, budget, roles, responsibilities, and governance of the OTIA III Program. Part II segues from Part I and transitions into how the Program operated and lessons learned.

AI Disclaimer

AI was used for light editing but not for content generation.

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John L. Craig has served as a civil engineering executive in both the public and private sectors, leading award-winning multibillion-dollar programs and projects around the world. He served as the Program Manager/Director, Owner's Representative, and Principal-in-Charge for the Fluor-HDR Joint Venture that delivered the Oregon Transportation Investment Act III State Bridge Delivery Program from 2009 to 2015, the last and final of three since the Joint Venture-Program began in 2004. A retired U.S. Army Corps of Engineers Lieutenant Colonel and former Director of the Nebraska Department of Transportation, he holds bachelor's and master's degrees from the University of Central Missouri, a master's degree from the University of Alaska-Fairbanks, and has published on the natural-built environment, engineering, construction, national defense, and security. He currently resides in Omaha, Nebraska, and can be contacted via email at johnlcraigconsulting@cox.net.