9-9012-01-1

Implementing a Project and Portfolio Management System for TxDOT Project Development

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Project 0-9012-01: Implementing Primavera P6

OCTOBER 2011

Performing Organization:	**Sponsoring Organization:**
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Performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.	

Executive Summary

Beginning in the summer of 2009, Texas Department of Transportation (TxDOT) started developing the framework for implementing a sophisticated new system to manage its large and diverse portfolio of projects during their development phase. This was followed by the implementation itself for managing project schedules, project and portfolio resources and costs during their development cycle. This unique and challenging implementation across TxDOT encompassed all functional areas involved in the project development phase. It was successfully completed by overcoming technical, technological, and cultural challenges inherent with any implementation of this scale and magnitude.

During the course of this implementation, hundreds of TxDOT employees spread across various district and division offices were trained. The needs and benefits of this system were continuously communicated vertically and horizontally across TxDOT. Technical constraints in the use of a new and sophisticated system were overcome and technological barriers in integrating various information systems were surmounted to provide a seamless and integrated system from which internal and external stakeholders can obtain project and portfolio related information.

The system is now populated with several thousand project schedules, with work calendars and resource assignments for a large subset of the portfolio. It is capable of providing decision-support that was not previously possible. Moreover, since all functional areas of project development process are represented in the system, the system can be used to analyze various issues using the same portfolio of projects. This was not possible in the past, due to the lack of a standardized enterprise platform for such needs.

During this implementation, the Center for Transportation Research (CTR) at The University of Texas at Austin provided critically needed experience and expertise. CTR had previous experience in developing and implementing a similar system across the Dallas District of TxDOT. During 2009-2010 CTR Assistant Director Nabeel Khwaja co-led the implementation, along with Maureen Wakeland of TxDOT. Today, the system is helping TxDOT develop and manage its four-year portfolio of active projects by helping define the portfolio of projects that can be developed in the next four fiscal years within the resource and fiscal constraints of its revenue projections. Through this system, TxDOT staff can monitor and track the progress and ensure timely delivery of projects, meeting commitments to the public on thousands of projects. The following report summarizes work performed by CTR under the RTI Implementation Project 9-9012-01.

Background

TxDOT underwent a prolonged (1) phase of Audits and assessments (both internal and external) from around 2007 until 2011 culminating in the Sunset Approval during the 82nd legislative session (2). During these audits, it was identified that TxDOT project development phase was in need of additional transparency through better scheduling, monitoring and reporting. TxDOT's project development phase broadly encompasses a series of co-dependent mini-phases aligned within organizational functional and geographic boundaries, during which schematics are developed; environmental studies are conducted; any needed right-of-way is procured; relocation plans for utilities are designed and executed; detailed engineering plans, construction specifications, and cost estimates

(PS&E) are developed; and the project is eventually let. For different projects, this phase can last anywhere from a few brief months to over a decade.

TxDOT is one of largest state departments of transportation in the United States and manages a vast network of roadways and bridges. At any given time TxDOT has several thousand projects in various phases of development spread across the state. In addition, project development is decentralized both geographically and functionally and is led by individual offices scattered around the state. The 2007 self-audit of TxDOT Field Operations (3) reviewed the process in detail and provided several useful recommendations regarding the management of decentralized project development. One such recommendation centered on the deployment of standardized tools and strategies to manage this large portfolio:

> *"Developing standardized strategies and tools for managing project schedules throughout the project development life cycle would improve execution of the planning process for future projects and improve the accuracy of reported schedule progress. Potential issues could be identified early in the development process such that the execution strategy could be adjusted to help ensure letting dates are achieved."*

Following the release of the self-audit report of the field operations, TxDOT Administration set up a working group (4) to identify and recommend a statewide system for use during the project development phase. The working group recommended the use of Critical Path Method (CPM) of scheduling by utilizing the Oracle Primavera P6 Professional Project Management (P6) software suite. In addition, the work group recommended and implemented (after TxDOT Administration approval) a transitional system to catalogue all projects in active development. The transitional system was termed, "Project Development Management System (PDMS)."

CPM scheduling for the project development phase of transportation projects is not a new concept. However, its adaptation at enterprise-level is virtually non-existent in the public sector until this implementation by TxDOT (and prior implementations on limited level by two individual Districts of TxDOT), in part because CPM scheduling requires a number of trained employees with skills in both transportation project development and the newly formalized field of project management.

Following the approval of the recommendations made by the working group, the Administration set up an interim Project Management Office (PMO) to lead the process (5) for implementing and integrating P6 into TxDOT Project Development business process, identifying and training project development staff in Districts, Divisions and Regions, implementing the P6 software tools, and in essence managing the deployment of this new system and its accompanying processes. A brief timeline for accomplishing the major tasks for this implementation are shown in Figure 1.

ID	P6 System Implementation Major Tasks	Start	Finish
1	Develop a standard WBS and standard templates	12/1/2008	6/1/2009
2	P6 software configuration for TxDOT needs	1/15/2009	6/30/2009
3	P6 automation tools - development	5/1/2009	9/4/2009
4	Regional office staffing- for Regional PMO support	7/1/2009	11/30/2009
5	P6 training (PM, RM, Executive)	7/2/2009	8/31/2009
6	P6 schedule development - data population	7/15/2009	12/15/2009
7	PDMS Tool - Phase Out	7/15/2009	12/15/2009

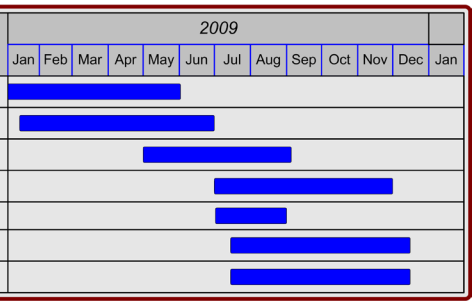


Figure 1 - Original P6 Implementation Timeline

The original Implementation Contract (IPR) between TxDOT and CTR consisted of the following six tasks.

1. Direct the necessary activities of the P6MO (interim)
2. Meet implementation milestones
3. Develop the organizational framework and job descriptions for the permanent P6MO
4. Draft policy and communicate it with ADM
5. Develop, along with the Regions, Standard Operating Procedures (SOP) for the P6MO/Districts/Regions
6. QA/QC Work

Interim Project Management Office (PMO)

Setting up the PMO was critical, as it provided an organizational unit that could act as a central clearinghouse for all information related to the implementation. TxDOT Administration set up an interim Project Management Office (PMO) consisting of existing District, Division and Regional staff co-lead by Ms. Maureen Wakeland, P.E. and Mr. Nabeel Khwaja, P.E.

The PMO very quickly identified numerous policy, technical, cultural and technological challenges that required solutions and resolution. Most of these can be enumerated under the following categories:

1. Developing a clear understanding of the policy goals and objectives of the Administration.

This was probably the most important challenge. The P6 system was new to most of TxDOT staff; its prior use within TxDOT had been confined to a few offices. Furthermore, at the Design Team level there was a lot of confusion about the general need and benefits of implementing such a sophisticated system. In order to ensure that the objectives, goals, needs and benefits of the system were consistently communicated vertically and horizontally across the organization, the PMO helped in developing policy memorandums to be issued by the TxDOT Administration.

Several such memorandums were drafted during the course of this implementation and issued by the Administration to the District Engineers, Division, Office and Regional Directors (DDOR) to help in developing a clear understanding of the policy goals and objectives from this implementation. The initial primary goals identified by the Administration were:

- Project schedule management,
- Project and portfolio resource management and
- Project and portfolio cost management. (JULY 17, 2009 JB Memo)

2. Communicating the goals, objectives and benefits of this implementation to various internal (and some external) stakeholders.

Following the issuance of the above-mentioned policy memorandums, the PMO developed a series of PowerPoint presentations that were based on them. These were used in classroom based training sessions to communicate a standard message regarding the need for this system. This PowerPoint helped in explaining the benefits of this implementation as well to TxDOT staff during the technical training sessions conducted across the state.

From anecdotal observation, these PowerPoint presentations helped with adoption of the system. By communicating benefits, it allowed for a better reception of the system. Two benefits of importance to the staff were that the new system would allow for fairer assessment of workload across Design Teams and sharing of work across District boundaries. For future similar implementations of this magnitude, it cannot be over-stressed that developing a consistent, well considered communication plan is critical in overcoming cultural resistance to change. Identification of benefits horizontally and vertically across the organization helps with the buy-in needed to move the change process forward.

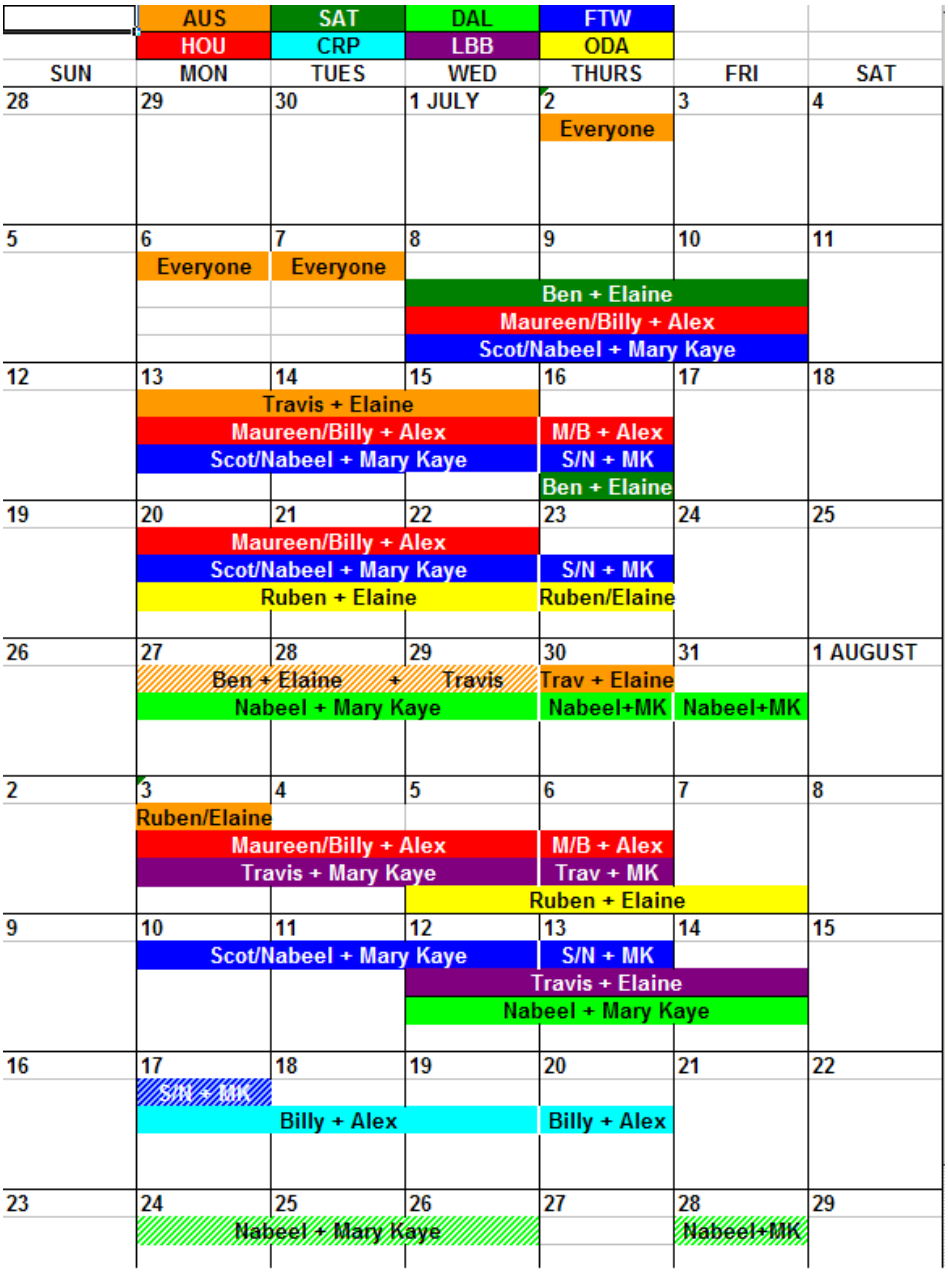


Figure 2 - Snapshot of the Training Calendar Jul-Aug 2009

3. Identification of business processes across all functional groups involved in the project development phase.

Standard P6 templates were developed to model the business processes for CPM scheduling, while ensuring that the goals set up by the Administration were supported by the templates and the subsequent schedules based on them. As mentioned earlier, TxDOT Project Development is not only geographically diverse—scattered across at least 25 Districts and in some cases further scattered across various Area Offices of each District—it is functionally diverse as well. Various components of project development are done

within functional boundaries (i.e., Advance Planning, Environmental, Bridge and Structural design, Geometric Design, Hydraulic Design, etc.).

The P6 system works best when schedules utilize a functionally representative work breakdown structure (WBS). Therefore, in order to ensure that the standard templates used for developing schedules statewide were based on WBS that fairly represented the most common functional structure within TxDOT Project Development, the PMO held numerous working sessions, webinars, and meetings with experts around TxDOT to develop several standard templates for use in creating schedules.

This was a challenging task because, due to decentralization, frequent variations existed across District boundaries. In order to account for those, the PMO provided guidance and direction to individual Districts and their Design Teams in modifying certain aspects of the statewide templates to allow for modeling the variations from the standard process without affecting the standard elements needed to ensure consistent and accurate reporting of schedule information through the Project Tracker portal.

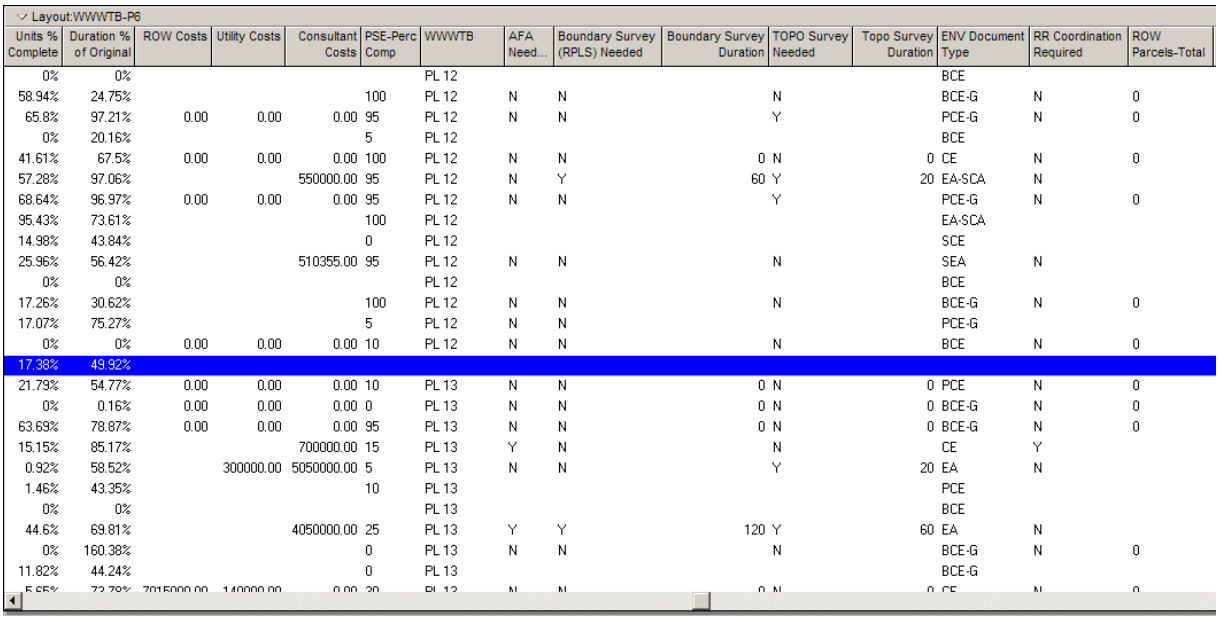
PMO quickly identified that the functional areas of right-of-way (ROW), utilities, and environmental generally fall on the critical path for most large projects. Therefore, developing good sub-templates to model the business process involved in these phases was important to improve the overall accuracy of planned milestones dates. In order to develop better template models, with the Administration's approval the PMO helped establish expert panels for each of the critical path functional areas. This included, but was not limited to, ROW & Utilities, Environmental, and Railroad Coordination, to model the business process and time and resource needs for these functional areas.

These expert panels conducted numerous meetings both in person and through webinars to develop standardized templates for their functional area of work. Prior to getting started with this effort, the PMO staff provided the members of the workgroup with formal and informal training in the use of the P6 system and the general principles of CPM scheduling. Going forward, it is highly recommended to identify the critical paths of the targeted projects that will benefit most from CPM scheduling and emphasize the development of templates for these, since identifying these details early on can save considerable time and effort involved in 'retrofitting' the schedules later on that have been created without the proper templates.

4. Providing technical support to other related initiatives during P6 implementation.

During the P6 implementation, several additional initiatives spurred by the Sunset commission recommendations were underway. Some of them had overlaps with the P6 implementation. Two such notable initiatives consisted of developing the "Where We Want to Be" (WWWTB) and the 4-year pavement management plans. The WWWTB initiative had significant overlaps with the P6 implementation due to the fact that the WWWTB effort was intended to define the boundaries of the portfolio of projects that TxDOT could develop with in-house and consultant resources within a 4-year time period; and since the P6 implementation's three primary objectives were schedule, resource and cost management, therefore WWWTB effort needed to be conducted in close concert with the P6 implementation. In order to support the WWWTB effort, the PMO team attended several meetings that were held to develop the parameters of the WWWTB effort and provided much needed support to the effort by establishing data fields, associated values, P6 layouts, and defining and publishing the data-requirements to collect user-input data for each project in the WWWTB portfolio.

By linking additional data fields from the Design and Construction Information System (DCIS) to the P6 system, the PMO provided valuable timesaving and quality enhancing support to the WWWTB initiative. Similarly for the needs of developing the TxDOT 4-year pavement management plan, the PMO developed additional data fields, associated values, P6 layouts, and business rules in the P6 system to collect pavement improvements related data from the users. Furthermore, with the help from TSD in upgrading the P6-DICS Interface program (PDI), PMO was able to bring in reference marker limits of each project from the DCIS system to provide quick and fast platform for integrating pavement improvement and project location information in one layout (Figure 3).

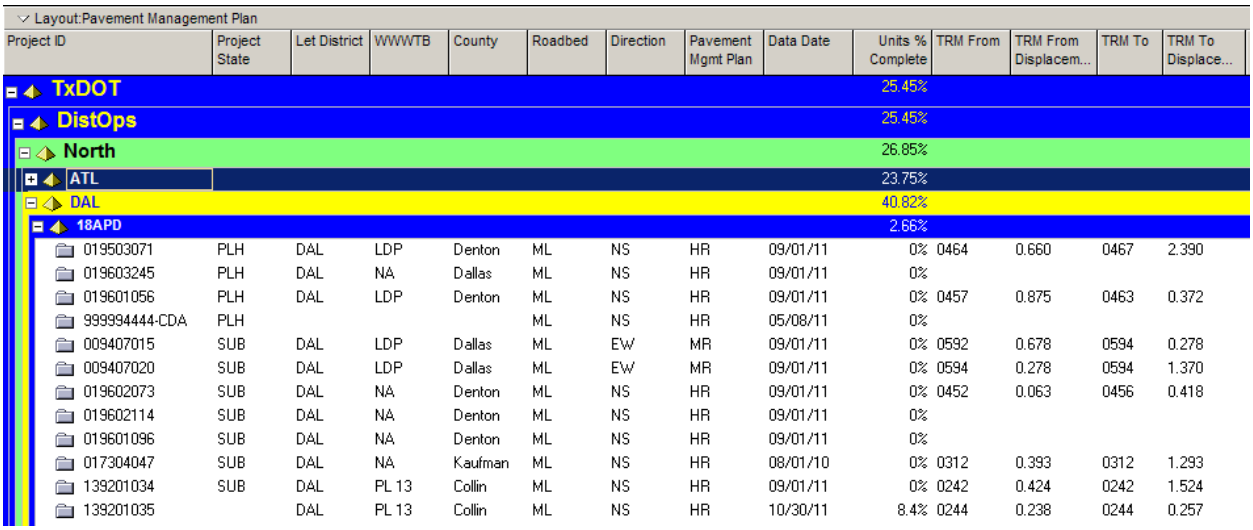


Layout:WWWTB-P6

Units % Complete	Duration % of Original	ROW Costs	Utility Costs	Consultant Costs	PSE-Perc Comp	WWWTB	AFA Need...	Boundary Survey (RPLS) Needed	Boundary Survey Duration	TOPO Survey Needed	Topo Survey Duration	ENV Document Type	RR Coordination Required	ROW Parcels-Total
0%	0%					PL 12						BCE		
58.94%	24.75%				100	PL 12	N	N		N		BCE-G	N	0
65.8%	97.21%	0.00	0.00	0.00	95	PL 12	N	N		Y		PCE-G	N	0
0%	20.16%				5	PL 12						BCE		
41.61%	67.5%	0.00	0.00	0.00	100	PL 12	N	N	0	N	0	CE	N	0
57.28%	97.06%			550000.00	95	PL 12	N	Y	60	Y	20	EA-SCA	N	
68.64%	96.97%	0.00	0.00	0.00	95	PL 12	N	N		Y		PCE-G	N	0
95.43%	73.61%				100	PL 12						EA-SCA		
14.98%	43.84%				0	PL 12						SCE		
25.96%	56.42%			510355.00	95	PL 12	N	N		N		SEA	N	
0%	0%					PL 12						BCE		
17.26%	30.62%				100	PL 12	N	N		N		BCE-G	N	0
17.07%	75.27%				5	PL 12	N	N				PCE-G		
0%	0%	0.00	0.00	0.00	10	PL 12	N	N		N		BCE	N	0
17.38%	49.92%													
21.79%	54.77%	0.00	0.00	0.00	10	PL 13	N	N	0	N	0	PCE	N	0
0%	0.16%	0.00	0.00	0.00	0	PL 13	N	N	0	N	0	BCE-G	N	0
63.69%	78.87%	0.00	0.00	0.00	95	PL 13	N	N	0	N	0	BCE-G	N	0
15.15%	85.17%			700000.00	15	PL 13	Y	N		N		CE	Y	
0.92%	58.52%		300000.00	5050000.00	5	PL 13	N	N		Y	20	EA	N	
1.46%	43.35%				10	PL 13						PCE		
0%	0%					PL 13						BCE		
44.6%	69.81%			4050000.00	25	PL 13	Y	Y	120	Y	60	EA	N	
0%	160.38%				0	PL 13	N	N		N		BCE-G	N	0
11.82%	44.24%				0	PL 13						BCE-G		

Figure 3 - Screenshot of the P6 WWWTB Layout

This helped with collecting quality data that could be updated whenever the WWWTB portfolio of projects was updated. In addition, by linking additional data fields from DCIS to P6, the PMO was able to help identify basic data quality issues inside the DCIS system; and ensure the use of correct and updated list of projects that defined the WWWTB portfolio. In addition, it allowed for QC of data inside the DCIS system since by linking it to the WWWTB portfolio information, QC issues were easily detectable and were easy to highlight in simple layouts (Figure 3).



Layout:Pavement Management Plan

Project ID	Project State	Let District	WWWTB	County	Roadbed	Direction	Pavement Mgmt Plan	Data Date	Units % Complete	TRM From	TRM From Displacem...	TRM To	TRM To Displace...
TxDOT									25.45%				
DistOps									25.45%				
North									26.85%				
ATL									23.75%				
DAL									40.82%				
18APD									2.66%				
019503071	PLH	DAL	LDP	Denton	ML	NS	HR	09/01/11	0%	0464	0.660	0467	2.390
019603245	PLH	DAL	NA	Dallas	ML	NS	HR	09/01/11	0%				
019601056	PLH	DAL	LDP	Denton	ML	NS	HR	09/01/11	0%	0457	0.875	0463	0.372
999994444-CDA	PLH				ML	NS	HR	05/08/11	0%				
009407015	SUB	DAL	LDP	Dallas	ML	EW	MR	09/01/11	0%	0592	0.678	0594	0.278
009407020	SUB	DAL	LDP	Dallas	ML	EW	MR	09/01/11	0%	0594	0.278	0594	1.370
019602073	SUB	DAL	NA	Denton	ML	NS	HR	09/01/11	0%	0452	0.063	0456	0.418
019602114	SUB	DAL	NA	Denton	ML	NS	HR	09/01/11	0%				
019601096	SUB	DAL	NA	Denton	ML	NS	HR	09/01/11	0%				
017304047	SUB	DAL	NA	Kaufman	ML	NS	HR	08/01/10	0%	0312	0.393	0312	1.293
139201034	SUB	DAL	PL 13	Collin	ML	NS	HR	09/01/11	0%	0242	0.424	0242	1.524
139201035		DAL	PL 13	Collin	ML	NS	HR	10/30/11	8.4%	0244	0.238	0244	0.257

Figure 4 - Screen shot of the Pavement Management Plan Layout with P6 and DCIS fields

5. Developing standardized and focused training based on needs and functional requirements of various P6 users.

Four different training instruction sets were developed as part of this overall implementation.

- *Project Manager Training.* This instruction set was the most comprehensive because it covered all aspects of schedule development and management in the P6 system. This consisted of approximately 20 procedures and was continuously updated during the first few months of training based on staff feedback. Initially, this training was conducted during 24 classroom hours. It was later compressed to 20 classroom hours by eliminating procedures that could be done through automating the integration of data from other information systems with P6.
- *Resource Manager Training.* This instruction set was primarily geared towards managers of staff who provide support to the Project Managers during the Project Development phase. The classroom training time for this was set at 8 hours.
- *Management Training.* This training set was developed to help train TxDOT District Engineers and Division Directors in understanding various reports and information that could be had from the P6 system to help manage their projects and resources. The instruction time was set at 4 hours. Five such training sessions were held. One each per region and an additional session in Austin.
- *P6 Timesheets Training.* This was developed for users whose interaction with P6 was limited to reporting progress on individual tasks within a project through the use of P6 Timesheets program. This program is a progress reporting system and not to be confused with payroll timesheets.

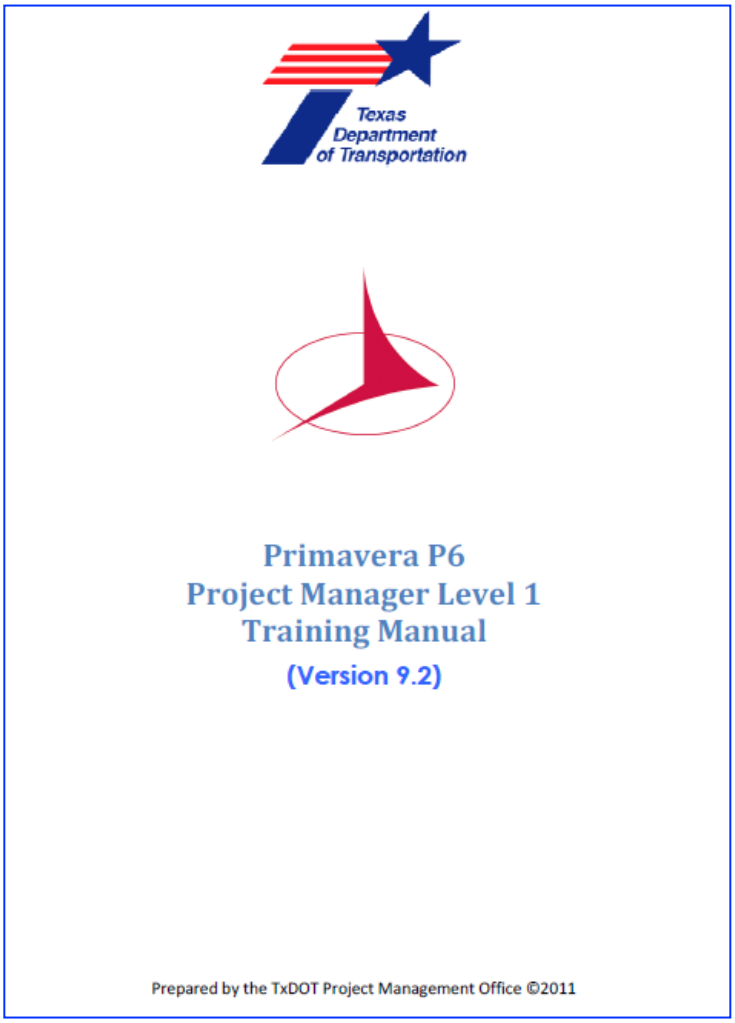


Figure 5 - Screen shot of the DES300 Training Manual

6. Developing reporting standards for providing information from schedules to both internal and external stakeholders.

Reporting the progress of work at project level is critical for meeting the requirements of the Sunset Commission recommendations. In order to facilitate this, the PMO team worked closely with TSD to develop a P6 API based custom program, the Project Tracker Extraction program (PTE), to extract project milestone dates for tracking, monitoring, and reporting the progress of work. Since P6 schedules can be constructed in many different ways, eight standard (six required and two optional) milestones were defined by the PMO in the statewide P6 scheduling templates and required in every schedule created to help ensure consistent reporting across projects. However, this method does allow arbitrary selection of activities that define the predecessor work needed to meet a milestone. A better method predicated on the Earned Value (EVM) is being deliberated for pilot testing.

7. Identification of technical and technological constraints and finding solutions to meet the overall goals and objectives of P6 Implementation.

The PMO identified several technical and technological constraints during the P6 Implementation. These can be grouped under the following categories.

- *Integration of information with existing information systems of TxDOT.* The PMO identified that many pieces of information needed inside the P6 system related to project identification, cost, location, funding information, and others, could be obtained from existing information systems (primarily DCIS). Therefore, in order to save hundreds of man-hours of staff time needed to manually populate basic project identification information, customized integration tools utilizing P6 Application Programming Interface (API), could be developed. The PMO working with the Technology Services Division (TSD) of TxDOT led the effort in identifying data that was needed inside P6 to support the overall needs of the Project Managers. TSD developed the interface programs utilizing P6 API tools that allow through automation the update of P6 database with more than 55 different data elements for each project from DCIS. This integration system was successfully developed by the Technology Services Division of TxDOT through a series of meetings with the PMO during which requirements were identified, standard process for storing values were developed, fields with proper field types were set in the P6 database, and numerous technical and technological constraints were overcome.
- *Managing baselines in P6.* The P6 system allows a user to create unlimited number of baselines. Baselines in their simplest definition are a snapshot of P6 schedule at any given time. However, the TxDOT P6 system is also being used to provide a set of "target" dates for eight (six required and two optional) project development milestones through the external Project Tracker portal and the target dates essentially rely on "a" baseline. Therefore, it was essential to ensure that the baseline used for reporting the target dates is not arbitrarily modified or switched. The current version of the P6 system does not provide granularity in 'access rights' to effectively centralize this functionality without centralizing a major portion of the baseline management process. In order to overcome this constraint, the PMO came up with a novel method of utilizing P6 secure codes, baseline type feature, and the use of API based custom software to extract target milestone dates. The development of this concept into a working system required many hours spent in meetings to define the requirements and to subsequently develop and implement the custom PTE program by TSD.
- *Project and Activity screen data.* A big technical constraint identified during the early implementation was the limited capability to show detailed activity (or task) level data in summarized format on Project level layouts and reports. The PMO overcame this challenge by working with the TSD to develop a custom API based program for extracting Activity level data primarily related to milestone dates and showing them as part of various Project Layouts.

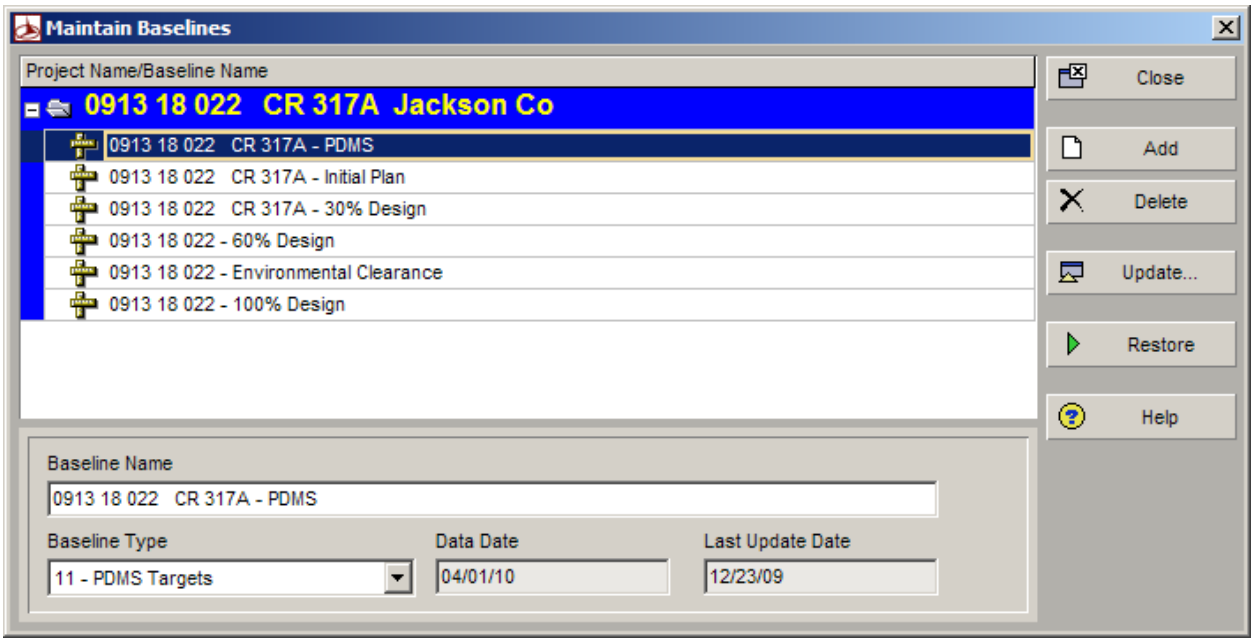


Figure 6 - P6 Baseline Maintenance functionality with Baseline Type Definitions

8. Training of geographically, technically and functionally diverse set of employees across the state.

A TxDOT consultant team from Innovative Management Solutions (IMS) conducted technical training sessions. As noted before, TxDOT design and resource managers are spread over a large geographical area. Through the implementation of the P6 system, indirect, standardization of managing and reporting the project development phase took place.

During the pilot-training class conducted in Houston in June 2009, it was identified that several policy related questions needed to be addressed consistently. All training classes were to be scheduled with at least one member of the interim PMO present during a substantial portion of the training class. This imposed considerable travel requirements (Figure 2) on all members of the PMO; however, it yielded several benefits.

- PMO staff was familiar with the TxDOT culture and was able to address many potential issues before them becoming issues.
- PMO staff was able to collect valuable feedback from many questions posed during these training sessions and quickly bring them to the attention at proper authority level for addressing any concerns and minimizing any potential time-consuming discussion in the training classes that were primarily focused on the technical aspects of the system. Moreover, the feedback collected was used to help improve the technical procedures to minimize the additional workload from this implementation.
- Many IT issues were identified and quickly resolved by having an interim PMO team member present during the training sessions.
- Through observations in various training sessions, PMO team was able to quickly identify repeat and unique issues and prioritize the time of the PMO to find solutions based on the prevalence of an issue.

9. Developing security procedures to ensure the integrity of project and portfolio data.

Since the start of this implementation, the PMO has spent considerable time and effort in developing and continuously improving the processes required to securely manage a portfolio of 5,000 (and growing) projects in the P6 system. This has required setting up elaborate and detailed structures in the database to organize projects, defining access rights, assigning and maintaining access rights to over 2000 users of the system and carefully establishing any new processes and procedures that impact the security and integrity of the information in the P6 system. This has been a continuous effort and requires considerable time and effort on part of the system administrators of the PMO.

10. Reporting Progress to the Administration and District Management.

Through out this implementation, another continuous effort was to keep TxDOT Administration and District/Regional leadership abreast of all progress. The PMO provided and continues to provide various progress reports and highlights issues of concern to the TxDOT leadership. This is accomplished by formal meetings with the Administration to provide an overview; by attending Regional Leadership Team meetings in the four regions and presenting progress and highlighting issues of concern; and by attending TxDOT District Engineers, Division, Office, and Regional Directors (DDOR) meetings and other forums.

Transition from PDMS:

As mentioned earlier, in order to comply with the recommendations of the Sunset Commission, the TxDOT Administration had set up a transitional system for cataloging all active projects in a portfolio along with basic schedule type information for each project in the PDMS system. However, during the P6 implementation, it was identified that it was needed to ensure that target deadlines identified through the Project Tracker portal did not get changed during the transition from PDMS to P6.

Therefore, CTR developed unique software to read target dates in the PDMS dataset (an MS Access based system) and converted to basic CPM-type schedules for use as a baseline inside the P6 database for each project in the PDMS system. As part of this process all projects (over 5,000) that existed in the PDMS system were converted and assigned as baseline to schedules to ensure that target dates (commitments) highlighted through Project Tracker portal to external stakeholders and the public stayed consistent during the transition from PDMS to P6.

This complex and unique undertaking was completed successfully in a short amount of time and provided for integrity in TxDOT external reporting. Furthermore, this conversion provided a secondary benefit of creating thousands of CPM schedules in a very short timeframe to comply with the Administration goal of populating the P6 system with schedules data for projects.

The goals for this endeavor were set by the Administration through a policy memo and categorized the portfolio by the letting date and PS&E developer; i.e., in-house or consultant designed. The following graphic depicts the timeline for populating the P6 system with CPM schedules.

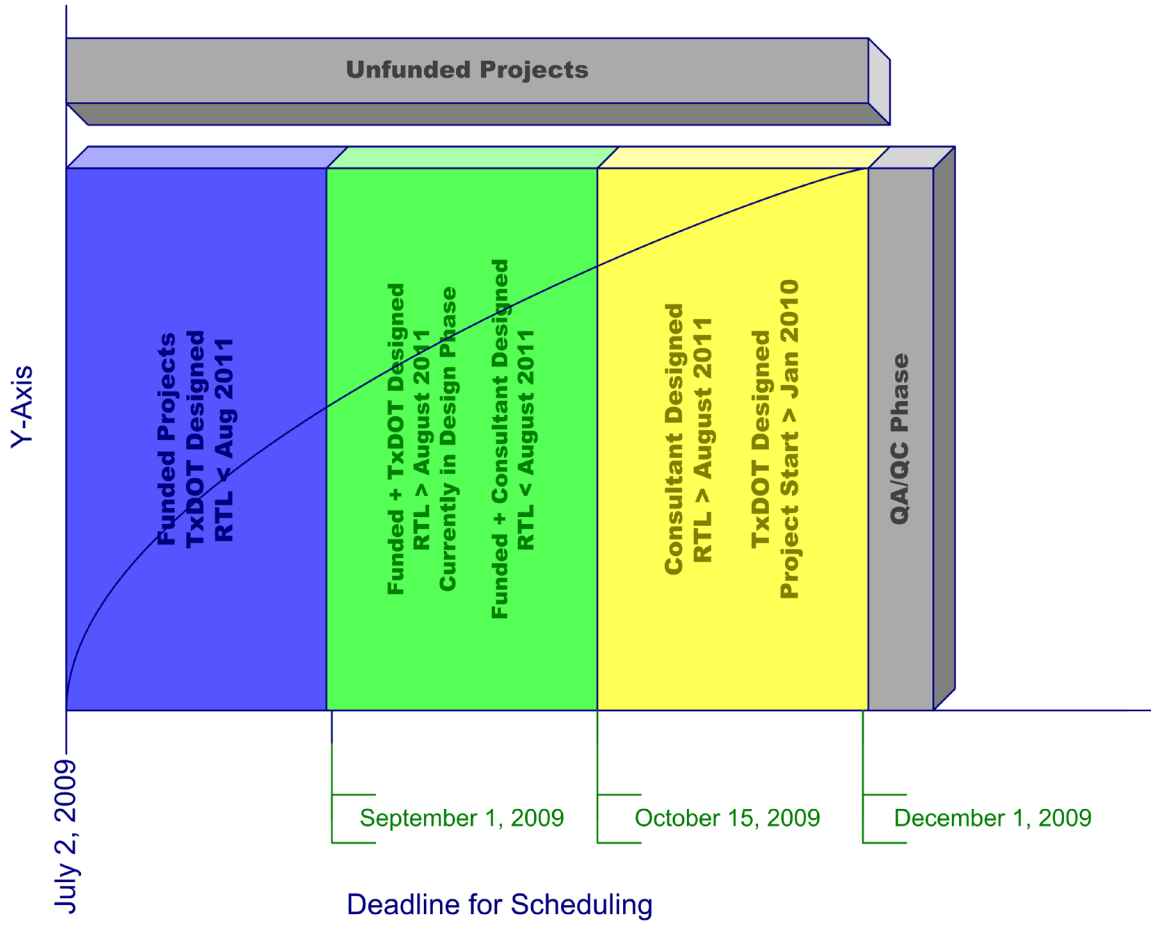


Figure 7 - Target Dates for populating P6 system with schedules

Conclusions

The TxDOT P6 Implementation did not follow a traditional path for any enterprise-system implementation of this class and magnitude. It was borne out of a rare and unusual set of circumstances; i.e., TxDOT's legislatively required Sunset approval process that was prolonged by two years. Developing a management and reporting system for its portfolio of projects was an important requirement to meet recommendations of the Sunset Commission's staff report. TxDOT Administration, District, Division, and Regional management did its best to expedite this implementation, used any and all resources that could be devoted to this effort, and made it a priority at every level of the organization by providing leadership, support, and 'push' where needed to make it a reality.

In addition, the Technology Services Division of TxDOT provided critical support in integrating the information from various systems. Last but not least, this implementation would not have been possible without the adoption by the Project Development staff that is scattered across the state and were able to learn the use of this system and develop proficiency to be able to populate thousands of CPM schedule in a short amount of time. This has resulted in having an enterprise system that is now being used increasingly for providing project and portfolio level information at various levels of the organization.

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References

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