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16. Abstract

Within Texas, the development of urban travel demand models (TDMs) is a cooperative process between the Texas Department of Transportation and Metropolitan Planning Organizations (MPOs). Though TxDOT-Transportation Planning and Programming Division is responsible for developing and validating TDMs for many of the Texas MPOs, the MPOs play an important role in model development by providing the demographic data and regional roadway information required for model development and forecast applications. Like other MPOs nationwide, Texas MPOs struggle with the difficulties of limited resources, time, and staff for the development of accurate and reliable TDMs. Owing to the cooperative process between TxDOT and Texas MPOs, and the different sizes and staff resources among Texas MPOs dedicated to model development, the MPOs in Texas have different needs and challenges in this regard. This project researches current practices, trends, and innovations by MPOs in Texas and nationwide for managing this process. The goal is to assist MPOs in developing institutional capacity to undertake travel-related technical analyses in a complete and timely manner. While the results from the study include tiered recommendations appropriate for MPOs of all sizes, the focus is on small- and medium-sized MPOs with limited staff and data resources for providing information for developing models. In addition to this report, a product of this research includes a training course targeting MPO directors or those leading TDM tasks for an MPO.

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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

The United States Government and the State of Texas do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

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CHAPTER 1. INTRODUCTION

1.1 STUDY PURPOSE

1.1.1 What Is the Problem?

The Texas Department of Transportation (TxDOT) is invested in and committed to supporting the state's Metropolitan Planning Organizations (MPOs) in their travel forecasting activities. The MPOs rely on TxDOT for assistance commensurate with MPO need. In the case of the majority of Texas MPOs, this assistance includes developing their travel demand models (TDMs) and often applying the models on the MPO's behalf to support regional plans and decision making. In these cases, TxDOT relies on the MPOs to deliver timely and accurate data for model development. Both parties have an interest in ensuring a smooth and efficient process for exchange of data and information. With increasingly complex policy questions being asked of TDMs at the same time that funding is ever more tightly constrained, the challenge is how TxDOT can facilitate and foster additional MPO capacity for TDM modeling activities.

Transportation Planning and Programming (TxDOT TPP) is the specific TxDOT division charged with oversight of and assistance to Texas MPOs to ensure a consistent and appropriate planning process; this includes both planning and administrative support, as well as technical travel forecasting for all MPOs statewide. Within the cooperative process between TxDOT and the MPOs, in the majority of cases where TxDOT provides model development or model application assistance, TxDOT (*1*):

- Develops and maintains the TDMs, conducts travel surveys, and performs five-year traffic counts.

For these same areas, the MPOs are responsible for:

- Development of base- and forecast year demographic databases.
- Development of base- and forecast year transportation system (mostly highway) networks.

There is flexibility in the process with regard to the application of the TDMs to support planning activities. Observation of the current practice is that TxDOT supports the MPOs across *all* TDM activities according to the needs of each specific MPO. That is, the MPOs with the most technical resources and capabilities operate fairly independently with TxDOT providing oversight as appropriate and assistance as needed. The MPOs at the other end of the spectrum receive higher levels of technical support. The problem as worded in the research Problem Statement (included as Appendix A) focuses on this latter group of MPOs:

> Currently, there is no means of ensuring that an MPO is fully acquainted with all facets of MPO responsibilities within the travel demand modeling process. In addition, periodic staff turnover at MPOs inevitably necessitates TxDOT staff providing MPOs additional support and guidance regarding the travel demand modeling process and MPO roles and responsibilities.

In commissioning this current research effort, TxDOT identified MPO institutional capacity as a primary opportunity for focus.

1.1.2 What Is the Significance/Scope of the Problem?

This current research effort is intended to support TxDOT TPP's commitment and goal of developing MPO institutional capacity by requiring three items in the research:

1. An investigation of what exactly delays or impedes the MPO portion of the overall travel demand modeling process.
2. What guidance can be provided to support MPOs in managing the process?
3. What methodologies or guidance can be implemented by the MPOs to better manage that process?

1.1.3 What Are the Technical Objectives of This Research Effort?

The technical objectives of this research were to develop methods and guidelines so that MPO directors and planning managers may better manage the MPO portion of the overall travel demand modeling process. Included in the research Problem Statement, TxDOT TPP provided a vision that included "a detailed interview of Texas MPO staff to ascertain and document the following:

- The various MPO approaches for managing their portion of the overall travel demand modeling process.
- The actual or perceived factors that hinder the MPO planning process.
- What MPO directors think could be done to improve the process."

As further directed in the Problem Statement, the research included in-depth focused discussions with Texas MPO directors, an assessment of the role and effect of MPO structure, resource availability, and a review of MPO best practices for managing the MPO portion of the overall travel demand model process. Finally, the research documents various approaches to increasing MPO capacity in modeling, including both technical proficiency and process management, within the purview of Texas MPO roles and responsibilities and the distinct learning needs of such a varied audience.

1.1.4 What Benefits Does This Research Effort Deliver and How Will the Results Be Used within TxDOT?

This area is more fully discussed in the conclusions to this report. The intended benefits and results as worded by TxDOT in the research Problem Statement were to provide "viable methods and guidelines to MPO leaders" so that TxDOT would be able to "help assure [MPO] application of standard TxDOT procedures and methodologies regarding the travel demand modeling process as currently practiced within Texas."

The key findings of the investigation into what exactly delays or impedes the MPO portion of the overall TDM process suggest that benefits are achievable across various fronts. The interviews of parties familiar with the Texas experience revealed significant issues, including internal constraints faced by both TxDOT and the MPOs, as well as process and communication challenges in the cooperative relationship between the MPOs and TxDOT. While these issues currently hinder the timely completion of the travel demand modeling process, many of these issues are addressable despite the overall complexity of the TDM subject matter itself.

The study findings provide TxDOT with the information to address these issues, first and foremost by identifying solutions that can be used by MPO directors, staff, and policy boards to better guide and manage their individual TDM process. The primary solutions to address this aspect are expected to be communicated and implemented using the course "Managing the Travel Model Process" which was developed and tested as part of this research effort. Course materials and concepts directly usable by TxDOT and MPOs to assist in managing the cooperative TDM process include:

- Identification of the staff skills necessary to complete the TDM process.
- Materials and methods for MPO directors to use to better organize and manage the flow of work within the TDM process.
- Solutions to improve the timely delivery of technical inputs for TDM.
- Strategies for MPO directors to improve internal MPO staff and policy board communications relative to the TDM process, schedule, and technical requirements.

This stand-alone training course is oriented toward MPO directors or staff designated as being directly responsible for managing the TDM process and addresses the topic of managing the model development process. This course and the pilot test implementation are more fully described in Chapter 4.

The remainder of this introductory chapter presents the background for why and how MPOs conduct modeling activities generally across the nation, and then focuses upon the Texas-specific approach.

1.2 BACKGROUND

To understand why MPOs are conducting modeling activities, it is important first to understand the general responsibilities of MPOs and the current cooperative relationship of TxDOT and Texas MPOs in developing and applying travel demand models.

1.2.1 A Brief History of the MPOs

As is explained in the recent publication "Metropolitan Planning: The Evolving Legacy and an Abbreviated History of the First 50 Years" (*2*), metropolitan planning for transportation emerged as a response to a need identified as federal, state, and local planners and engineers grappled with identifying specific route locations of the emerging Interstate Highway System. By the 1950s, the gaps between planning and engineering and local, state, and federal perspectives had resulted in "freeway revolts" and general outcry in several cities. The metropolitan transportation planning process which exists today has clear antecedents in efforts by the U.S. Bureau of Public Roads (BPR)—now it would be known as the FHWA—to provide for a metropolitan planning process that was cooperative, continuing, and comprehensive. In fact, as described in this same historical review, the BPR during the 1950s and 1960s elaborated many of the technical steps that still support the 3C planning process today and even many of the TDM techniques still in use.

As the seminal federal legislation in this regard, the Federal Aid Highway Act of 1962 mandated urban transportation planning as a condition for receiving federal-aid transportation funds in urban areas (*3*). This was done with the intention of encouraging the development of efficient and effective regional transportation systems. To ensure the participation of local officials and

citizens of the region and provide them a larger role in urban transportation decision-making processes, the Federal-Aid Highway Act of 1973 required that a "continuous, comprehensive and cooperative" (3C) planning process be followed by state and local officials. Consequently, the law mandated that MPOs be designated in urban areas with populations greater than 50,000 people. The roles and responsibilities of MPOs have been defined, redefined, and reinforced in every reauthorization from 1973 through the most recent one signed into law in 2012.

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 is also widely regarded as a landmark legislation that has shaped present day MPOs (*4*). This act delegated greater responsibility and accountability for planning and implementation of transportation projects to MPOs and substantially raised their profile as regional planning agencies. The legislation was expressly intended to confer the metropolitan areas with greater control (and accountability) over the performance of their transportation system through, among other things, encouraging better coordination amongst the key stakeholders at the metropolitan level, the state level, and the private sector. One of the key requirements of this legislation was the preparation of a fiscally constrained regional long-term transportation plan to be drafted by the MPO. This legislation also designated MPO regions having a population of over 200,000 as Transportation Management Areas (TMAs) and entitled the MPOs of these TMAs to a larger share of the federal funds apportioned by corresponding state departments of transportation (state DOTs). The Transportation Equity Act for the 21st Century (TEA-21), introduced in 1998, maintained the basic approach in ISTEA and further expanded the roles of MPOs by emphasizing the importance of environmental justice and intelligent transportation systems.

The surface transportation program authorization act immediately prior to the current act, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), was passed into law in 2005. SAFETEA-LU added additional transportation planning responsibilities for MPOs such as land-use planning, environmental sustainability planning, and more extensive strategy development in the long-term transportation plan to preserve and improve the performance of transportation facilities. However, it also provided additional time and federal funds to the MPOs to undertake these responsibilities. SAFETEA-LU expired as of September 30, 2009. Its funding was renewed multiple times until the U.S. Congress passed the current act.

The current surface transportation program authorization act, Moving Ahead for Progress in the 21st Century (MAP-21), was signed into law on July 6, 2012 (P.L. 112-141). Requirements related to the metropolitan transportation planning process generally continue their previous trajectory. The primary change is the explicit requirement that the long-range plan incorporates system performance measures and targets, and assesses progress in achieving those targets. The U.S. Secretary of Transportation is required to establish criteria for evaluating such performance-based processes; at report publication, the Secretary had not yet released these criteria (*5*). It is the researchers' current assessment that the new performance-based planning requirements are unlikely to substantively change the roles and responsibilities of metropolitan travel demand modeling process that is being explored under this current research effort.

1.2.2 MPO Overview Planning Requirements

Specifically, an MPO is a federally mandated transportation decision-making body comprised of representatives from local government and transportation agencies. These organizations pursue initiatives that make effective and efficient use of federal (and other) transportation funds to

address the many transportation challenges that today threaten to reduce the economic productivity, environmental sustainability, and social mobility of urban centers in the United States. Each MPO has some level of administrative staff including a director and sometimes planning and engineering professionals.

As organizational structures mandated and controlled by federal law, all MPOs nationwide have the same basic set of planning requirements. Specifically, MPOs are required to produce the following key planning documents (*6*):

- Statement of planning priorities and activities, generally called the Unified Planning Work Program (UPWP).
- Long-range transportation plan, generally called the Metropolitan Transportation Plan (MTP).
- Transportation Improvement Program (TIP).

The purpose, the planning horizon, and the update cycle for these documents are summarized in Table 1. Other related documents the MPOs produce include a Public Participation Plan, Annual Listing of Obligated Projects, and Annual Performance and Expenditure Report.

Table 1. Details of the MPO Planning Products.

Document	Planning Horizon	Purpose	Update Cycle
MTP	20 years	**Metropolitan Transportation Plan.** To define a vision for the region's transportation system and establish long- and short-term goals. Identify policies, programs, and projects for development that advance adopted goals.	Every 5 years (4 years for TMAs)
TIP	4 years	**Transportation Improvement Program.** To outline the projects that are earmarked and approved for funding for implementation in the short-term planning horizon.	Every 4 years
UPWP	1 or 2 years	**Unified Planning Work Program.** To ensure financial transparency in the transportation planning process. The document lists out the amount and source of state and federal funds to be used for planning activities.	At least every 2 years

Sources: (*7*, *8*)

The MPO works in tandem with state and transit agencies, and performs a coordinating role in the transportation planning process. The nature and extent of the relationship between the MPO and other state and regional agencies, especially DOTs, varies from state to state. An important aspect of this coordination is to address the issue of fiscal constraint.

The obligation of MPOs to ensure their transportation planning activities are financially feasible is laid out in both the United States Code of Federal Regulations (23 CFR Part 450). MPOs are required to include a financial plan as part of the MTP which demonstrates how the projects in

the plan can be implemented considering system-level estimates of costs and reasonably expected revenue sources. Projects included in the TIP must be consistent with the MTP and the TIP likewise includes a financial plan of estimates of system-level funds reasonably expected to be available that is cooperatively developed by the MPO, state DOT(s), and public transportation operator(s). The revenue and cost estimates for the TIP are required to reflect inflation by year of expenditure.

In addition to the above planning documents and processes, some MPOs have additional responsibilities. Specifically, all MPOs designated as TMAs are required to produce a traffic congestion management plan (CMP) that identifies strategies to reduce traffic congestion. In addition, if an MPO has been previously categorized as a nonattainment area (NAA) as per section 107(d) of the Clean Air Act (CAA) (*9*), then it is charged with the responsibility of coordinating air quality planning with the state DOT by ensuring that all its projects conform to the State's air quality plan known as State Implementation Plan (SIP). These MPOs, and MPOs categorized as being a maintenance area (previously in nonattainment), are required to update the MTP every four years. There is also additional stringency applied to the TIP for these MPOs. Apart from these federal requirements, state laws can also impose additional requirements on MPOs.

1.2.3 MPO Use of Travel Demand Models to Meet Planning Requirements

In undertaking their responsibilities, MPOs often utilize a TDM to assess the effectiveness of possible strategies and actions in response to public policy mandates and communicate the model results to policymakers and the public at large. As described in the recent publication "Metropolitan Planning: The Evolving Legacy and an Abbreviated History of the First 50 Years" (2), the use of travel demand models as a quantitative tool to support transportation planning precedes the federal legislation which first mandated metropolitan planning organizations. As mentioned previously, during the 1950s and 1960s, the U.S. Bureau of Public Roads (BPR)—now known as the FHWA—defined many of the technical steps even many of the TDM techniques that still support the 3C planning process today. The use of TDMs as a quantitative and analytical tool to support transportation decision making is well-founded practice for MPOs across the United States and organizations with similar analytical needs across the world today.

In specific cases and purposes (in particular for air quality nonattainment and maintenance areas and MPOs with population greater than 200,000), the use of a travel demand model to support MPO planning activities is required. For the purpose of supporting an MTP, a TDM is required in these two cases:

- If the MPO study area is in nonattainment or maintenance status for air quality according the U.S. Environmental Protection Agency (EPA), a TDM is required for the MTP for air quality conformity determination[1] (to occur at least every four years) (*10*).

[1] Federal requirement pertains only to TMAs that are serious, severe, or extreme ozone, or serious CO, nonattainment areas (http://www.fhwa.dot.gov/planning/certcheck.htm). The State of Texas requires that all nonattainment area plans be based on travel demand models, with more stringent model requirements for the areas that fall into the federal model requirement category. See also TAC Title 30, Part 1, Rule 114.260.

- If the MPO is designated as a TMA, a TDM is required for the MTP (adopted update required at least every four years).[2]

There are other instances for which a TDM is required, for example for certain types of project-level analysis for projects which are considered major investments; the MPO's consultative partners in Texas, including TxDOT TPP, the Texas Commission on Environmental Quality (TCEQ), FHWA, and the Federal Transit Administration (FTA), assist the MPOs in determining these other required instances. For the purpose of MTP adoption and updates, TxDOT's 2001 Traffic Data and Analysis Manual specifies that TxDOT TPP performs travel demand model updates on either a 5-year or 4-year cycle to support the required MTPs; this manual includes this model cycle schedule in a table specified by MPO and based upon air quality status and TMA designation as described above (Chapter 2, Section 7). This manual is currently under update and this model update cycle is likely to change. TxDOT TPP staff agrees that, while not required for all MPOs, a TDM is best practice to support an MTP.

1.2.4 State of Practice Nationwide for MPO Modeling Process Management

MPOs across the nation grapple with the difficulties of limited resources, time, and staff for TDM development. TRB Special Report 288, *Metropolitan Travel Forecasting: Current Practice and Future Direction,* documented the modeling practices of MPOs (*11*). First of all, as shown in Figure 1, it was demonstrated that many MPOs are in the smallest MPO category, under population 200,000 in size, and thus subject to staff and funding limitations.

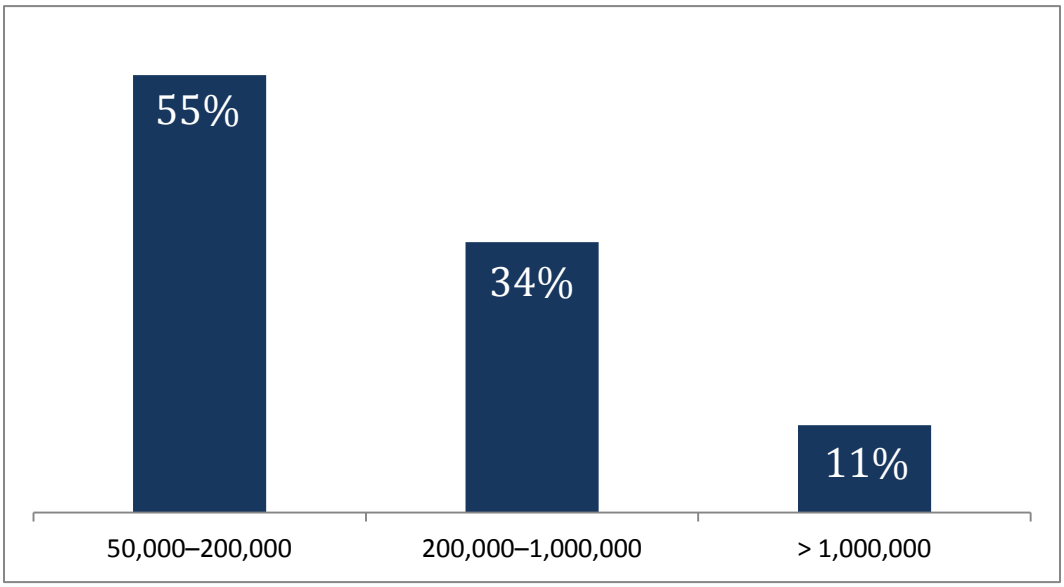


Figure 1. MPOs by Population.

Source: (*11*).

[2] Under federal rule, all other TMAs (not in the first group) must meet minimum travel model standards under Conformity Rule IF already previous practice ("no backsliding"). The State of Texas requires that long-range plans by TMAs be based on "estimates of travel demand" and that "development of long-range transportation plans relies on computer travel demand forecasting."

For the largest MPOs (those with more than 1 million population), all of these MPOs are conducting some sort of travel demand modeling. As shown in Figure 2, 91 percent of these MPOs have some sort of collaboration between MPOs and state on modeling, but a full 77 percent are developing TDMs with the state only providing technical assistance.

For medium-sized MPOs (population 200,000–1 million), the percentage of these MPOs that collaborate with their state on modeling increases to 92 percent, but about half (55 percent shown in Figure 3) are in the category where the MPOs are developing the models and the state is only providing technical assistance.

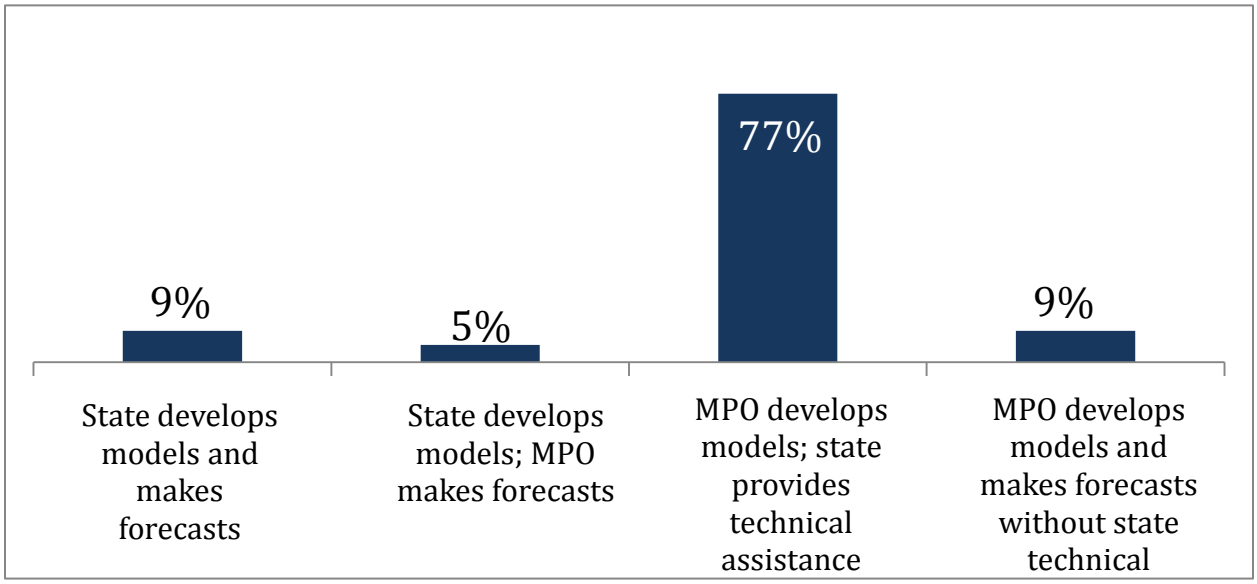


Figure 2. Modeling Approach for Large MPOs (Population over 1 Million).
Source: (*11*)

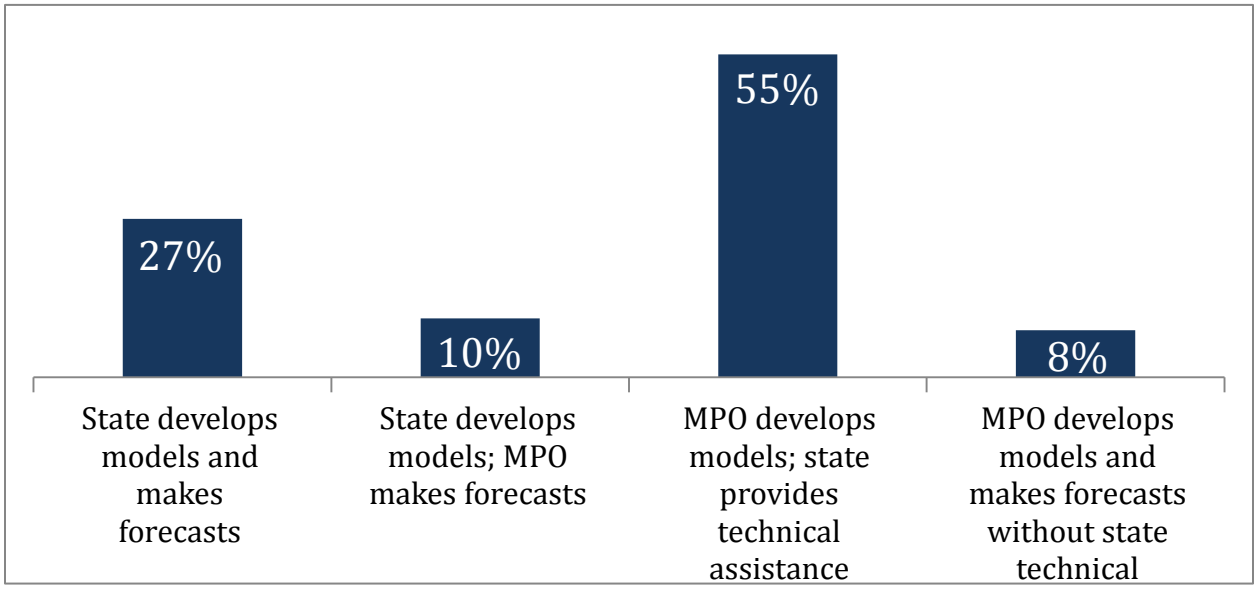


Figure 3. Modeling Approach for Medium MPOs (Population 200,000 to 1 Million).
Source: (*11*)

Of the smallest MPOs (population 50,000–200,000), the state DOT performs all of the modeling for 42 percent, as shown in Figure 4. Seven percent are in the category that the DOT develops the models and the MPO makes the forecasts, and 28 percent are in the category of developing their own models with state assistance. Thus, a full 77 percent of these smallest MPOs have some sort of collaboration between MPOs and state on modeling.

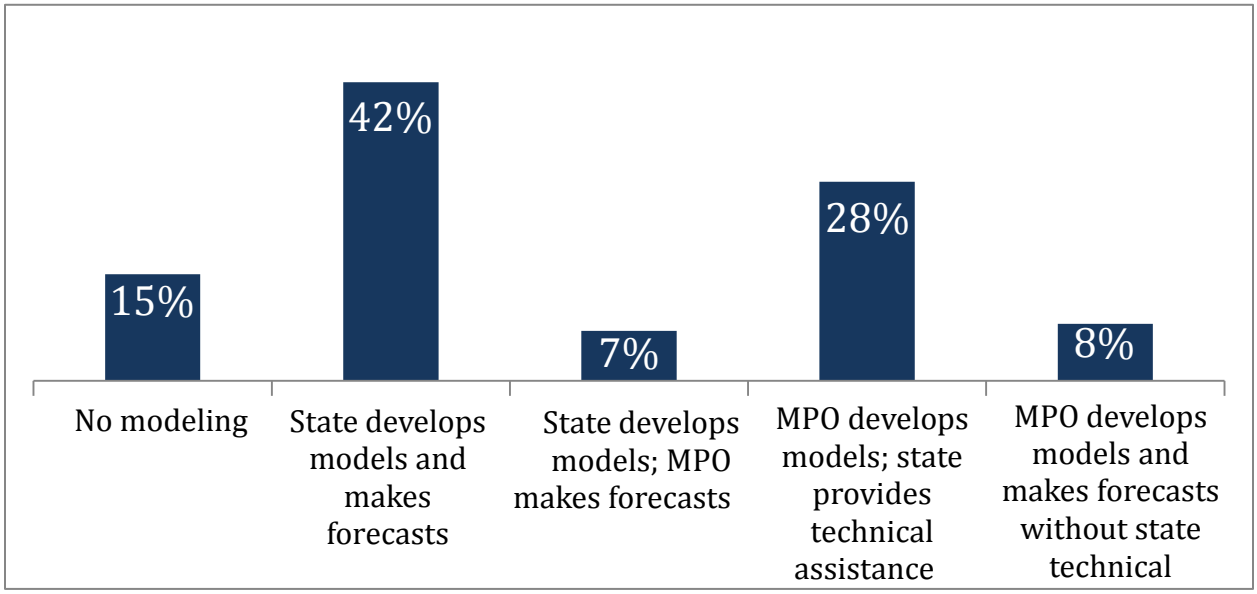


Figure 4. Modeling Approach for Small MPOs (Population 50,000 to 200,000).
Source: (*11*)

As the above context demonstrates, Texas MPOs are not unique in collaborating to some degree with the state DOT on travel demand modeling. Indeed, various efforts are on-going to address a growing concern about the increasing complexity of planning questions being asked of MPOs, especially MPOs with smaller staffs, which are already strained by present demands. These initiatives demonstrate not only the breadth of this issue but are also resources each MPO should be aware of. These include:

- Transportation Planning Capacity Building (TPCB) Program (FHWA/FTA).
- Transportation Research Board (TRB) Transportation Planning Applications Committee activities on state-of-practice and scalable analysis approaches (ADB50).
- Transportation Research Board Transportation Planning for Small- and Medium-Sized Communities Committee activities on incorporating modeling into the planning process (ADA30).

Recent publications also supplement the knowledge gained from SR 288, described above. These include:

- Strategies to Attract and Retain a Capable Transportation Workforce, 2011 (*12*).
- Modeling and Analysis Needs and Resources for Small Metropolitan Area Transportation Planning: Report on a Peer Exchange, 2012 (*13*).

1.3 TXDOT'S CONSULTATIVE ROLE

Texas has MPOs in each of these categories—large, medium, and small—with the majority in number falling in the small category. As referenced earlier in this chapter and as will be described in more detail, current TxDOT practice is to support *all* Texas MPOs across *all* TDM activities according to the needs of each specific MPO. That is, the MPOs with the most technical resources and capabilities operate fairly independently with TxDOT providing oversight as appropriate and assistance as needed. The MPOs at the other end of the spectrum receive higher levels of technical support. This cooperative partnership which consolidates model development, estimation, and validation of MPO models within a central division of TxDOT is a proactive approach to manage the planning process consistently across urban regions of Texas and Texas as a whole, especially under prevailing fiscal and human resource constraints. The following sections and chapters further explore this cooperative partnership.

The 3Cs planning process described above is still alive and well for metropolitan planning today. The partners in this process today are each MPO, the state DOT, and federal transportation administrations, as shown for Texas in Figure 5.

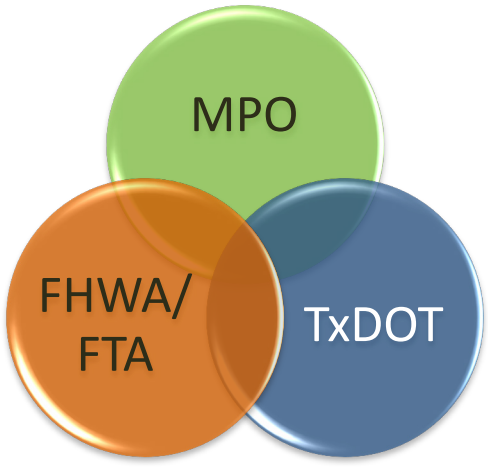


Figure 5. 3Cs Planning Process Partnership in Texas.

Overarching and including travel demand modeling as a subject area, TxDOT acts as an intermediary and partner with the MPOs and the federal government: as a financial intermediary, provider of planning guidance, and general resource to the MPOs. This relationship is not only practical for forwarding the joint interests of both TxDOT and the MPOs, it is mandated in federal and state law and described in the rules at both levels for various aspects of transportation planning (23 C.F.R. Part 450, 30 TAC 114.260, and 43 TAC 16.53 being examples, TAC being the Texas Administrative Code). This intermediary relationship TxDOT serves is shown in Figure 6.

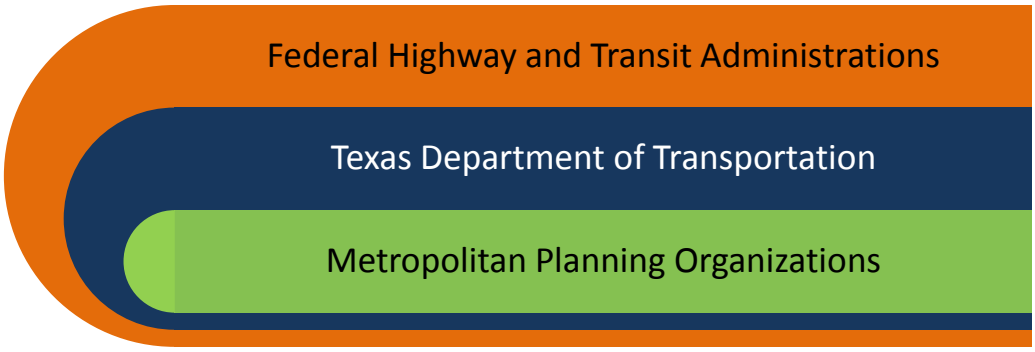


Figure 6. TxDOT's Consultative Role in the MPO Planning Process.

According to TxDOT's *Metropolitan Planning Funds Administration Manual*, TxDOT's role is to assure compliance with acceptable federal requirements and that performance goals are being achieved. TxDOT TPP is "responsible for providing general oversight to carrying out the metropolitan transportation planning process by the department" (*8*). Understanding this overarching oversight role is key to understanding TxDOT's involvement even when TxDOT is not performing the MPO's model development or application tasks directly. As mentioned previously, other consultative partners also play a role in ensuring federal guidelines are met, including the TCEQ with respect to air quality federal and state concerns, FHWA, and FTA.

The collaborative partnership between TxDOT and the MPOs extends across various aspects of transportation planning including, for instance, the development of the financial plan elements supporting both the MTP and the TIP, as required under federal rules as described previously. In Texas, the financial constraint aspect of collaboration is addressed in various sections of the TAC, including the sections describing MPO responsibilities (43 TAC 16.51), the MTP (43 TAC 16.53), the TIP (43 TAC 16.101), the Statewide TIP (STIP) (43 TAC 16.103), and the state's Unified Transportation Program (UTP) (43 TAC 16.105). Planning and programming documents related to project development that TxDOT is involved with as part of this collaborative relationship are shown in Figure 7. The MPOs' TIP documents are included as part of the STIP.

Each of the documents shown in Figure 7 has specific requirements regarding financial constraint. Generally, the shorter the time-frame, more information is available concerning both project costs and funding availability. TxDOT's UTP is generally referenced by the other plans to demonstrate financial constraint, owing to several factors: TAC rules require each document be consistent with the UTP, TxDOT updates the UTP at least annually to reflect the most current project and funding information, and the UTP lists individual projects specifically. For the near-term horizon, projects shown by year in the STIP and MPO TIPs (43 TAC 16.103 and 43 TAC 16.101, respectively) are required to be consistent with funding reasonably expected to be available by year as provided under the UTP. The UTP is developed based upon the TxDOT-developed long-term planning assumptions (43 TAC 16.151) and 20-year cash flow forecast (43 TAC 16.152). MTPs (43 TAC 16.53) are required to be based on the same assumptions, with some guided flexibility for local planning purposes. The SLRTP (43 TAC 16.54) has both a financially constrained component, including the STIP and UTP, and a component that is not financially constrained and identifies corridors, projects, strategies, and other needs.

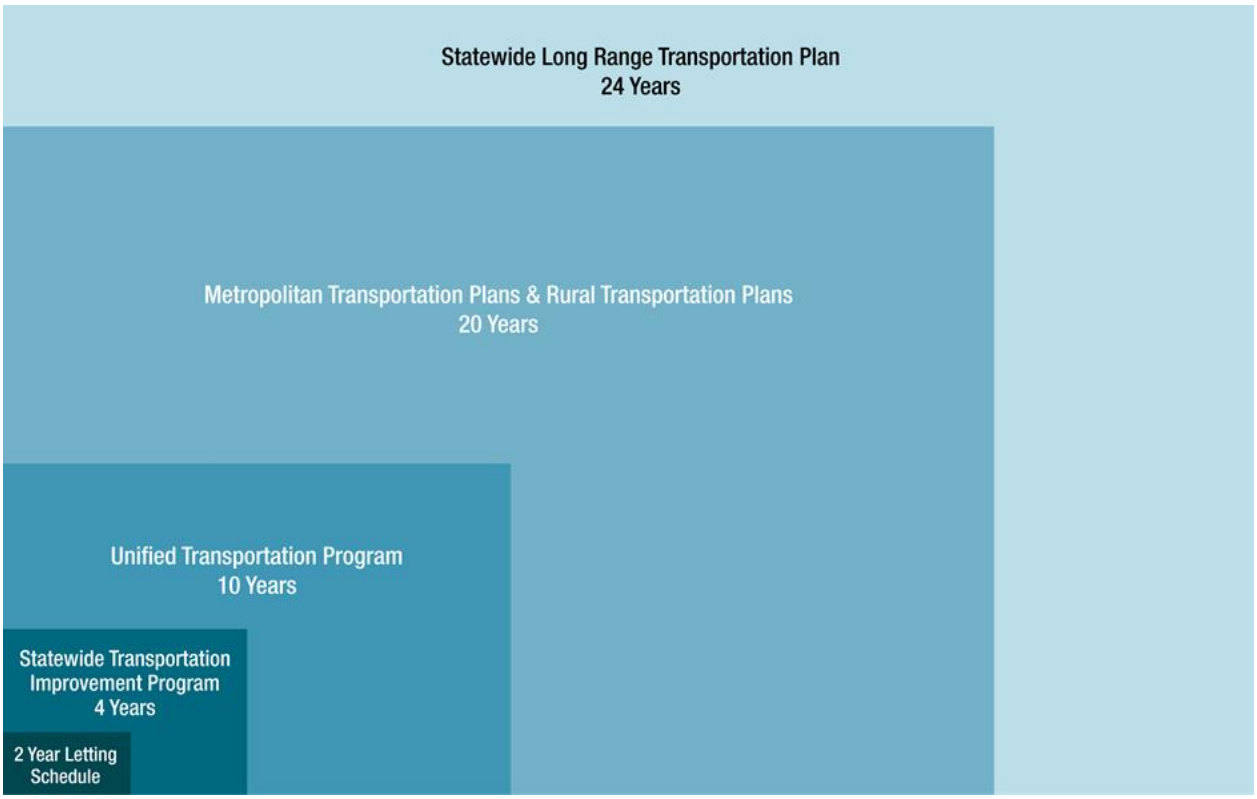


Figure 7. Nesting of Key Texas Transportation Plans and Programs.
Source: TxDOT TPP, 2013.

1.4 TEXAS MPOS, TXDOT, AND TRAVEL DEMAND MODELS

Table 2 lists the 25 Texas MPOs, the major city associated with the MPO, area air quality and TMA status, and the current TDM development party. Air quality nonattainment and maintenance areas as well as TMAs have additional requirements compared to other MPOs, including requirements related to travel demand modeling. In Texas, TxDOT and all 25 Texas MPOs (listed in Table 2) collaborate in the transportation planning process and in the development of TDMs and their inputs. However, within this broad cooperative arrangement, there are several variations in terms of who does what, the information flow processes, and the sophistication of the TDM models. Often, this arrangement is based on the nature of the MPO region in terms of size, population, demographics, and consequent mobility challenges.

Table 2. Texas MPOs and General Characteristics.

Metropolitan Planning Organization	Major City	2010 Census Population	Air Quality Status	TMA Status	TDM Developed By
Abilene MPO	Abilene	125,229	Attainment	No	TxDOT
Amarillo MPO	Amarillo	216,490	Attainment	No	TxDOT
Brownsville MPO	Brownsville	226,282	Attainment	Yes	TxDOT
Bryan-College Station MPO	Bryan	194,851	Attainment	No	TxDOT
Capital Area MPO	Austin	1,603,952	Attainment	Yes	TxDOT/ MPO
Corpus Christi MPO	Corpus Christi	328,116	Attainment	Yes	TxDOT
El Paso MPO	El Paso	853,190	Nonattainment	Yes	TxDOT/ MPO
Harlingen-San Benito MPO	Harlingen	153,819	Attainment	No	TxDOT
Hidalgo County MPO	Weslaco	772,000	Attainment	Yes	TxDOT
Houston-Galveston Area Council	Houston	5,892,002	Nonattainment	Yes	MPO
Killeen-Temple MPO	Belton	348,556	Attainment	Yes	TxDOT
Laredo Urban Transportation Study	Laredo	243,978	Attainment	Yes	TxDOT
Longview MPO	Longview	103,406	Attainment	No	TxDOT
Lubbock MPO	Lubbock	245,161	Attainment	Yes	TxDOT
Midland-Odessa Transportation Organization	Midland	267,927	Attainment	No	TxDOT
North Central Texas COG	Arlington	6,417,630	Nonattainment	Yes	MPO
San Angelo MPO (SAMPO)	San Angelo	96,283	Attainment	No	TxDOT
San Antonio-Bexar County MPO	San Antonio	1,763,463	Attainment	Yes	TxDOT/ MPO
Sherman-Denison MPO	Sherman	86,830	Attainment	No	TxDOT
South East Texas Regional Planning Commission	Beaumont	388,746	Nonattainment	No	TxDOT
Texarkana MPO	Texarkana	94,278	Attainment	No	TxDOT
Tyler Area MPO	Tyler	165,017	Attainment	No	TxDOT
Victoria MPO	Victoria	86,793	Attainment	No	TxDOT
Waco MPO	Waco	234,906	Attainment	No	TxDOT
Wichita Falls MPO	Wichita Falls	108,311	Attainment	No	TxDOT

Note: Large MPOs by 2010 population are highlighted in dark green, medium in light green (14, 15).

The formal relationships for model development between TxDOT and the individual MPOs are described in Table 3. Generally, TxDOT TPP handles TDM estimation and validation for 21 of the MPOs. The MPOs handle the collection and preparation of demographic and network data for the model development and make travel forecasts using the TDM developed by TxDOT TPP.

As previously mentioned, within this broad cooperative arrangement, there are several variations with regard to the level of TxDOT oversight and technical model support, based upon MPO technical resources and needs.

Table 3. TxDOT and Texas MPOs: A Flexible Modeling Partnership.

Formal Relationship with TxDOT for Model Development	MPOs in Category
Independent, with TxDOT Oversight	Houston–Galveston Area Council North Central Texas COG El Paso MPO*
Substantially Independent, with TxDOT Oversight & Assistance as Needed	San Antonio MPO Capital Area MPO
Under TxDOT Purview for Model Development	All Remaining (20) MPOs

**In the period 2012–13, TxDOT was assisting the El Paso MPO with its TDM directly as needed.*

Various additional model activities besides model development also occur, including travel surveys, traffic count data collection, and software acquisition and maintenance, and the formal relationship for those activities may be different than above (TxDOT still conducts travel surveys for almost all of the MPOs). However, it is the model development process and the relationship between TxDOT and the MPOs, especially the MPOs under TxDOT purview for model development, which is under examination under this current research effort. As Table 3 demonstrates, current TxDOT practice is to support *all* Texas MPOs across *all* TDM activities according to the needs of each specific MPO. That is, the MPOs with the most technical resources and capabilities operate fairly independently with TxDOT providing oversight as appropriate and assistance as needed. The MPOs at the other end of the spectrum receive higher levels of technical support. In the latter cases, the strength of the cooperative relationship between TxDOT and MPO obviously becomes much more critical to the MPO to successfully develop and apply a TDM for the MTP planning process.

When TxDOT is directly involved with the development of an MPO's model, for example for one of the 21 small- or medium-sized MPOs previously highlighted, the cooperative relationship to develop the model is that shown in Figure 8.

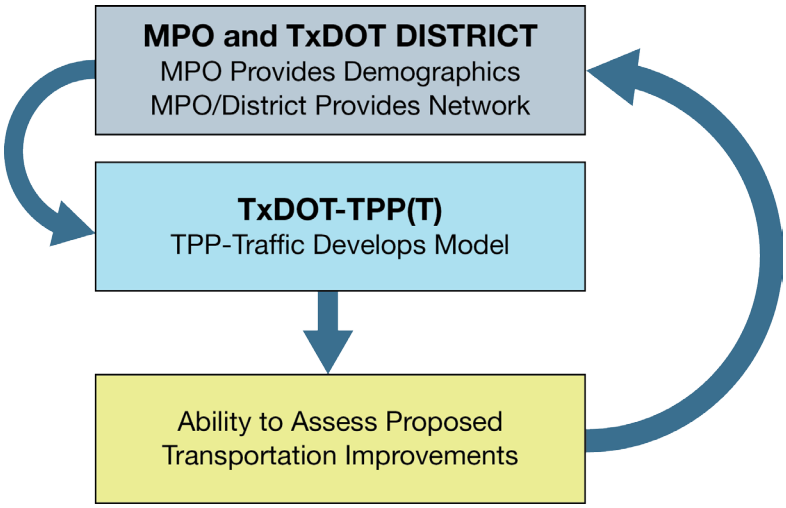


Figure 8. Cooperative Model Development Process in Texas.

Source: (*16*).

As previously described, in this cooperative relationship for MPOs under TxDOT purview for model development, TxDOT develops and maintains the TDMs, conducts travel surveys, and performs five-year traffic counts. The MPOs are responsible for development of the base- and forecast year demographic databases, including definition of the Traffic Analysis Zone (TAZ) structure, and the base -and forecast year transportation system (mostly highway) networks (*1*).

It is the timely and quality delivery of these TDM inputs which TxDOT TPP has identified as the primary cause of TDM development delays. This is the reason that the technical objectives identified by TxDOT TPP for this research effort pertain exclusively and directly toward MPO institutional capacity building.

1.5 CHAPTER SUMMARY, STUDY APPROACH, AND REPORT ORGANIZATION

1.5.1 Chapter Summary

TxDOT as an agency has a history of a proactive, flexible approach to meet the varied travel demand modeling needs of Texas MPOs. As described in the preceding pages, MPOs nationwide are facing a challenge similar to that of Texas MPOs in needing more information and knowledge to improve MPO institutional capacity for modeling and model management. TxDOT's commissioning of and participating in this research effort demonstrates that TxDOT continues to seek ways to improve the process for both TxDOT and the MPOs. This research effort targets toward improvements that benefit the overall metropolitan transportation planning process, with a focus upon building capacity at the MPOs.

1.5.2 Study Approach

The study approach was oriented toward context definition, both through research and through extensive interviews and discussions with stakeholders in the MPO modeling process. This open and participatory approach to the overall research effort was intended to provide the best information to assess the current areas of success, challenges, and possibilities for improvement according to the different stakeholders involved. As shown in Figure 9, the research work plan

flowed first from data and general input gathering stages which included an extensive interview phase. Interviews included Texas MPO directors and staff involved with the TDM process; other stakeholders in the Texas process including TxDOT districts, TxDOT regions, and the Texas Division of FHWA; as well as representatives from non-Texas MPOs, other state DOTs, and FHWA representatives from the national Planning Office and Modeling Resource Center. For additional perspective, the team researched approaches used in and outside of the transportation planning field for institutional capacity building, including previous research into the challenges faced by MPOs specifically and solutions and approaches proposed by others for this complex problem. These findings are summarized in Chapter 3. This information-gathering stage was formative in defining issues, perceptions, and possible approaches to test in the pilot course.

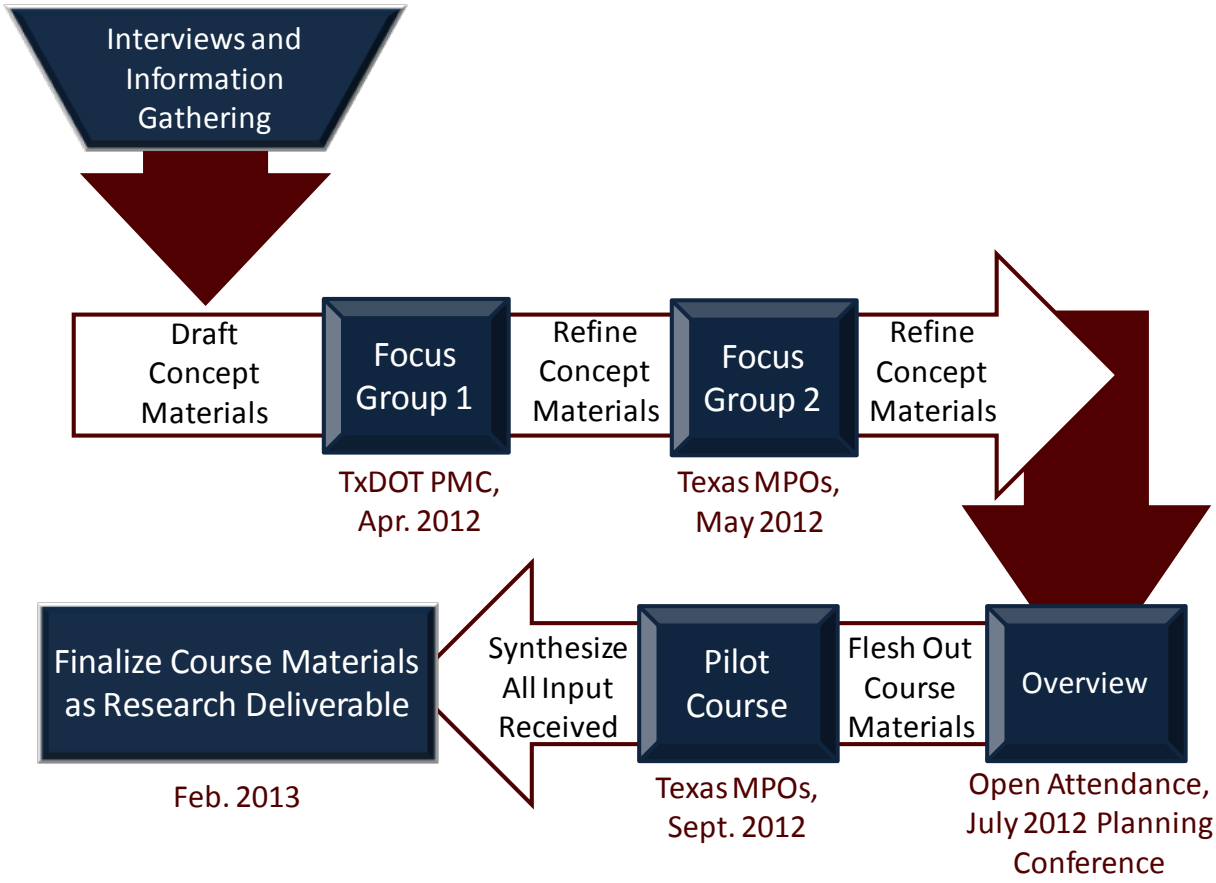


Figure 9. Process to Develop and Refine the Training Course Materials.

Using all of this context and research, the team synthesized findings to identify and recommend helpful approaches and conceptual-level materials for MPOs to build their TDM institutional capacity. These materials were offered for consideration by and discussion with the research PMC, which was considered Focus Group 1, held in April 2012. These conceptual materials were then refined and used as the basis for discussion with a second Focus Group meeting with Texas MPO stakeholders in May 2012. Finally, a three-hour overview of the proposed course was presented as a pre-conference event at the July 2012 TxDOT Planning Conference. Registration was open and participants included a broad diversity of the transportation planning profession, including the private sector. Each of the interviews and events provided invaluable input that was incorporated into the development of the pilot course, handbook, and training

materials oriented toward MPO directors and lead planning staff. This process and the pilot are summarized in Chapter 4.

Chapter 5 describes the conclusions by the research team from the entirety of the process described above, including recommendations for moving forward with the MPO-oriented TDM process training course, as well as other recommendations for TxDOT and MPOs to consider, as suggested by research findings.

CHAPTER 2. INTERVIEWS AND INFORMATION GATHERING

2.1 INTRODUCTION

This chapter summarizes the findings from the initial research task, Interviews and Information Gathering, as highlighted in Figure 10 below. This task included extensive interviews with: Texas MPO directors and staff involved with the TDM process; other stakeholders in the Texas process including TxDOT districts, TxDOT regions, and the Texas Division of FHWA; as well as representatives from non-Texas MPOs, other state DOTs, and FHWA representatives from the national Planning office and Modeling Resource Center. This information-gathering stage was formative in defining issues, perceptions, and possible approaches to test in the pilot course.

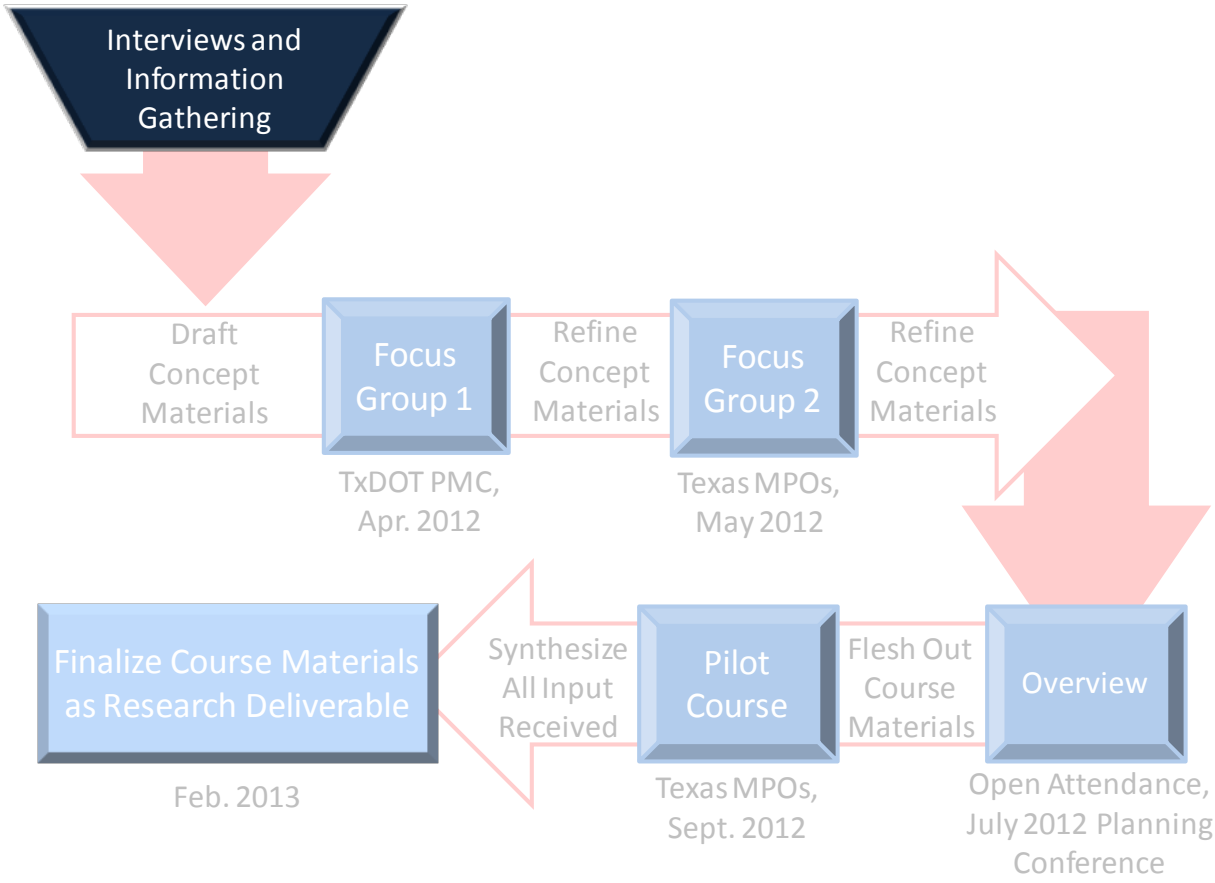


Figure 10. Interviews and Information Gathering Task.

2.2 INTERVIEW OBJECTIVE AND APPROACH FOR TEXAS MPOS

The specific objective for interviewing the Texas MPOs was to inquire about the MPO TDM development and application process and the challenges that Texas MPOs face in fulfilling their TDM responsibilities. This task serves to support the required investigation into what exactly delays or impedes the MPO portion of the overall TDM process, as well as the technical objective defined by TxDOT in the research Problem Statement to ascertain and document the following:

- The various MPO approaches for managing their portion of the overall travel demand modeling process.
- The actual or perceived factors that hinder the MPO planning process.
- What MPO directors think could be done to improve the process.

In the study kickoff meeting held in September 2011, the study team together with the TxDOT Project Management Committee (PMC) decided that a direct interview format, in groups or individually, would yield the best quality information for the study. Two events were targeted for group interview sessions of Texas MPOs: the Association of Metropolitan Planning Organizations (AMPO) national conference held in Dallas, Texas, October 25–28, 2011, and the Texas Association of MPOs (TEMPO) meeting scheduled for November 30, 2011, in Austin, Texas. Three interview sessions were held at the AMPO meeting between October 25 and 26; one interview session was held at the TEMPO meeting. In anticipation of these events, a TxDOT TPP PMC member emailed an introduction to the study to every MPO director with encouragement to participate in the interviews; TTI also called MPO directors ahead of each event to schedule participation.

Following the interviews conducted at those two events, TTI called any remaining MPOs that had not yet participated and made arrangements for individual interviews. A total of 17 out of 25 MPOs were interviewed. The MPOs shown in Table 4 participated; their size is shown according to year 2010 Census population figures shown previously in Table 2 and similarly identified as Small (under 200,000), Medium (200,000–1 million), and Large (over 1 million).

Following is the list of questions posed during the interviews with the Texas MPOs:

1. Please describe how the TDM development process works for your MPO.
2. Please describe the steps TxDOT TPP follows for your MPO's TDM development and application process.
3. What do you feel FHWA's role is in this process?
4. How well does the current cooperative MPO-TxDOT TPP model development process work for your MPO? Does the process meet your MPO's needs? What works? What doesn't?
5. For what purpose(s) do you (or others) use your MPO's TDM now?
6. What questions would you like to be able to answer with your MPO's TDM? What constraints are preventing your MPO from using the model to answer those questions?
7. What technical tools do you use to implement your MPO's model or develop inputs for it?
8. What are the driving forces motivating your MPO to invest time and resources in model development? Do you see this changing in the future?
9. Do you have an opinion on your MPO's organizational approaches which positively or negatively affect TDM activities?

Where appropriate, the facilitator asked follow-up questions to clarify the response.

Table 4. MPO Interview Participants.

MPO Name	Metropolitan Area Name	Size
Abilene MPO	Abilene	Small
Brownsville MPO	Brownsville	Medium
Bryan-College Station MPO	Bryan	Small
Capital Area MPO	Austin	Large
Corpus Christi MPO	Corpus Christi	Medium
Harlingen-San Benito MPO	Harlingen	Small
Hidalgo County MPO	Hidalgo County	Medium
Houston-Galveston Area Council	Houston	Large
South East Texas Regional Planning Commission	Beaumont	Medium
Killeen-Temple MPO	Killeen-Temple	Medium
Longview MPO	Longview	Small
Lubbock MPO	Lubbock	Medium
San Angelo MPO	San Angelo	Small
San Antonio-Bexar County MPO	San Antonio	Large
Texarkana MPO	Texarkana	Small
Waco MPO	Waco	Medium
Wichita Falls MPO	Wichita Falls	Small

Note: Large MPOs by 2010 population are highlighted in dark green, medium in light green (see Table 2).

2.3 OBJECTIVE AND APPROACH FOR OTHER INTERVIEWS

In seeking out opinions of various stakeholders in the process, the study team sought to define the context for the challenge faced by MPOs in providing timely and accurate model inputs for TxDOT to develop the TDMs. Interviews with individuals from various stakeholder groups other than Texas MPOs were undertaken in order to inform this effort and to provide additional perspective. Specific objectives for these non-Texas MPO interviews included:

- Research existing process and communication management tools provided by TxDOT TPP to MPOs regarding the TDM aspect of regional transportation planning.
- Conduct and summarize interviews with individuals from entities outside of Texas MPOs, including individuals both in Texas and outside Texas.

Most of the interview participants were targeted based upon discussion with the study PMC during the September 2011 Kickoff Meeting; participants from state DOTs and MPOs outside Texas were identified through interviews with stakeholders at the FHWA national planning office. Interview representation is shown in Table 5. Interviews were conducted between November 2011 and January 2012, in person or by phone, and in groups as appropriate.

Table 5. Individuals Interviewed for Contextual Understanding.

Agency	Representation	Number of Persons Interviewed
TxDOT	TxDOT TPP Management and Technical Staff	3
	TxDOT Regional Planning Areas	4
	TxDOT District Staff	4
FHWA	Modeling Resource Center	1
	National Planning	1
	Texas Division	2
Non-Texas MPOs	Thomas Jefferson Planning Council (Charlottesville, VA MPO)	1
	West Florida Regional Planning Council (Pensacola, FL)	1
Non-Texas State DOTs	North Carolina DOT	1
	Florida DOT	1

Following is the list of questions asked of these study participants who were not with Texas MPOs:

1. Please describe your understanding of the TDM development process for Texas MPOs.
2. Please describe your agency's role in the TDM development process for Texas MPOs.
3. What do you feel FHWA's role is in this process?

4. How well does the current model development process work from your perspective? What works? What doesn't?

5. For what purpose(s) does your agency use Texas MPOs' TDMs or results?

6. What questions would your agency like to see answered with the Texas MPOs' TDMs? What constraints are preventing the model being used to answer those questions?

7. What technical tools are you aware of that Texas MPOs could be using for model development or application? (e.g., GIS [geographic information systems] and/or Excel® for demographics development, TransCAD for running the model)

8. What do you think are the driving forces motivating MPOs to invest time and resources in model development? Do you see this changing in the future?

9. Do you have an opinion on MPO organizational approaches which positively or negatively affect TDM activities?

Where appropriate, the facilitator asked follow-up questions to clarify the response.

This activity, in addition to the Texas MPO interviews, supported the required investigation into the factors, real and perceived, which delay or impede the MPO portion of the TDM process.

2.4 INTERVIEW FORMAT

Interviews were conducted informally, although care was taken to follow Institutional Review Board (IRB) protocol according to the Texas A&M University's Division of Research (*17*). For in-person interviews, participants were provided a Consent Form with Information sheet to initial and sign; all forms were completed prior to the interviews beginning. For phone interviews, participants were emailed the Consent Form with Information sheet when the interview was scheduled, then were requested to give their verbal consent prior to the interview beginning.

For both in-person and phone interviews, the Principal Investigator provided a brief introduction to the study before handing the interview facilitation over to a research associate specializing in facilitation. Generally, a third team member took notes for later transcription. As the interview questions above demonstrate, the intended interview approach was to ask open-ended questions to solicit the widest range of responses. Care was taken not to prompt study participants for any particular response. Where appropriate, the facilitator asked follow-up questions for clarification.

2.5 SUMMARY OF INTERVIEW FINDINGS

In all of the interviews, participants were eager to share their experiences and, when familiar with the Texas process, very positive about TxDOT sponsoring this study. An overview of the findings from these interviews was presented at the PMC meeting held on February 24, 2012. As presented to the PMC, these interviews provided a wealth of insight into the process, roles, perceptions, as well as substantive ideas for moving forward in the research effort through 2012. The following synopsis presents over-arching themes that the research team gathered from the interview exercise.

2.5.1 Process Understanding of Each Agency

Not unexpectedly, the understanding of the Texas TDM process varies among the parties represented. TxDOT TPP demonstrated the clearest understanding of the process, at least for the portion of the TDM process described, up through model inputs development. For TxDOT TPP, interview participants were the managers and team leads for the process and did not include other staff persons who work on the technical aspects of the models with the MPOs. Therefore, the understanding of these other individuals regarding the process has not been documented. However, most of the process management and coordination does occur through the three individuals who were interviewed.

For the others interviewed, the following summarizes their understanding based on the interviews:

- For Texas MPOs, almost all the MPOs for which TxDOT handles the model development suggested that their main involvement in the model development process is to provide the network and demographic data inputs for the base year and the forecast years to TxDOT. Several MPOs described the process to develop inputs in detail. Several Texas MPOs shared that they have less understanding about the TDM process. For example, one director lamented that not only does his MPO not have the staff to conduct modeling, he does not understand why they need a model or how often they are supposed to update their model. He noted that because his policy board does not understand the TDM development process, it is difficult to convince MPO board members to recruit additional staff to accomplish TDM tasks.
- The TxDOT regions staff offered perspective reflecting the roles of both TxDOT TPP and the MPOs: they understand the basic process and how it fits into the MPO planning process. They see their role being to facilitate communication between the MPO and TxDOT TPP.
- TxDOT districts generally expressed that they felt less comfortable with their understanding of the process. TxDOT district staff has limited involvement with the model development process, including inputs development, although in some cases, they may serve on the MPO technical committee.
- FHWA Texas Division demonstrates a clear oversight perspective, but purposefully avoids getting involved in specific procedures between TxDOT and the MPOs. FHWA Texas describes their modeling role as:
    - Oversee MPO planning through certification review for TMAs.
    - Limit direct TDM input to nonattainment areas.

  FHWA Texas staff has gotten involved in project studies in other areas upon request.

Responses to the question on roles and responsibilities followed a similar pattern, with agency involvement in the TDM development process for Texas MPOs being the highest for TxDOT TPP and the Texas MPOs, with decreasing involvement proceeding from the TxDOT regions and TxDOT districts, and FHWA Texas having an oversight role. TxDOT TPP's answer was most robust with respect to the data collection and analysis activities performed in support of model inputs development; they also described coordinating with the MPOs to anticipate modeling activities for the entire model development process over a multi-year process. Most Texas MPOs knew they are responsible for model inputs development but were unclear about

further roles and responsibilities they might have in the process. TxDOT districts described a role in the process that varies based upon the designation of TxDOT district membership as part of the MPO Technical Advisory Committee. None of the TxDOT district representatives claimed modeling knowledge or expressed interest in becoming more involved with the modeling directly and none mentioned having or using a TransCAD license themselves. TxDOT regions see their role as being a liaison between TxDOT TPP and MPO: they described informally acting as interpreters when MPOs come to them with questions about the process; no direct technical assistance is provided from the Regions. FHWA Texas described their role with regard to the modeling process as being limited to the nonattainment areas and the TMA certification review process. FHWA Texas staff has some background in modeling; in addition, they call upon the FHWA Modeling Resource Center as necessary to address specific modeling issues.

The FHWA National Planning Office and the FHWA Modeling Resource Center describe their own roles as providing oversight and serving as a technical resource, respectively.

2.5.2 Existing Process Management and Technical Tools

The interviews of those familiar with the Texas TDM process provided valuable perspective into the process management aspect of the Texas model inputs development and the model development process as a whole. TxDOT TPP staff provided examples of current process management tools, as well as feedback on procedures tried in the past and ideas they have for future improvements. The list of process management tools that TxDOT TPP was using at the time of these interviews includes:

- Model coordination meeting materials.
- One-page Excel timeline tool.
- Standardized transmittal memos.
- Detailed guidelines for MPO data submittals.

The interview responses referred to these items and their use in discussion of the process and how it functions. TxDOT TPP staff continues to refine their process, both to improve the process overall and as needed to be flexible for the situations of particular MPOs.

TxDOT TPP's TDM process management tools, including their rather new (in 2012) timeline tool are shown in Table 6 and Figure 11, respectively. Technical tools and resources available to support the MPO TDM development process are listed in Table 7 and Table 8, respectively.

Table 6. TxDOT TPP TDM Process Management Tools.

Process Management Tools

- Model Coordination Meeting Agenda
- One-page Excel Timeline Tool
- Detailed Microsoft Project Schedule (not updated or in current use)
- TDM Meeting Preparation Checklist (available for use, not required)

Correspondence with MPO/Guidelines for Submittals/Transmittal Documents

- Typically Delivered at Kickoff Meeting
    - Demographic Delivery Memo (delivered at Kickoff, detailed) (version 10/6/2011)
    - Network Editing Memo (delivered at Kickoff, detailed) (version 10/6/2011)
    - TWC Data Delivery Memo (outlines responsibility to keep data secure)
    - Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook
    - (new) Geocoding TWC Data Guidelines
    - (new) Aggregating Census Data Guidelines
- Base Model
    - CD and list of travel demand model data
    - Executive Summary
    - Presentation to MPO Technical Committee and/or Policy Advisory Board
- Forecast Model Delivery
    - TDM Data Delivery Memo (provides completed model files)
    - CD of travel demand model data
    - Executive Summary Updated to Reflect Forecast Model Aspect
    - Presentation to MPO Technical Committee and/or Policy Advisory Board

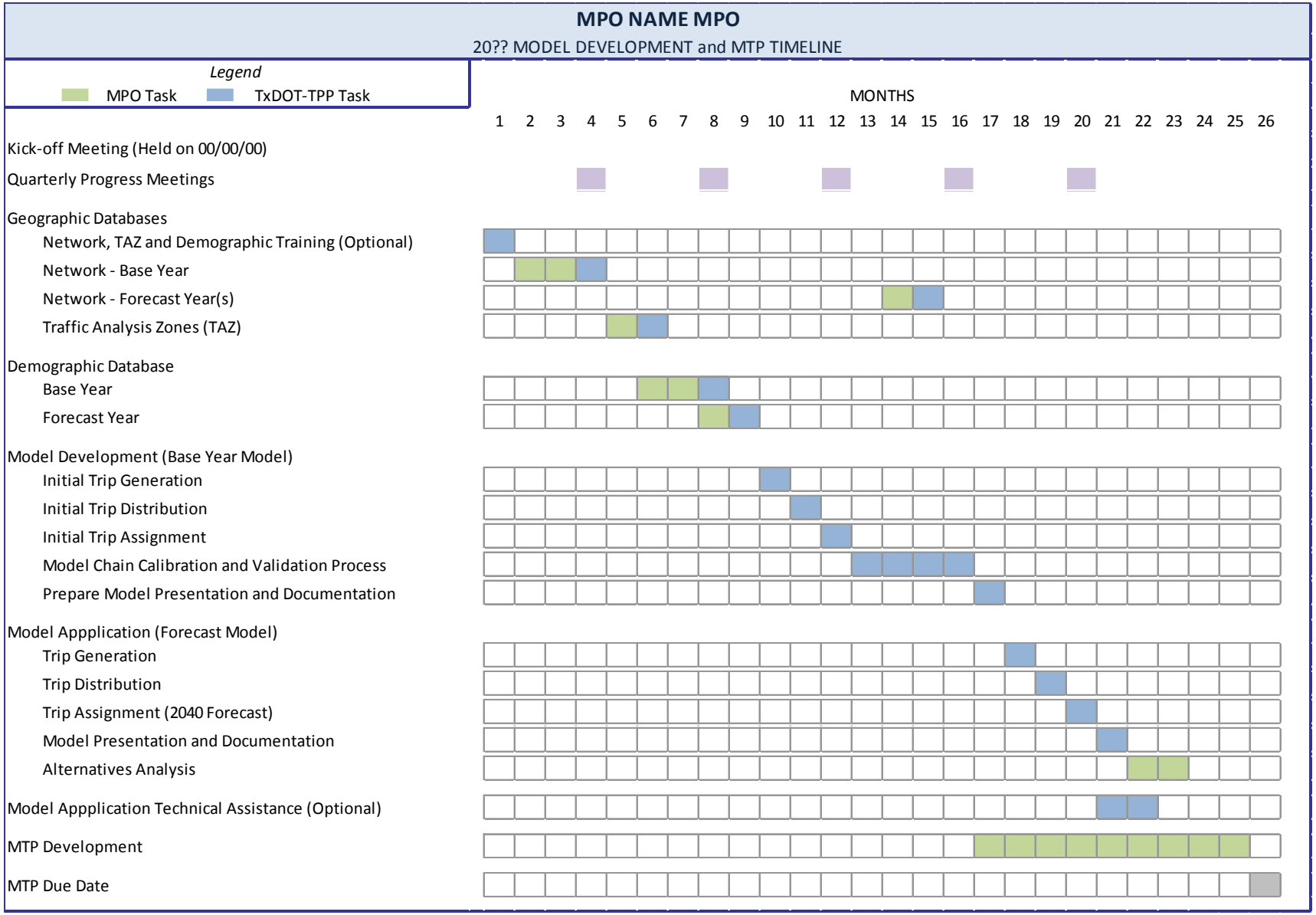


Figure 11. TxDOT TPP TDM Timeline Tool (Example).

Table 7. TxDOT TPP TDM Technical Tools.

Data Resources Provided to MPO for Model Inputs Development

(typically at Model Coordination Meeting)

- Prior Model Network and TAZ Files in TransCAD Format
- Prior Model Network Hard-copy Plot, by Facility Type and Lanes for Mark-up
- Texas Workforce Commission (TWC) Data (if available at time of meeting)
- Other Geographic Information System (GIS) Data Sets
    - County(ies) Boundary
    - MPO Boundary
    - Streets Layer
    - Bridges
    - Railroads
    - Rivers
    - Other Water Features

References Available to MPO

- Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook, TxDOT and TTI, February 2007
- Memo: Aggregating Census Data (January 2012)
- Memo: Geo-coding TWC Data (January 2012)

Training Available

(for a region or individual MPO)

- General TransCAD Training (TTI)
- Introduction to Travel Demand Modeling (TTI)
- Model Inputs Development Training (TTI)
- Model Application/Alternatives Analysis Training (TTI)

Assistance Available to MPO

- TxDOT TPP Staff Person Assigned to the Model
- Demographics Development Training (TTI) – becoming practice
- Network Development Assistance (TTI) – becoming practice
- Demographics Development Assistance (TTI-CS)
- TransCAD Help Desk (staffed M-F year round)

Table 8. Other Resources Provided by the State of Texas for MPO TDM Development.

TransCAD Statewide License (TxDOT)
Population Data (Texas State Data Center)
Employment Data (Texas Workforce Commission)
One-Stop Demographic Data Analysis Tool (Beta Webpage, TxDOT)
Traffic Data and Analysis (TxDOT) • Base Year Saturation Counts • Counts for Freeway Facilities – mainlanes, ramps, frontage roads • External Station Counts and Forecasts • Vehicle Classification Data
Travel Survey Data and Analysis (TxDOT) • Trip production and attraction rates by trip purpose (vehicle and person) • Average trip lengths • External travel • Commercial vehicles • Special generator trip rates • Auto occupancy factors • Mode of travel
Functional Classification Data (coordinated effort with TxDOT district and MPO)
Air Quality Analysis for Nonattainment and Maintenance Areas (TxDOT)
Texas Statewide Analysis Model (TxDOT, for externals in some cases)

2.5.3 Perceptions on How Well the Current Process Is Working in Texas

The larger context of this research effort is process improvement, especially focused on the needs of the small- and medium-sized MPOs in developing and delivering quality TDM inputs on schedule. The researchers understand that, in asking this question, many of those involved in the process see opportunities for improvement; all of the ideas were documented and included for consideration.

Across the spectrum of TxDOT TPP, TxDOT districts and regions staff, as well as Texas MPOs, most expressed frustration with the current process results in terms of model timeliness. Many also credited both TxDOT and MPO staff for working with limited resources: limited staff, limited staff skill sets, and other demands on staff time. Many involved in the process identified

opportunities for improvement. As noted above, everyone interviewed was very positive about TxDOT sponsoring this study, were aware that TxDOT TPP staff is participating through the PMC, and offered their perspectives in the spirit of improving the process.

TxDOT TPP staff offered specific observations including the following:

- MPOs are under a lot of pressure from their Policy Boards to make specific planning deadlines; TxDOT TPP staff is willing to take heat sometimes for missed deadlines because TxDOT TPP staff is not under same pressures.
- Usually both TxDOT TPP and MPOs will agree to an initial schedule, but once it slips, those involved ("especially the MPOs") seem unwilling to commit to a new schedule.
- TxDOT TPP staff noted that they are reluctant to "badger" MPOs for model inputs after providing an initial timeline. They noted that MPOs who seem to accomplish model inputs development tasks more efficiently often have an engaged MPO director who stays in touch with TxDOT TPP through frequent contact and often who has a technical interest or background in modeling themselves.
- A lot depends on the MPO director, as far as an MPO staying on task to deliver model inputs.
- TxDOT TPP staff expressed a sincere belief in their current process of communication through meetings, memoranda, CDs, phone, and email, with follow-ups through phone and email.
- TxDOT TPP staff is optimistic about the prospects of their fairly new timeline tool to manage the process for individual MPOs.

TxDOT district and region staff, as supporting participants in the Texas process, noted:

- MPOs are constrained by their work program, so TDM schedule changes are a hardship.
- It has been previously discussed that the TxDOT region staff assist MPOs with contracts to hire consultants to develop demographics, but this has not moved forward.
- TxDOT TPP seems to be under-resourced: "It would help the entire state if TxDOT TPP has sufficient staff for model development and maintenance."
- The way the MTPs have "bunched up" [for example, many MTP updates are due in 2014 and 2015] is making it more difficult for TxDOT TPP.
- Several in this group of interview participants described a general environment of finger-pointing between the MPOs and TxDOT TPP over missed deadlines.
- A lack of prompt guidance from TxDOT TPP regarding model inputs was cited as sometimes causing the MPOs to miss their deadlines.
- TxDOT districts suggested that TxDOT TPP provide a manual where other TxDOT representatives can reference the model development process, so it does not seem like a "black box."
- TxDOT region staff identified a need for updated procedural documentation for TxDOT TPP, like the Standard Operating Procedures that the TxDOT regions operate under, which might clarify roles and responsibilities and the process.

Overwhelmingly, Texas MPO interview participants were very positive about TxDOT conducting this study. Most participants were very interested in providing their input; a minority expressed skepticism that positive change would result from it. Several Texas MPO directors mentioned calling TxDOT TPP staff and receiving helpful individual guidance explaining the steps of the

process. Texas MPOs who have had recent interaction with TxDOT mentioned positive improvements TxDOT has made—the timeline tool, demographics guidebook, and interactive and MPO-specific workshops, for example. Many of the MPO directors recognize the challenges they have at the MPO level and had constructive ideas for improvements to the process for both TxDOT and the MPOs. Specific concerns include:

- Many of the MPOs volunteered their belief that TxDOT staff themselves are very knowledgeable, skilled, and helpful when called upon, and yet many MPOs noted process and communication issues between TxDOT TPP and the MPOs as their highest concern. Those who had seen the new TxDOT TPP timeline tool were optimistic about it.
- MPOs identified strategies that work within the current context including the following:
    - Hiring or training modeling staff to perform modeling tasks (this tended to be the larger MPOs, but two medium-sized MPOs have also made an investment in this direction).
    - Hiring a consultant (typically for support tasks such as network or demographics development, although one MPO described hiring a consultant to develop their entire model, later having to seek TxDOT TPP review of that model).
    - When hiring a consultant, several MPOs identified the importance of MPO staff conducting thorough reviews of consultant work.
    - If an MPO staff person has the skill set, assigning the task to that person. Several MPO directors described being actively engaged in the model inputs development task. One MPO director said he develops the model inputs. Others identified an MPO staff member, often someone with Geographic Information System (GIS) or planning expertise, who works on TDM inputs.
    - Several MPOs mentioned requesting direct assistance from TxDOT TPP and receiving several days of on-site training by staff contracted to TxDOT. One MPO described traveling to TxDOT TPP's Austin, Texas, office with the MPO staff person who would be doing the modeling, in order for them to meet TxDOT TPP staff and get to know them better.
- Staff turnover in TxDOT and MPOs and lack of training for existing staff was cited as a challenge by many.
- MTPs being on a similar schedule [as mentioned previously, many MTP updates are due in 2014 and 2015] results in modeling activities for all MPOs occurring at the same time. All MPOs interviewed for whom TxDOT develops the model have found that the whole process takes longer than anticipated. A couple of MPOs said they have not had a working model for more than 10 years.
- Several noted that "one size does not fit all"—every MPO is unique and has unique modeling needs and different analysis needs.
- TDM development delays impact MPO staffing and consultant support, which are formally programmed in the UPWP.
- The TDM process is confusing and difficult to explain to the MPO policy board, which makes it difficult to justify the time and resources spent on modeling activities.
- Some MPO policy boards blame the MPO directors for model delays; other policy boards understand that the model development involves many parties.
- Credibility in the model affects credibility in the MTP planning process.

The issue that small and medium MPOs are understaffed and lack resources for model development appeared to be a foregone conclusion by all interviewed (FHWA perspective on the future of MPOs even appears to suggest that the trend is that these areas will receive even less attention under future federal funding authorization). Hence, suggestions for improvement generally focused on process and communication improvements, as well as staff training. Existing technical model training available for MPOs received positive reviews, but it was suggested that technical training be more strategically timed during each MPO's model development process and be offered on a more regular basis. Another idea which arose during one of the MPO group interviews was that the MPOs form a model users group. As identified above, the MPO director's understanding of and involvement in the TDM process was identified as a focal point for how well the model inputs development process works.

2.5.4 MPO Quality Control Practices for Model Inputs Development

Most of the MPOs do not have an explicit quality control process in place. There are primarily two reasons for this:

- Ensuring quality control is a very time intensive process.
- MPO directors end up doing model tasks themselves or allocating tasks to staff without necessary skills, leaving no one else to perform quality control.
- MPOs rely on TxDOT TPP to review model inputs.
- One MPO suggested a two-level quality control process with the first level of screening by a GIS professional and a second level of screening by the MPO technical committee; another MPO felt that their technical committee would not review to the necessary level of detail.
- One MPO suggested that for resource management purposes, TxDOT is in a much better position with regard to data resources and staff expertise to generate the base data for MPOs statewide, for example the highway network data, for each MPO to then review.
- Another MPO mentioned that they do successfully use a consultant to assist with developing model inputs. However, they have learned that MPO staff must review the material because the consultant is not familiar with the local area. Another issue mentioned by several MPOs with consultants is it is a good strategy to retain a percentage of their contract until TxDOT TPP has reviewed the model input deliverable in case there are changes to be made.
- One MPO described a circumstance where TxDOT TPP had emailed the wrong file to the MPO for review and update, resulting in the MPO having to re-do their work once the mistake was uncovered.

In their interview, TxDOT TPP staff noted their perception that they frequently receive data sets that have not undergone sufficient review prior to submittal. TxDOT TPP has identified this practice as a primary issue in the timely delivery of travel demand models back to the MPOs.

2.5.5 Resources for Model Inputs Development

The interview with TxDOT TPP and follow-up investigation of resources provided by TxDOT TPP staff to the research team demonstrated that there are many resources available to Texas

MPOs for TDM input development and to support the TDM development process as a whole. These items, previously listed in Table 7 and Table 8 include:

- Population and employment data resources.
- References and guidelines.
- Training.
- On-call assistance.
- TransCAD statewide license.
- One-Stop Demographic Data Analysis Tool.
- Traffic data and analysis.
- Travel survey data and analysis.
- Functional classification assistance.
- Air quality analysis for nonattainment and maintenance areas.

It was clear that Texas' centralized modeling support approach has provided a structure whereby these resources and others can be conceived, generated, maintained, and distributed for common benefit for the Texas modeling community, including Texas MPOs. Unfortunately, interview responses by Texas MPOs, as well as TxDOT regions and districts, demonstrated a general lack of awareness of these resources or where to get them if they knew they existed. For example, some MPOs were not aware of the Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook (*18*), a key reference for Texas MPOs to develop their model inputs.

2.5.6 Need and Purpose for Models for Texas MPOs

The need and purpose for TDMs for use by Texas MPOs generated discussion, as well. Interview participants pointed out that multiple agencies rely on the model results besides the MPO, including TxDOT, transit agencies, Regional Mobility Authorities (RMAs), and local cities. Interview participants cited the following uses for TDMs:

- Metropolitan Transportation Plan development.
- As an input for air quality analysis when required.
- As a quantifiable analysis tool to support (or refute) policy decisions.
- As an input to assist with project prioritization. For example, one MPO described the model as a de-politicizing tool that helps different local entities look at the most important projects first, instead of devolving to "taking turns" with each area getting a project built.
- For "what if" analysis, or scenario testing.

When asked the question of what other types of analysis participants would like to be able to use TDMs for, several TxDOT districts expressed more interest in operational analysis over TDMs to support project design because there is decreasing funding available for the large-scale projects that TDMs are best suited to analyze. In contrast, one TxDOT district pointed out that some areas have a need to analyze travel demand more in depth than is currently possible, for example non-auto modes or other trip purposes such as a large university.

Both the National Planning Office and the Modeling Resource Center of FHWA mentioned a need for MPOs to examine a broader array of policy and alternative questions. When asked a follow-up question if this is feasible at smaller MPOs to have that technical expertise or even for

an MPO policy board to understand the linkages between land use planning and transportation, one interviewee provided an interesting response:

> In recent times I have noticed there has been a "sea change" in that the smaller MPOs want to evaluate strategies as resources are becoming scarce and they want to invest wisely. Like operations strategy….DTA [dynamic traffic assignment] is one of the things we have been providing support. Some of the other tools are microsimulation, etc. These smaller MPOs want the best value for their money and want to be able to see what the benefits are.

The perspective from FHWA national participants was that there is not a one-size-fits-all model: MPOs should apply an appropriate amount of detail for the types of questions that are being asked for the MTP and to satisfy the various environmental demands.

2.5.7 Other Technical Tools Texas MPOs Could Be Using

An additional question explored other technical tools and other ways to look at modeling that might be considered to address current challenges. In Texas, responses generally referenced operational analysis, including dynamic traffic assignment, as a desirable step in addition to current models to support more detailed analysis.

FHWA national responses reflected their experience working with MPOs across the United States, as well as their knowledge of available tools. Generally, they suggested that practitioners should think of models less as a unit, but more as a series of tools, for example:

- Activity-based, land use, and economic models.
- Freight models (especially Freight Analysis Framework).
- Micro-simulation and multi-resolution concepts.
- Peak-period analysis.

Another approach to consider is the use of strategic level analysis methods wherever possible, instead of assuming that disaggregate modeling is necessary to answer every question. Examples of these other methods and models include:

- National Smart Growth model.
- GreenSTEP climate change model.
- STEP2 accessibility data.
- Planning-oriented level of service tables (coming soon from FHWA, similar to Highway Capacity Manual analysis).

With these initiatives, FHWA is trying to provide analytical tools: strategic planning models that serve the opposite end of the spectrum for the spatially and temporally disaggregate models. These can be more useful for a small- and medium-sized MPO. It saves investment in training MPO staff in regional TDM analysis if all the MPO needs is project level design and implementation.

In addition, a re-orientation toward performance management as a technique for better planning was described as a likely focus area for the federal legislation that was upcoming later in 2012.

2.5.8 MPO Organizational Approaches

All interview participants seemed to agree that there is no one-size-fits-all in travel demand modeling. Interview participants made various observations and suggestions concerning MPO organizational approaches, including:

- Small MPOs nationwide seem to be "hit or miss" with regard to having staff capable of TDM tasks; having GIS skills is a good first step. For the smallest MPOs, the director is often performing "hands-on" development of the model inputs because other staff does not have the technical skills or know the process. The director is also often directly involved in quality control and trains new staff if they lose someone.
- Collaborating as a region with other small MPOs on a model is a strategy working elsewhere:
    - Example in Texas of the Valley MPO collaboration.
    - Examples from other states referenced cases where the regional entity is housed separately from the MPOs it represents.
- Partnering with a local university can expand resources/skill sets.
- One Texas MPO benefits from several local agencies pooling funds to hire a modeler to meet area needs.
- Most MPOs that are co-located with city or Council of Governments (COG) said that co-location is mutually beneficial in terms of borrowing some GIS personnel and getting to know land use data sources.

2.5.9 Lessons Learned from Other States, Non-Texas MPOs, and FHWA National

Over and above the responses to individual questions, participants from outside of Texas offered ideas and suggestions, including "lessons learned" from other states. These included most particularly the message that "we are not alone"; that is, Texas shares similar challenges with other states. Other states mentioned leveraging university partnerships, as Texas already does to some extent at the state DOT and MPO levels.

The general "take-away" from the interviews of other state DOTs and MPOs was that the state DOT-to-MPO relationship in TDM development and application varies, even when it is collaborative as it is in Texas. The research team documented their understanding of these various approaches in Figure 12. A broad organizational shift in this relationship in Texas is not a focus of the current research study. However, understanding these different approaches was helpful to the researchers in interpreting the input by non-Texas parties and may be of interest to TxDOT in the long-term future.

In Figure 12, the state DOT office responsible for modeling overall and the DOT regions and districts (or comparable units) are represented in orange, the MPOs are represented in green, and consultant partners are represented in dark blue; size represents extent of responsibility for the modeling process and lines represent communication channels.

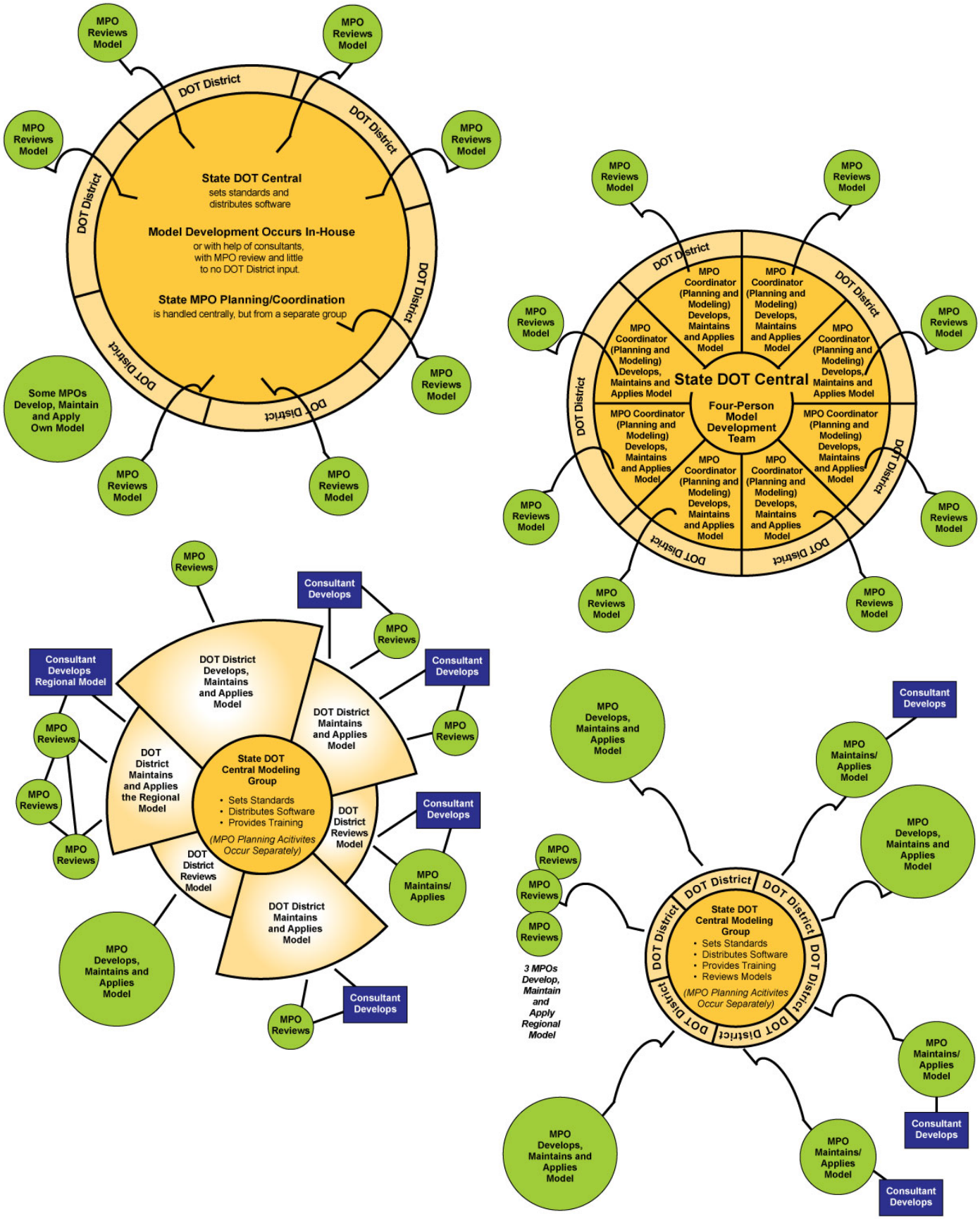


Figure 12. Organizational Approaches for the State DOT-to-MPO TDM Relationship.

The intent behind including the representation in Figure 12 is to demonstrate the variability and flexibility of an organizational relationship between a state's DOT and the MPOs they collaborate with. Most importantly for each, "the exception proves the rule": interview participants universally acknowledged that the relationship between each state DOT and each MPO to develop and implement TDMs is highly dependent and variable based upon staff abilities at both (including as staff changes at these organizations over time).

Focusing upon the state DOT's role generally setting TDM standards, one state DOT staffer offered his perspective on the state DOT staying relevant in the constantly evolving technical practice area of travel forecasting models. This DOT's approach includes:

- Allowing MPOs latitude to deviate from the statewide standards.
- When asked as a follow-up why the MPOs continue to adhere to the statewide standards generally, these were the points made:
    - The state DOT does not support new approaches with training or assistance until adopted as standard.
    - The state DOT does incorporate new approaches as appropriate, so that statewide standards align with industry state of practice and do not constrain MPO model progress.
    - MPOs know their models are more defensible against court challenge if they adhere to a common standard.

Finally, the lessons learned from other states included some additional suggested approaches for facilitating a cooperative relationship between a state DOT and MPOs for TDM activities:

- Formalize agreements between the state DOT and the MPO concerning travel model roles and responsibilities (Unified Planning Work Program tasks, scope, and schedule). (Note: "travel model" is a general term encompassing TDMs and in this report may be considered interchangeable with TDM.)
- In one state, the state DOT assigns a full-time staff coordinator for each MPO, and this person shares responsibility with the MPO for both planning and modeling activities. Depending on the MPO and the DOT coordinator, travel demand modeling is conducted by the best person suited to the task, either at the MPO or the DOT. As a result of the planning and the modeling being part of the coordinator's job description, the state DOT planner is fully invested in both sides of the process: completing the model on time to support the MTP plan schedule that they are also responsible for.
- For one state interviewed, both the state DOT and the MPO representatives recommended a strategy of deliberately nurturing a cordial, professional respect between state DOT and MPOs.
- Participate in (or sponsor) a statewide model user group. The structure of these groups varies from informal to highly formal.
- Make resources readily accessible through Web (example shown in Figure 13). The interviews from outside of Texas provided a very helpful perspective.

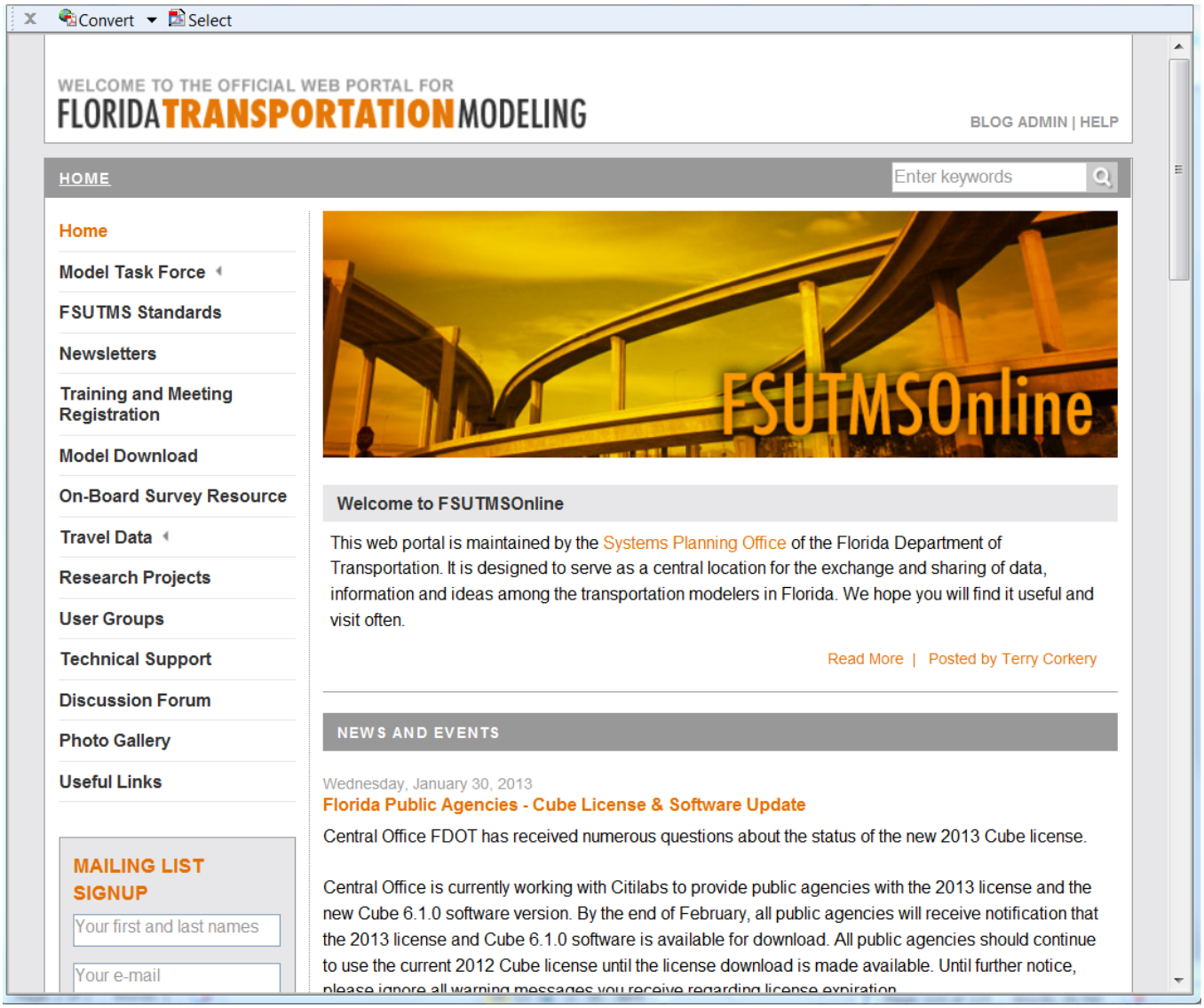


Figure 13. Florida Transportation Modeling Web Portal.
Source:(*19*)

2.6 CHAPTER SUMMARY AND RECOMMENDATIONS

In summary, this chapter presented the input that the project team received in response to one of the initial tasks: to conduct an investigation of what delays or impedes the MPO portion of the overall travel demand modeling process, including ascertaining and documenting the following:

- The various MPO approaches for managing their portion of the overall travel demand modeling process.
- The actual or perceived factors that hinder the MPO planning process.
- What MPO directors could do to improve the process.

These were the technical objectives laid out in the original research Problem Statement.

As demonstrated by the above summary of responses, the interviews were productive and offered insights well beyond the scope of the questions asked, providing an assortment of perspectives, insights, examples, and inspiration to the research team. Texas MPO directors and staff offered a range of perceptions regarding the current process, their own skills, and their available resources, as well as suggestions for improvement. It is clear that many share a concern with TxDOT that MPOs need additional institutional capacity for TDM activities. And, as stated previously, many MPO directors and staff were very positive about TxDOT conducting this study and hopeful that this study could result in positive change.

2.6.1 Recommendations for MPO Training Course

Based upon findings under this task, a training course oriented toward TDM process management was confirmed as being a helpful step forward. In addition, given the MPO staff resource constraints identified through these interviews, it was clear that the focus of the training course should generally be on the MPO director, as a consistent staff member for even the smallest staffed Texas MPO.

A clear need identified through these interviews is that not all Texas MPO directors understand the TDM purpose and appropriate application as part of the planning process. In addition, many expressed frustration with the length of the TDM development process, in some cases based upon very little knowledge of what steps the process includes. There was also apparent confusion regarding the role of the MPO and TxDOT TPP in terms of who bears the ultimate responsibility for a TDM being available for use in time for MTP development activities. Certainly, it was clear that the MPOs feel their plans benefit from having a TDM for this purpose, even when they are not exactly sure how to best employ a TDM in support of their MTP.

Therefore, key recommendations for the MPO training course as a result from this task include:

- Focus on the MPO director (for small- and medium-sized MPOs, or the planning or modeling director for large MPOs).
- The learning objectives for the course should address approaches and techniques necessary for MPO directors to:
    - Understand the need, use, and purpose of TDMs, including how to apply a TDM as part of the MTP development process.
    - Identify and schedule the TDM development steps necessary to support an upcoming MTP adoption/update.

- Identify and manage all available resources to ensure a TDM model is available for application in support of developing an MTP.

2.6.2 Other Recommendations

As a result of the open-ended dialogue with the Texas MPOs and other interview participants as summarized in this chapter, additional recommendations suggested themselves outside the boundaries of the MPO training course originally anticipated under the research Problem Statement. These include:

- TxDOT should continue offering current technical TDM training and assistance. Offer the training on a regular schedule which the MPOs can then plan for and budget in their UPWPs.
- TxDOT should continue to incorporate the TxDOT TPP timeline tool as a process management and responsibilities identification tool.
- TxDOT should continue current efforts to update procedural documentation for TxDOT TPP to clarify roles and responsibilities for the TDM development and application process (the Traffic Data and Analysis Manual, 2001).
- TxDOT should continue the activity whereby TxDOT TPP (the Systems Planning group) visits and assists each MPO individually to budget time and resources for MPO activities, including developing inputs for the TDM.

Some of these recommendations, specifically addressing the pilot course, will be highlighted as key recommendations in the concluding chapter.

CHAPTER 3. INSTITUTIONAL CAPACITY BUILDING APPROACHES

As a supplementary research task, the study included an effort to investigate approaches used in and outside of the transportation planning field for institutional capacity building. This task included previous research into the challenges faced by MPOs specifically. These findings are summarized here as additional perspective which informed later study steps.

3.1 CURRENT STUDY IN CONTEXT – THE TEXAS MPOS

MPOs are in a unique position to act as facilitators for the analytic assessment of regional transportation policies and actions, and as information exchange centers and consensus builders between policy makers, the public, and other relevant agencies. As described in Chapter 1, from their inception in 1962 through the legislations of the post-Interstate Highway system era, MPOs have been tasked with many responsibilities—some even outside of the realm of conventional land-use and transportation planning. Additionally, the presence of numerous state and local initiatives has made every MPO unique in its own right. As of February 2013, there are 384 MPOs in the United States (*13*). Some of them have flourished under the ideals set forth by the recent series of federal legislations, while others have struggled to meet the most basic requirements.

As previously referenced, Table 2 in Chapter 1 on page 13 lists the 25 Texas MPOs, some of the key demographics of their respective planning regions, their designation year (i.e., the year they were established), and TMA status. As mentioned earlier, there is a preferential distribution of federal funds to the TMAs over the other MPOs. This places the small- and medium-sized MPOs without TMA status at a financial disadvantage. On the other hand, medium-sized MPOs with TMA status are subject to additional requirements, as well, which is also difficult. The issue of limited funding with respect to responsibilities is a problem common to all small- and medium-sized MPOs in the nation, which has led to the development of creative cooperative partnerships in some states (such as in Texas and Florida) between state departments of transportation and small- and medium-sized MPOs.

The cooperative partnership between TxDOT and the state's 25 MPOs was described in detail in Chapter 1. Broadly speaking, TxDOT TPP handles TDM estimation and validation for 21 of the MPOs. The MPOs handle the collection and preparation of demographic and network data for the model development and make travel forecasts for use in TDM application. As was also explained above, within this broad cooperative arrangement, there are several variations with regard to TxDOT oversight and technical model support. Such a diverse landscape reflects the needs of MPOs with their varying organization styles, governance types, and staffing resources to perform TDM activities.

This cooperative partnership as a solution for constrained resources represents a highpoint of metropolitan planning in the Texas setting. The initiative to consolidate model development, estimation, and validation of MPO models within a central division of TxDOT (i.e., TxDOT TPP) is a visionary and proactive approach to manage the planning process within urban regions of Texas and Texas as a whole, especially under the prevailing fiscal and human resource constraints. Indeed, Texas is acknowledged, alongside the state of New York, for this approach in the 2013 TRB publication "Metropolitan Planning: The Evolving Legacy and an Abbreviated History of the First 50 Years" (*2*).

Within this overall visionary and proactive setting of the TxDOT TPP-MPO partnership, there is, as is typically the case for most partnerships, room to improve the specific details of the cooperative process. The current study specifically aims to expand MPO institutional capacity, as well as provide an open investigative approach for identifying issues and challenges the MPOs face. As described in Chapter 2, this broader perspective includes the challenges that MPOs and TxDOT TPP face in developing the TDM, as well as in coordination and communication between MPOs and TxDOT TPP.

Specifically, this chapter focuses on research into the transportation planning state of practice with reference to MPO processes, coupled with a targeted literature review of state of the art strategies in human resource and project management for organizations generally. The goal is to identify strategies and techniques that can assist TxDOT TPP and MPOs to perform more efficiently and effectively. The rest of this chapter is structured as follows: section 3.2 develops a typology for MPO organization structures based on a synthesis of earlier studies, and discusses MPO funding considerations; section 3.3 describes MPO staffing from the perspective of human resource management; section 3.4 presents the travel demand development process from the perspective of project management; and section 3.5 summarizes the discussions.

3.2 MPO ORGANIZATIONAL SETUP AND FUNDING

3.2.1 Introduction

As explained in Chapter 1's background section, transportation planning is a cooperative process. The 3C (continuous, comprehensive, and cooperative) planning process was established with the intent that all relevant stakeholders stay informed of the critical mobility and accessibility-related issues in the region, thus providing them full opportunity to be involved in the decision-making process. In this respect, federal surface transportation legislation effectively articulates the responsibilities of the planning agencies—including those of the MPOs. However, there are no explicit directives that the law prescribes on how an MPO should be structured, organized, and administered.

From an organizational perspective, MPOs generally have the following boards and committees (*20*):

- A governing policy board made up of local elected officials and state and public transportation officials.
- A technical advisory committee (including engineers, planners, and other local staff).
- A citizen's advisory committee.
- Miscellaneous committees specific to each MPO based on regional needs, such as a bicycle-pedestrian committee, freight advisory committee, etc.

The MPO staff is expected to prepare documents that aid the policy board to arrive at regional decisions. They may also be called upon to assess other initiatives involving local and community considerations.

The organizational setup of an MPO is determined by agreement between the local government and the state. The nature and extent of the relationship between the local government and the MPO varies significantly across the country. Generally, MPOs are hosted within a Regional Planning Organization (RPO), Council of Government (COG), municipality, county, or other

similar agency, or operate independently as free-standing entities. Bond et al. report that 69 percent of MPOs in the U.S. are hosted by another local government agency, of which RPOs (26 percent) are most common as MPO hosts, followed by municipalities (20 percent), and counties (20 percent) (*21*). Each of the two broad MPO organization setups—hosted versus independent—comes with its own unique set of advantages, some of which are listed in Table 9. In summary, a hosted MPO has the advantage of economies of scale, while an independent MPO has the advantage of better work delineation and independence in policy formulation and administrative structure.

Table 9. Potential Advantages of Each Organization Setup.

Potential Advantages of Hosted MPOs	Potential Advantages of Independent MPOs
• Reduced cost of operation in terms of renting floor space, staffing, and supplies. • Financial assistance from the host agency for MPO operational expenses and local match for federal funds. • Potential availability of employees with specialized skill sets (such as GIS capabilities) for specific MPO tasks. • Integration of MPO transportation planning with planning objectives of host agency.	• Independence in transportation planning and policy decision making. • Independence in administrative functionality (such as recruiting and purchasing). • Sense of identity as a specialized agency for MPO staff.

Source: (*21*)

Of course, the MPO setup is not exactly as simple as being either hosted or independent. Indeed, even within the hosted MPO setup, there is a continuum between a completely integrated hosted MPO and one that retains several features of an independent, free-standing MPO. The next section discusses five finer types of organizational setups between the hosted MPO setting and an independent MPO setting.

3.2.2 Types of MPO Organizational Setups

Based on the literature on MPO organizational setup, five models of MPOs may be identified (*21*, *22*):

- **All-in-one agency model** – In this setting, the MPO and the host agency are treated as one entity and the MPO does not have any separate identity. Such agencies are usually housed within the Regional Planning Council. Both governance (composition of the committees and policy board) and staff functions (day-to-day staff responsibilities) are identical across the organization. Examples of such a model include Southern California Association of Government and Sacramento Area COG in California and Houston-Galveston Area Council and North Central Texas COG in Texas.
- **Dual purpose MPO model** – Under this setting, the host agency controls the MPO planning funds to support the transportation planning staff and ensure required expertise for the planning division. The governing body is dominated by the host officials, who are also responsible for communication with external stakeholders. Examples include Bay

County Transportation Planning Organization (TPO) and Florida-Alabama TPO, both in Florida.

- **Component MPO model** – In this setting, the MPO is a separate unique entity with its own branding and sometimes even budget, but still functions within the host agency. In particular, the MPO director typically reports to the host agency and needs clearance from the host agency for administrative issues or organizational restructuring. But there are almost no overlapping duties for the MPO staff and those of the host agency, and the governance board is different for the two agencies. Examples include Gainesville Metropolitan TPO in Florida and Sherman-Denison and Wichita Falls MPOs in Texas.
- **Staff services agreement model** – The MPO governing board purchases a defined bundle of services from an outside source. The service provider may be a government agency or a consulting firm. The MPO is otherwise independent with its staff having only the MPO responsibilities and a governance system that is completely independent of any local agency. Lake-Sumter MPO and Sarasota/Manatee MPO in Florida are examples of this model.
- **Freestanding independent MPO** – This is a fully independent MPO with complete autonomy over its administrative functions. The director and other staff are employed directly by the governing board. Examples include Metroplan Orlando and First Coast MPO in Florida.

Figure 14 presents the MPO organizational setup models discussed above in the order of how independent the MPOs are under the different organizational models. Understanding the relationship between each MPO in the context of its regional organizational setup would help to customize communications and information flow between TxDOT TPP and Texas MPOs, including gaining an understanding of who exactly to talk to at MPOs or their hosting agency for high-level decision making.

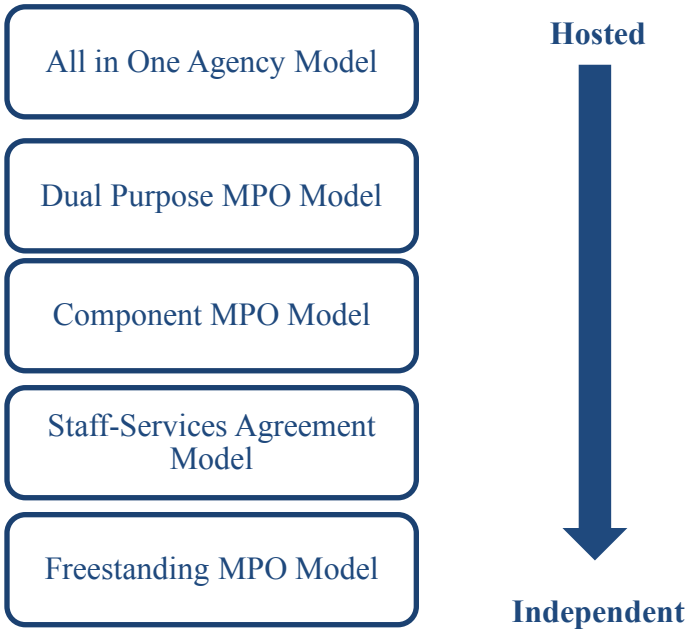


Figure 14. Hierarchy of the MPO Organization Models.
Source: Modified from (*21*).

3.2.3 MPO Funding

Independent of the MPO organizational setup discussed in the previous section, MPOs receive funds from various federal and local sources to pursue such transportation planning activities as developing transportation plans, programs, and other mandated documents. The primary federal grants are provided by FHWA and FTA. Generally MPOs receive 80 percent of their funds from federal grants and the remaining 20 percent funds from local and state governments through cash payments and other in-kind services (*23*).

FHWA funding is channeled to MPOs for transportation planning activities through state DOTs. The funds from FHWA (often referred to as PL-112 funds) are assigned to all the states on the basis of the ratio of the state's urbanized population to the nation's urbanized population, but a minimum of half a percent of the total funds is allocated to each state (6). State DOTs are responsible for allocating a portion of the FHWA funds they receive to MPOs whose planning areas have a population of 50,000 or more. Each state has its formula to decide what portion of the PL dollars to allocate to MPOs and how that MPO portion of money is allocated among MPOs in their state. In general, the allocation among MPOs within a state is based on population and air quality conformity standards for each MPO study area. Some states first distribute a share of the MPO portion of the PL dollars equally among all the MPO in the state and then distribute the remaining MPO money using a specific formula, while others apply their formula first and then later undertake adjustments (*24*, *25*). According to AMPO, MPOs receive an average of $924,693 PL dollars (*24*), but large MPOs receive substantially more PL funds than other MPOs. In fact, the median amount of PL dollars received by MPOs is only $302,000, which indicates that small- to medium-sized MPOs receive much less funds to execute a similar set of responsibilities as large MPOs.

FTA follows a slightly different and independent procedure from FHWA for distributing funds to state DOTs. About 80 percent of FTA funds (known as FTA-5303) are distributed based on the ratio of a state's urbanized population to the nation's urbanized population (this is similar to FHWA), while the remaining 20 percent are allocated according to an FTA formula to accommodate the planning needs in large, complex, urbanized areas that have a population over one million. There is no minimum guaranteed allocation of FTA-5303 funds for each state (*26*). State DOTs allocate these funds to the MPOs of urbanized areas in the state according to FTA-approved state-defined formulas.

The source of the FHWA and FTA funds themselves is cumulatively known as Transportation Planning Funds (TPF) that are 1.25 percent reserved from FHWA's Surface Transportation Program (STP); Bridge, Congestion Mitigation and Air Quality (CMAQ) Program; National Highway System (NHS) and Interstate Maintenance (IM) Programs; and FTA's Mass Transit Account of the Highway Trust Fund and the General Fund (*26*). The FHWA apportionment for years 2009 through 2011 averaged $316.59 million, while the FTA's metropolitan transportation planning funding contribution was $38.7 million for these years.[3] These funds vary greatly every

[3] The FHWA data have been sourced from http://www.fhwa.dot.gov/safetealu/fundtables.htm, while the FTA apportionment data have been sourced from the U.S. Government Printing Office documents "FTA Fiscal Year 2009-2011 Apportionments, Allocations and Program Information" for the fiscal years 2009 through 2011.

year depending on the extent to which Congress appropriates non-guaranteed funds authorized to be appropriated from the General Funds.

3.2.4 Funding in the Context of Texas

Within Texas, to distribute the federal planning funds, TxDOT TPP has developed a formula in cooperation with the MPOs; this formula has been approved by the Texas Transportation Commission, FHWA, and FTA. The formula considers factors such as population, status of planning, attainment of air quality standards, metropolitan area transportation needs, and other factors. In distributing the PL dollars, TxDOT sets aside two million dollars collectively for NAAs and for TMAs, as they share additional responsibilities. Of this, one million dollars is distributed amongst the NAAs based on their population with a minimum guaranteed amount of $50,000, while a similar approach is used to distribute the $1 million among the TMAs. The remaining apportionment is distributed to all the MPOs in proportion to population, with a minimum amount of $50,000 guaranteed to each one (*6*). FTA-5303 funds are allocated to MPOs based on the proportion of MPO population to the state population.

State governments provide support to MPOs within their state through a partial match of federal planning funds. Specifically, to receive FHWA planning dollars, a state has to generate a 20 percent match to the FHWA funds. The match need not all come from the state, but the state is responsible for generating the match. In practice, the match is also sometimes provided by local governments or third party agencies (*22*). Further, the match can be in the form of cash or in-kind services (such as insurance, purchasing, staff benefits, and engineering services). Overall, about 80 percent of planning dollars in a state are available through federal funds, and the remaining 20 percent are provided by state or local governments. TxDOT provides the 20 percent match in the form of in-kind services: TxDOT district offices match the 20 percent of PL-112 funds for each MPO, while TxDOT TPP provides the 20 percent match for FTA-5303 funds on a statewide basis (*6*).

3.2.5 Funding Challenges for Small- and Medium-Sized MPOs

One of the challenges small- and medium-sized MPOs face in Texas and across the nation is the lack of sufficient transportation planning funds to undertake transportation projects to address mobility and accessibility needs. As noted above, small- and medium-sized MPOs receive less federal and state funds when compared to large MPOs, though they have similar responsibilities as large MPOs. Even if the funding levels are reasonable, small- and medium-sized MPOs have less authority and independence to use transportation planning funds to determine which projects to implement. In addition, the arrangement of local and regional matching for federal transportation planning dollars (as opposed to state funding) makes it easier for MPOs in a region to secure federal funds through the state, but such local and regional matching is a challenge for small- and medium-sized MPOs.

While the issue of the intensity of funding is somewhat more difficult to resolve, one pathway forward is to provide small- and medium-sized MPOs with more flexibility and freedom to use the limited resources available to them. On the other hand, more flexibility at the MPO level in the use of federal transportation funds may make the system less transparent in terms of accountability and performance assessment of projects (*20*). Essentially, a system of *accountable responsibility* may be warranted, wherein small- and medium-sized MPOs work closely with

TxDOT TPP to examine TDM model results and generate a set of viable projects for investment but have more flexibility in final implementation decisions among the set of viable options. On the larger issue of the need for more funds, small- and medium-sized MPOs may need to act more entrepreneurially and explore alternate sources of funding by leveraging their unique position as an organization that can forge constructive relationships between important stakeholders (local and state governments, social service providers, affected interest groups, businesses, and decision makers).

3.2.6 General Planning Challenges for Small- and Medium-Sized MPOs

Capacity building for transportation planning has been recognized as an issue for small- and medium-sized MPOs for some time. In 2004, the Transportation Planning Capacity Building program facilitated a peer exchange for small- and medium-sized MPOs to discuss best practices to facilitate planning generally. Some of the recommendations are still relevant today and to the area of travel demand modeling. MPOs in the peer exchange identified these best practices:

- Recognize that coordinating with other agencies is part of the mission of an MPO. Improve coordination with other agencies by clarifying the MPO's mission and goals and learning more about other agencies.
- Increase opportunity for cooperation with other agencies by facilitating the exchange of information between agencies and improving communication.
- Use Memorandums of Understanding (MOUs) to formalize and clarify the respective roles and responsibilities of the different stakeholders in a project.
- Leverage relationships with other MPOs. Consider sharing resources and meeting regularly. Arizona, Pennsylvania, and Georgia were cited as examples of states that promote MPO interaction.
- Ask the state DOT to compile studies and projects relevant to the MPO area and make them available through the DOT website to enable the MPO to see available data.

Approximately one half of the participants in this peer exchange perform their own travel demand modeling in-house. The peer group identified funding constraints being a primary reason for smaller MPOs not doing so (*27*).

3.2.7 Travel Modeling Challenges for Small- and Medium-Sized MPOs

The specific technical area of travel demand modeling and needs of small- and medium-sized MPOs has also received attention. As mentioned in Chapter 1, FHWA published the item Modeling and Analysis Needs and Resources for Small Metropolitan Area Transportation Planning: Report on a Peer Exchange, in late 2012, in time for consideration by the research team for this study (*28*). In that report, key findings concerning small MPOs (with population under 200,000 according to Census 2000) included:

- These areas anecdotally have less need (and funding) for large-scale, long-term, capacity-oriented projects and therefore greater need for analysis tools to examine short-term operational and safety improvements. These tools may include micro-simulation tools, bottleneck analysis techniques, or highway capacity manual approaches, for example. Several of the MPOs in the peer group had extended their demand models to include DTA for this reason.

- When considering regional demand, the peer group noted that smaller metropolitan areas can be more affected by external traffic than larger areas, translating to greater relevance of a state DOT's statewide travel model for projecting future traffic flows through MPO areas.
- The study recommended collaboration between MPOs, including sharing training, perspectives, and trading in-kind services and information. Advantages and disadvantages of hiring consultants were explored, as well as leveraging local university expertise, where relevant.
- Another study recommendation suggested the use of National Household Travel Survey add-on surveys in places where local travel survey data are not feasible or affordable. One small Texas MPO was referenced as an example of innovative data collection in their adaptation of a GPS-based application used by volunteers in the community. State support was cited as providing a wealth of data for MPO modeling activities, echoing the Texas experience.
- The peer MPOs referenced an increasing need to examine non-auto modes in more detail.
- Using visualization methods to internally examine and then externally communicate model results to the public and decision makers was also recommended, including sector-to-sector traffic flow diagrams, travel time savings distributions, and other thematic maps.

The above peer exchange itself resulted from a request by Minnesota DOT to FHWA regarding recommendations for the role a state DOT can play in supporting small MPOs. These items echo the message heard in the interviews described in Chapter 2 of non-Texas MPOs and DOTs: Texas is not alone in seeking strategies to more efficiently assist MPOs with TDMs and other technical analysis appropriate for transportation decision making.

3.3 MPO STAFFING – A TALENT MANAGEMENT PERSPECTIVE

3.3.1 Introduction

Effective talent acquisition and management is a challenge for any organization and is particularly so for MPOs. Table 10 presents the average and median number of staff at MPOs throughout the nation, as obtained from the U.S. Government Accountability Office (GAO) (*20*). The average number of full-time staff across MPOs is 11. However, this estimate is highly biased toward the larger MPOs, as reflected in the relatively low median value of only four full-time staff. In fact, the average number of full-time staff at small MPOs is only three. These MPO staff personnel are expected to deal with a variety of planning issues, one of which is to provide assistance with TDM development. As a further complication, as policy needs change, so do the nature and structure of TDMs. Combined with typically rapid turnover rates of MPO staff personnel, the result tends to be a lack of continuity in TDM knowledge and skills at MPOs. Small- and medium-sized MPOs have to deal with the issue of talent gap on the one hand, while dealing with the lack of funding for talent acquisition on the other.

Table 10. Mean and Median Number of Staff at MPOs.

MPO Size	Mean number of full-time staff	Mean number of part-time staff	Median number of full-time staff	Median number of part-time staff
Small (population of less than 200,000)	3.19	1.43	2.00	1.00
Medium (population of 200,000 to 999,999)	8.19	1.50	7.00	1.00
Large (population of 1 million and above)	49.27	3.90	31.00	1.00
All MPOs	**10.96**	**1.77**	**4.00**	**1.00**

Source: (*20*)

To better understand talent management issues in organizations in general and to identify possible pathways forward for small and medium MPOs, the research team examined talent management literature in the field of human resource management. This research suggests the emergence of an increasingly integrated approach to talent management that encompasses multiple dimensions. A white paper on talent management by Balthazard identifies the key aspects of talent management (*29*). Figure 15 shows a modified talent management framework developed by the research team customized toward MPOs. Each component of this framework is discussed below in turn in the specific context of MPOs.

Figure 15. Components of Talent Management.
Source: Modified from (*29*)

3.3.2 Competency and Workforce Planning

Competency describes the knowledge and skills resident within an individual or an organization. Competency planning refers to the analysis and planning involved in ensuring that the collective human resource competencies at an organization are in sync with the full set of competencies needed by the staff to pursue the organization's goals and objectives. An important component of competency planning is to develop an inventory of required competences and available competences, and then identify areas of competency inadequacy (or talent gap) for workforce development. As a next step, a workforce plan is drafted. Workforce planning is the cornerstone of human resource management. Very broadly, strategic workforce planning involves estimating the supply and demand of talent and then identifying the actions necessary to close the talent gaps that exist today and may exist in the future (*30*). In the context of MPOs, this exercise could prove useful in helping Texas MPOs identify:

- Existing staff with appropriate skill sets and interest.
- Any competency inadequacy (i.e., talent gaps) in staffing.
- Appropriate personnel training.

These above steps provide the foundation for the MPO director to define a recruitment need, as well as identify any urgent need.

3.3.3 Recruitment

During the recruitment phase, the organization actively seeks to acquire a needed competency. For small- and medium-sized MPOs this phase is riddled with challenges. In a highly competitive labor market, there is a huge disparity between what benefits an MPO can offer and those that other opportunities offer. This coupled with the limited supply of people with the unique skill sets that the MPO demands makes it difficult for MPOs to attract quality talent.

While many different action plans may be pursued as part of a systematic approach, researchers identified three important facets of any such action plan. First, before deciding to hire someone new, the MPO, using a competency inventory, should identify existing staff having the required competency, using job rotation to minimize costs. If competency or capacity gaps still exist, a first component may be to access a talent pipeline of potential MPO staff through internship or fellowship programs with local universities, complemented with efforts to create an awareness of the opportunities and challenges that the transportation industry has to offer. Second, MPOs may position and brand themselves as an organization that shapes urban development of a region and makes tangible impacts to the quality of life of its citizens. MPOs need to actively promote this brand vision for their existence—as a public body focused on humanitarian causes. This may not only be an effective strategy to attract talent but may also improve retention of current employees. Third, a screening system may be considered to ensure efficient filtering of potential employees. For example, the MPOs may seek opinions from the state DOT or people in academia to evaluate the value and competencies that a potential employee brings to the table (*12*).

3.3.4 Learning Management

In the literature researched as part of this effort regarding learning management, individuals have two types of innate talents within them—actualized talent and potential talent (*29*). Actualized talent refers to the skill set an individual has currently, while potential talent refers to the skill set an individual can easily acquire if offered the right learning environment. Given how important skilled workers are and how quickly job descriptions can change in our quickly evolving world, many organizations have considered strategies to maximize their employees' talents. One strategy is a consistent but focused investment in training and development. Researchers define training and development as an organized activity aimed at imparting information and/or instructions to improve recipients' actualized talents. In addition, this activity should provide a learning environment that taps into employees' potential talent to perform and adapt well to changing work needs.

Figure 16 presents a suite of possible training and development methods. In the context of MPOs, the "on the job training" and "job instruction training" are perhaps the most practical and efficient methods. The pilot course being developed as part of the current study fits under the latter category. For any method chosen, implementation may be undertaken either through outsourcing to an external agency or through in-house development of the learning materials (such as tapping into the knowledge and skills of more experienced employees). Table 11 lists the advantages of each approach. Each of these aspects should be considered.

Figure 16. Training and Development Methods.

Table 11. Outsourcing vs. In-House Training.

Outsourcing	In-House Training
• Employee undergoing training will develop a broad and deep understanding of the issues. • Offers stronger diagnosis ability. • Provides a fresh and "out-of-the-box" perspective.	• Integrity of information is maintained (details imparted will be tailored to the context of the specific organization). • In line with the organization's core values and vision.

Learning management does not end with the development of training and development methods and modules, however. Appropriate preparation, including scheduling, is a necessity, as well as follow-up. In this context, De Smet et al. recommend the following (*31*):

1. *Help people who want to learn:* Organizations can foster an environment that highlights the need for knowledge development and skills acquisition. They can offer an interaction session that identifies the motivation and reasoning behind any training sessions offered.
2. *Uncover harmful mind-sets:* Even after acquiring a specific skill set, an individual may be reluctant to apply it owing to some pre-existing mindset. The organization should identify and dispel any such hindrances.
3. *Get the leaders on board:* The organization should involve leadership in the training to communicate that the subject matter is important.
4. *Reinforce the new skills:* The supervisor's role includes ensuring that the employee is correctly applying what they learned.

5. *Measure the impact:* The organization should develop appropriate measures of performance for a before-and-after evaluation of employee learning, and make changes to the training as appropriate.

3.3.5 Performance Management

Performance management includes activities that ensure that the goals of the organization are consistently being met in an effective and efficient manner. This exercise has to ensure that individual, team, and organizational activities and goals are all aligned and that the employee is performing well to achieve the collective vision and mission of the organization (*29*). The goal of performance management is to create a consistent, fair, and impartial process for the establishment of performance standards in an organization. To this end, MPOs need a metric that quantifies its success in mobilizing its resources and its workforce's productiveness. To identify where and how people are creating value, organizations typically use metrics designed to measure human productivity (*32*), sometimes referred to as key performance indicators. Many firms use quantitative key performance indicators such as cost of personnel and training time per employee, while others use more qualitative employee-output related key performance indicators including value added per person and the return on investment of training or recruiting.

3.3.6 Compensation

Compensation refers to all forms of payments and benefits, including direct financial payments (such as salaries and bonuses), indirect payment (such as paid insurance), and non-monetary perks. The issue of fairness should always be fundamental in an organization's compensation policy. Rewards should be linked with performance and, as noted before, performance should be measured equitably (*29*). Though the MPOs might not have much flexibility in terms of pay, they can encourage some form of recognition within the office for their best employees to motivate deserving individuals and other non-monetary perks.

3.3.7 Career Development and Succession Planning

Organizations cultivate leaders in several ways: by giving them feedback, coaching, mentoring, and training (*33*). It is often the case that such informal but deliberate nurturing within companies brings out leaders. Jones recommends some basic principles that a company should adopt to keep employees motivated and develop leaders (*33*). Here these principles are presented in the context of the MPO.

It is imperative that the senior staff at the MPOs build a rapport with other staff and encourage their development. High-achievers may appreciate being recognized. Developing leaders from within is beneficial as these individuals can facilitate staff transitions and succession as appropriate. On the other side, it is equally important for MPOs, after a systematic, objective, and defensible assessment of performance, to sideline non-performers from key positions. This results in improved work product quality, as well as demonstrates to other employees that quality work is appreciated.

3.4 TRAVEL DEMAND MODEL DEVELOPMENT – A PROJECT MANAGEMENT PERSPECTIVE

3.4.1 Introduction

For many MPOs with TDMs, modeling activities are at the core of the functions that an MPO undertakes. The TDM provides travel-related quantitative numbers that inform many MPO policy decisions. However, the TDM development could become very laborious if not done systematically. This section looks at the TDM development from a project management perspective.

The Project Management Institute provides the following definition of a project: *A project is a temporary endeavor undertaken to create a unique product, service, or result* (*34*). Larson and Gray describe the major characteristics of a project as follows (*35*):

- An established objective.
- A defined life span with a beginning and an end.
- Usually, the involvement of several departments and professionals.
- Typically, doing something that has never been done before.
- Specific time, cost, and performance requirements.

Most importantly, a project should not be confused with everyday work. In the context of MPOs, the Travel Demand Development Process is a project. To establish this, researchers look at the five major characteristics of a project and put things in perspective:

1. *An established objective* – to develop a TDM that will reflect the region's growth and transportation needs and provide a means to evaluate alternative plans and policies within the scope of the planning period.
2. *A defined life span with a beginning and an end* – it is aligned with the development cycle of the MPO's Long Range Transportation Plan.
3. *Usually, the involvement of several departments and professionals* – the MPOs and TxDOT are equally invested in this endeavor.
4. *Typically, doing something that has never been done before* – every version of TDM being developed builds on its predecessor and adds value.
5. *Specific time, cost, and performance requirements* – the MPOs and TxDOT work on TDM development with limited staff and resources under pre-determined federally mandated timelines and limited funding.

The next section discusses how projects are typically organized and scheduled, providing suggestions for MPOs to make the TDM process potentially more efficient and effective.

3.4.2 Organizing Projects

A project management system provides a framework for implementing project activities within an organization. Once a project has been commissioned, one of three different project management structures is used by firms to implement projects: functional organization, projectized organization, and matrix structure. Table 12 shows the key project-related

characteristics of the major types of organizational structures. Each of the organizational structures is discussed.

Table 12. Organizational Influence on Projects.

Organization Structure Characteristics	Functional	Matrix			Projectized
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Who controls the project budget	Functional Manager[4]	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's role	Part-time	Part-time	Full-time	Full-time	Full-time
Project Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time

Source: (*35*)

- **Functional Organization:** In this approach, projects are managed within the existing functional hierarchy of the organization, wherein the staff members are grouped based on their skill set into departments. The responsibilities are relegated to the respective departments and each department, independent of the other departments, will have to complete its project work. Communication is through usual management channels.
- **Projectized Organization:** This approach is at the other end of the spectrum. Dedicated project teams, which operate separately from the parent organization, take over the project. They may or may not be financially constrained by the parent organization.
- **Matrix Organization:** Matrix management is a hybrid organizational form that is between the extremes of the functional organization approach and the projectized organization approach. The matrix approach adopts a dual chain of command—one along functional lines and the other along project lines, with the project staff reporting simultaneously to both functional and project managers. Depending on the nature and extent of the project manager's influence, the matrix management structure can be further divided into weak, balanced, and strong matrix types.

The current setup for TDM development appears to fall under the functional organization approach, which offers considerable flexibility to the MPO with respect to its staffing resources

[4] The functional manager refers to the departmental head – in the context of the MPO it would be the MPO director. The project manager, on the other hand, is the lead expertise with respect to that specific project. This position is comparable to the Chief Modeler position for the TDM process.

without substantially impacting its day-to-day functioning. However, such an organizational approach can also lead to problems in quality control as well as lack of coordination and difficulty in meeting deadlines as MPO staff must juggle between TDM tasks and other obligations. Also, it is possible that since MPO staff work only on segments of the project, they do not identify with the entire project. The administrative communication channels might also slow down the process to some extent.

A possible alternative project management structure that may be considered by MPOs is the weak or balanced matrix approach. Such an approach recognizes the relative lack of independence of small- and medium-sized MPOs as well as the severe resource constraints under which these MPOs operate. This shift would require relatively minimal administrative changes. This, however, would involve assigning a project manager whose role would be to oversee the TDM process for the MPO ensuring that things get done right and on time. Identifying this specific role and responsibility at the MPO level may prove to be pivotal in fostering a sense of ownership with the project at the MPO level. At the same time, the flexibility of the staffing resources that currently exists would remain unchanged.

3.4.3 Project Scheduling

The next step in the project management process is the proper scheduling of the project to ensure appropriate resource allocation and timely completion of the project. As a first step, a work flow network has to be created. Described in the literature as simple graphic displaying the sequential flow of work and tasks (or "activities") throughout the project is easily understood by everyone, this need is clearly met by the new TxDOT TPP Timeline Tool. TxDOT TPP already consults with the MPO in the identification of responsibilities and agreement on the schedule in the Timeline Tool, a good step to ensure all parties agree on deadlines.

The literature includes two general types of decision support systems which could serve to schedule the TDM project (*35*): (1) CPM – Critical Path Method (*36*, *37*), or (2) PERT – Project Evaluation and Review Technique (*38*, *39*). The Critical Path Method is discussed first in some detail, since the method also constitutes an important part of the PERT Method. However, the PERT method also accommodates some additional considerations that researchers will discuss briefly after the overview of the CPM method.

Critical Path Method: Basically, the CPM entails the completion of a forward and backward scheduling pass that answers several questions, as listed below (in the listing below, an "activity" may be viewed as a specific task of the TDM project) (*35*).

Forward Pass—Earliest Times

1. How soon can the activity start? (early start—ES)
2. How soon can the activity finish? (early finish—EF)
3. How soon can the project be finished? (expected time of completion)

Backward Pass—Latest Times

1. How late can the activity start? (late start—LS)
2. How late can the activity finish? (late finish—LF)

3. What activities represent the critical path? This is the longest path in the network which, if delayed, will delay the project.
4. How long can the activity be delayed? (slack or float—SL)

The forward pass starts with the first project activity (with ES set to zero) and follows each path through the network to the last activity. Following the path, researchers add the activity duration and get the ES and EF for each activity (ES + Duration = EF). The sequence of project activities which add up to the maximum overall duration is called the critical path, and the schedule activities on a critical path are called "critical activities." The value of EF for the final activity corresponds to the expected time of completion for the entire project. The backward pass starts with the last activity on the network. Then, the process includes a step to backtrack along each path deducting activity durations to determine the late start and finish times for each activity. The backward pass begins by setting the late finish for the final activity, which is usually set equal to the early finish of this final activity (as obtained from the forward pass, which is also equal to the expected time of completion) or any project deadline that may exist.

After the forward and backward passes have been completed researchers measure the schedule flexibility by computing the difference between the early and late start/finish times. This difference between the LS and ES (LS − ES = SL) or between LF and EF (LF − EF = SL) is called the "total float." A critical path is typically characterized by zero total float. Total float tells us how flexible an activity is (i.e., by how much can it exceed its early finish date) without delaying the project completion date. It is also possible to determine "free float" – the amount of time that an activity can be delayed without impacting the early start of any activity that immediately follows.

Once the critical path is identified, the project managers can manage resources and staff dynamically throughout the project to avoid delays. If any critical activity is delayed, the project manager should identify and shorten those tasks that will have the least incremental cost – this is called schedule crashing. Also, the project manager should identify the paths that are not critical, but with very little slack, and consider compressing activities along those paths also – this is called fast-tracking.

Project Evaluation and Review Technique: One of the drawbacks of the Critical Path Method just discussed is that it is deterministic. This is overcome by using PERT. PERT focuses on scheduling projects under uncertainty. This involves specifying three estimates—optimistic, pessimistic, and most likely completion times—to define an approximate range of activity duration (assumed to be beta distributed). Using random draws the network is simulated many times over. At the end of PERT simulation, the project manager is equipped with a list of possible critical paths and their probabilities of occurring. While appealing, PERT can also be somewhat more confusing to absorb compared to the simpler CPM approach. Generally, MPOs in cooperation with TxDOT TPP should consider incorporating a critical path approach to scheduling TDM development tasks, if this is not already occurring.

3.4.4 Data Management

In this computer-centered world, data flow occurs at a phenomenal rate that can become overwhelming if an organization is not equipped with the correct tools. Data-centric projects such as the TDM development process require a system in place that can control data quality and help ensure data integrity. The literature identifies various options for use by smaller institutions,

which were the focus of this inquiry. None of the MPOs identified data storage as an issue, and certainly TxDOT has this aspect covered.

An area which is often a challenge for even the most sophisticated data users is how to organize working files, that is, those files which are not yet completed deliverables and which multiple people may need to access and update. In this case, the suggestions for efficiency and clarity in data sharing do apply. The literature suggests organizing active files around a single on-line repository accessible by the users involved with the project, for example:

- Dropbox (https://www.dropbox.com/) – storage with automatic synchronization.
- Google Drive (https://drive.google.com/start#home) – storage with automatic synchronization.
- Microsoft SharePoint – proprietary – web-based collaboration platform.

TxDOT already uses Dropbox for file transfer. Using this or one of these other data sharing tools and by having a systematic list of organized folders on the TxDOT TPP end, the MPOs can just copy everything that needs to be transferred into one single folder that automatically synchronize with the TxDOT TPP folders. It is also possible on the TxDOT TPP end to ask the synchronizing software to create duplicates so as to avoid risk of data loss or data overwriting. One other approach suggested by the literature and research team experience would be to maintain an independent online collaboration platform—a unified web location—with commonly used guidelines making it easy for people to share ideas and find the information and contacts they need to get their jobs done. These examples represent types of approaches for consideration.

3.4.5 Project Learning

Norman Kerth coined the term *project retrospective* to define the process of gathering the project team at the end of a project to review and learn from the experience (*40*). This involves a systematic approach. As a first step, the participating employees should be reassured by communicating to them that "regardless of what we discover, we understand and truly believe that everyone did the best job they could, given what they knew at the time, their skills and abilities, the resources available, and the situation at hand" (*41*). The next step is to identify an independent facilitator who will serve as a moderator and guide for the sessions. Ideally, the facilitator should be an experienced and impartial staff member who was not involved directly with the project. Such an arrangement greatly reduces the chances of employees getting intimidated to communicate "bad news" to the senior management, as the facilitator is independent of the project. The facilitator should draft a questionnaire that is aimed at teasing out cause-effect relationships, i.e., "task *a* was delayed because resource *b* was insufficient." The value of these retrospectives increases as they are examined collectively and over time, in order to measure progress and to discern patterns which can be either addressed (if a negative) or propagated (if positive).

3.5 CHAPTER SUMMARY AND RECOMMENDATIONS

This chapter presented challenges to and possible alternatives for the current operation and functioning of Texas MPOs that can potentially increase their efficiency in the TDM development and application process, as well as their overall competence level. Specifically, researchers have examined the state-of-the-practice in the nation on MPO structure and MPO

funding. Further, researchers identified the state-of-the art of techniques in the field of human resource management and project management and examined their applicability in the context of small and medium MPOs of Texas and the TDM development process. Broadly, researchers made the following recommendations (details are within each section).

3.5.1 Recommendations for MPO Training Course

While the context for Texas MPOs may change—under future federal legislation, if TxDOT's role in assisting the MPOs with the TDMs changes, even in response to internal staffing changes at each individual MPO—the current context is the one that the pilot course is intended to address. Therefore, the learning objectives for the MPO training course should include techniques for MPO directors to:

- Consider the development of a TDM as a project and themselves as the project manager.
- Understand TDM concepts, tools, resources, and data available to the level of detail necessary to manage the process whereby the MPO develops the TDM inputs.
- Understand how to apply the MPO's TDM as part of the MTP planning process.
- Implement and ensure a quality assurance process at the MPO level for TDM inputs.
- Understand and be able to identify quality assurance aspects in the TDM development and application activities.
- Assign the MPO's technical and quality control tasks to appropriate staff.
- Identify resources that are typically available for TDM activities, including staff, data, training, and assistance.
- Identify critical path schedule and resource constraints which might derail a TDM development schedule.
- Widen the existing spectrum of resources, considering flexible and creative approaches such as those explored in this chapter.

3.5.2 Other Recommendations

Other recommendations pertain more generally, based upon findings in this chapter and needs identified during the information gathering stage.

Section 3.2 presented the five types of organizational setup models. As part of the process management process for the travel demand model development project, each MPO should be aware which one of the five types the MPO falls into. This identification can help customize communications and information flow between TxDOT TPP and MPOs, including gaining an understanding of who exactly to talk to at MPOs or their hosting agency for high-level decision making and to resolve operational hiccups.

TxDOT may wish to consider providing additional flexibility, beyond its current practice, to the MPOs to use funds for TDM development activities, to hire modeling staff, support additional training, or contract out modeling activities; concurrently, TxDOT might expect higher MPO accountability for modeling tasks (Section 3.2 provides pertinent information in this regard). TxDOT may also, through its training programs and mentor relationship, encourage small- and medium-sized MPOs to adopt a more entrepreneurial spirit and explore alternate sources of funding by leveraging their unique position as an organization that can forge constructive relationships between important stakeholders.

MPOs may consider the six-component talent management framework developed by the research team for MPOs (Section 3.3 details this framework); examine the recommendations made by the team under each component of this framework. Each component of this framework should be discussed in turn in the specific context of the individual MPO.

TxDOT and each MPO could examine the project management perspective articulated in this report for the TDM process; specifically, the research team advocates considering the "Model as Project" concept, the matrix-based approach to project organization (Section 3.4 provides additional detail).

TxDOT and the MPOs could evaluate the existing options for data sharing to control for data quality and ensure data integrity (Section 3.4 provides examples).

TxDOT and the MPOs could conduct a project retrospective analysis after each TDM implementation in order to promote dialogue and identify positive steps forward for the next model development process (Section 3.4 describes this type of analysis).

Many of these recommendations above are actions that the MPOs may consider today or in the future. Some of these recommendations, specifically addressing the "Managing the Travel Model Process" course, will be highlighted as key recommendations in the concluding chapter.

CHAPTER 4. PILOT TEST: STAND-ALONE TRAINING COURSE

4.1 INTRODUCTION

The findings documented in the previous chapters speak to the need for a training course to address the non-technical, managerial aspects of travel demand modeling in support of MPO activities. This research has identified the topical areas of greatest need for MPO capacity building with respect to TDM activities as:

- Travel model uses, when required and best practice.
- Process steps of model development and application.
- Resources available for developing model inputs.
- Roles and responsibilities in the process to develop and apply a model in support of an MTP.
- Putting it all together to support timely use of the model for the purpose of MPO required products, including the MTP.

Hence, as originally envisioned in the research work plan, materials were developed to test a course directed at Texas MPO directors and MPO staff involved in managing the MPO side of TDM development. The process to develop materials for the proposed pilot course began toward the end of the interviews. The course materials were expanded and refined through various feedback opportunities prior to the pilot course as shown in Figure 17.

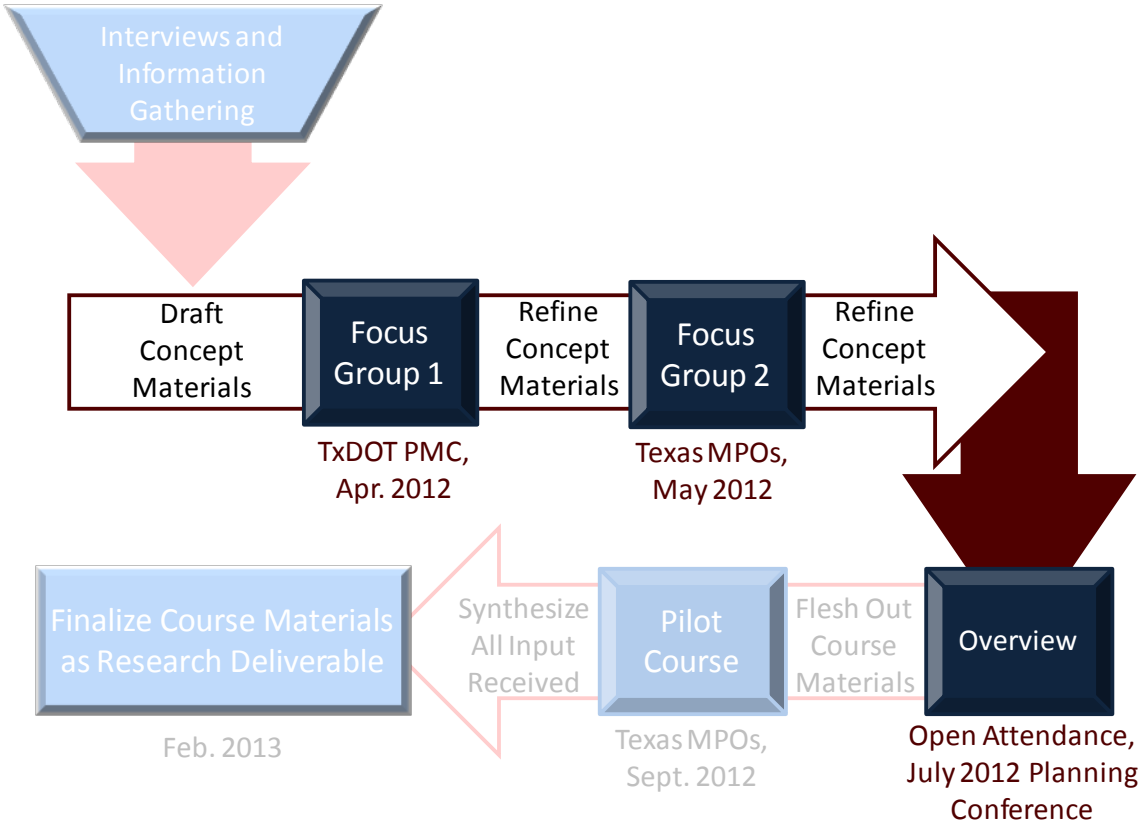


Figure 17. Interim Milestones in Developing and Refining the Training Course Materials.

4.2 FOCUS GROUPS AND OVERVIEW WORKSHOP

Following the interviews and research into MPOs and general institutional capacity building, researchers moved to conceptualize awareness-building materials for the purpose of improving the process of model inputs development by small and medium Texas MPOs. During this phase, then, the purpose of additional focus groups meetings was to gain feedback on these materials from the TxDOT TPP and Texas MPO stakeholders most directly involved in the TDM development process. The focus group opportunities included:

- **Focus Group 1: PMC Meeting, April 25, 2012**. The first focus group was held on April 25, 2012, as part of the regular research effort PMC meeting; this meeting included TxDOT TPP staff on the PMC, with the addition of a Federal Highway Administration Texas Division representative and a representative from the TxDOT Environmental Affairs Division (TxDOT-ENV). The purpose of Focus Group 1 was to solicit input from PMC members, plus FHWA Texas Division and TxDOT ENV representatives, on the first draft concept materials for the pilot course. The PMC already includes representatives from TxDOT TPP and Texas MPOs; the representatives from FHWA and ENV were invited to ensure that the research team had properly presented specific planning process requirements in course materials.
- **Focus Group 2: Texas MPOs, May 23, 2012**. The second focus group was held on May 23, 2012, following a regular meeting of the Texas MPOs organization, TEMPO. The purpose of Focus Group 2 was to solicit input from Texas MPO directors (or designated staff) on current draft concept materials for the pilot course to be tested as part of the research effort. The agenda itself was structured around the presentation materials, including the draft agenda for the training course to be reviewed. Meeting attendance included nine Texas MPO directors (one interim), three Texas MPO staff, and six research team members.

The focus group meetings were immensely productive and provided insights well beyond the scope of the questions asked, providing a variety of perspectives, insights, examples, and inspiration to the research team. All of this information was subsequently communicated to the PMC as part of regular PMC meetings. Some of the Focus Group 2 participant suggestions included process improvements focusing on ways that TxDOT TPP could facilitate the model development process. Generally, participants were eager to share their experiences. As originally intended, each focus group represented an additional step in the progression toward the course materials to be tested as part of the pilot course implementation.

Generally, a vision for the pilot course materials emerged out of the focus groups. The course would be focused upon empowering the MPO Directors to expand their institutional capacity with respect to TDM activities, encompassed in this statement made by one MPO:

> Assist in identifying for MPOs a path for innovation at the same time that it helps to manage expectations for what is possible under the existing process, that is, enable the MPOs to be as productive and efficient within the context today but also provide MPOs approaches for process improvement, including technical improvements to the models themselves to address area-specific questions.

4.3 WORKSHOP OVERVIEW: JULY 17, 2012 (TXDOT PLANNING CONFERENCE)

In addition to the two focus groups, the research team, with the permission of and introduction by TxDOT TPP staff on the PMC, conducted an additional, non-scoped effort to provide additional opportunity for input on the proposed "Managing the Travel Model Process" training course lesson objectives and concept materials. The overview was conducted for three hours on July 17, 2012, in Dallas, Texas, at the hotel where the TxDOT Planning Conference was to officially start the following day. Registration for the overview was available to all conference attendees and therefore all who registered saw the announcement of the overview on the conference webpage. Over 100 conference attendees registered, and the room was full. Representation at the overview included FHWA, MPO, TxDOT, and consultant staff, in addition to the research team and a few attendees from other states.

During the presentation, the research team covered the study purpose, progress, overall course objectives, each lesson's objectives, and 4–10 slides per lesson to demonstrate the general approach, level of detail, and topics the course would include. Comments and questions were fielded during the presentation, and participants were encouraged regularly through the presentation to fill out their participant input forms.

The evaluation results were tabulated and presented at the next PMC meeting. The overview was well received: participants ranked each of the lessons and the course overall over 4 on a scale of 1–5, with 5 being the highest rank. Numerous specific comments were also provided for each lesson and the course overall, all of which were reviewed in detail by the research team to inform further course materials refinement and development of new materials, as appropriate.

4.4 PILOT COURSE MATERIALS DEVELOPMENT

By the time the pilot began, the course materials had undergone substantial comment and refinements, including two extensive work sessions with the PMC in the weeks prior. The research team included not only four travel demand modelers but also two non-modelers, each a highly trained professional facilitator and one an instructor certified to provide National Highway Institute courses. Therefore, in addition to the technically rich content, the course approach has been structured to maximize participant engagement and learning, specifically:

- Course learning objectives were stated at the beginning of the course, and the lessons were structured to meet the course objectives. These were reiterated at the end of the course.
- Lesson-by-lesson learning objectives were stated at the beginning of each lesson and the lecture, exhibits, and activities were developed to meet the lesson objectives. These were reiterated at the end of each lesson.
- Lecture was limited to 40 percent of overall course content, with other material including question and answer engagement, group and individual activities, and group discussions.
- As appropriate for more complex concepts, presentation slide graphics are animated to improve communication potential.
- Reference materials were included in the handbook, as appropriate. For example, an exhibit listing data resources is provided under Lesson 4, where data are discussed.
- Two lecturers traded lessons to reduce audience tune-out and lecturer exhaustion.

The pilot course handbook is not provided as an appendix to this report because it is available as a separate research deliverable. The pilot course presentation slides are provided in Appendix B. To communicate the approach of the course, the following section highlights some of the key content messages that the pilot course delivered.

4.5 PILOT COURSE KEY MESSAGING

The course introduction contains this key message: every MPO and every MPO Director is unique. However, most large and small MPOs share common travel model challenges. From the research in this effort, the study identified the spectrum of challenges shown in Figure 18. These change over time as the MPO Director gains experience, MPO staff changes, the community changes, different transportation policy and project questions need to be studied, etc. Identifying the specific challenges of an MPO is key to setting and meeting improvement goals.

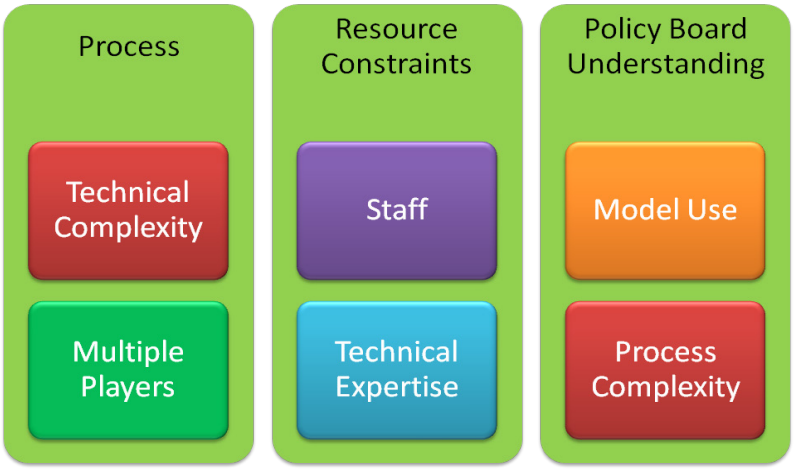


Figure 18. MPOs Large, Medium, and Small Share Common Challenges.

The course also introduces the vocabulary for managing the travel model process. Lesson 1 introduces the model concept, specifically that a model is a representation of traffic for a known time ("today") that an analyst applies to future year conditions to forecast traffic. The base model for the year when traffic is known is shown in Figure 19. From this key model concept, the course builds a vocabulary for using travel models in the planning process, starting with these terms:

- Develop a base year model.
- Calibrate and validate a base year model.
- Apply a model to a forecast year.

A question explored in Lesson 2 is when a model is required to support an MTP. From the interviews, it was clear that there is a lot of confusion on this issue outside of TxDOT TPP. Figure 20 shows one of the graphics presented to explain model requirements.

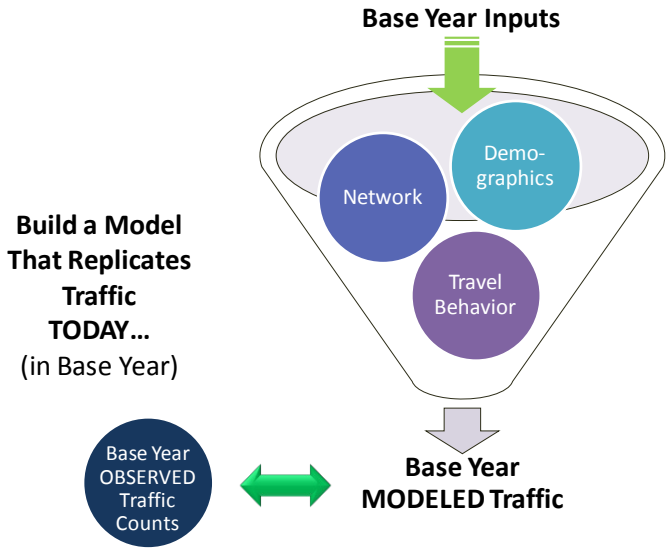


Figure 19. Model Concept.

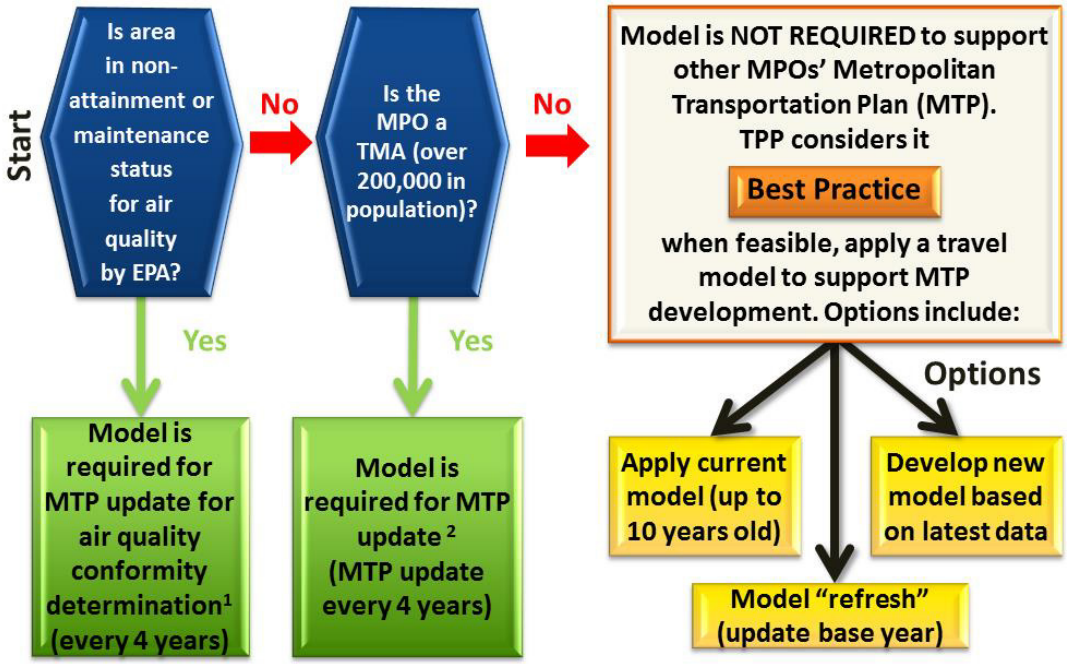


Figure 20. When Is a Model Required for an MTP?

[1] Federal requirement pertains only to TMAs that are serious, severe, or extreme ozone, or serious CO, nonattainment areas (http://www.fhwa.dot.gov/planning/certcheck.htm). The State of Texas requires that all nonattainment area plans be based on travel demand models, with more stringent model requirements for the areas that fall into the federal model requirement category (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20). See also TAC Title 30, Part 1, Rule 114.260.

[2] Under federal rule, all other TMAs (not in first group) must meet minimum travel model standards under Conformity Rule IF already previous practice ("no backsliding"). The State of Texas requires that long-range plans by TMAs be based on "estimates of travel demand" and that "development of long-range transportation plans relies on computer travel demand forecasting" (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20).

Another critical concept for MPO directors to understand is that sometimes the model they have in hand is sufficient for the modeling tasks needed or the available time and resources. It was explained that 5 years old is still relatively young for a travel model if certain criteria are met, including that no substantial changes in local growth pattern or travel behavior. The example of an old and new model vehicle as shown in Figure 21 demonstrates this concept.

Following this discussion, Lesson 2 includes material on options for even older models, introduced with a picture of a 2002-model vehicle in Figure 22. The "Kicking the Tires" exhibit shown in Figure 23 exemplifies the type of tools incorporated in the handbook. This opportunity is when these terms are added to the TDM management vocabulary:

- Update a model.
- Stale model.
- Refresh a model (also known as a non-traditional update).

Figure 21. Models: 5 Years Old versus New.

Figure 22. Models: Older than 10 Years.

Exhibit 2.e "Kicking the Tires" of an "Older" Base Year Model

How Old Is "Old"?

If the base year of the model is…	Then the model is…
< 5 years old at MTP adoption,	not "old."
> 5 years old but < 10 years old at MTP adoption,	may need adjustments for application. See the remaining sections of this exhibit.
> 10 years old at MTP adoption,	"stale." Review options for a full new model development OR nontraditional update of the base year model.

What Is the Forecast Year of the Current Model?

If the forecast year of the model is…	Then…
≥ the 20+5 rule (the 20-year planning horizon that the MTP must span plus the 5 years that the MTP is valid),	The current forecast year is still applicable without additional work, as long as the network is adjusted to include any new projects added to the MTP and the model is re-applied for the forecast year.
< the 20+5 rule (the 20-year planning horizon that the MTP must span plus the 5 years that the MTP is valid),	One simple option is to create forecast year demographics and network, and re-apply the existing model to the new forecast year.

Other Questions to Consider: Confidence in Model Performance

Has the study area undergone significant change since the base year that would affect the model's representation of the study area?

Examples:

- How confident are you in the quality of model inputs for the original base year? For the forecast year?
- From a practical perspective, is there potential to develop a new model within your MTP time frame?
- Are data available to support a new base year?

One test to consider is running new base data in the model (demographics and network) and looking at how well the model matches counts (a preliminary "refresh" – see next section).

Figure 23. "Kicking the Tires" Exhibit.

Lesson 2 continues by explaining the big-picture steps to develop a new base year model, including a simple schedule showing a possible process when MTP and model development cycles align, as shown in Figure 24. This simple schedule serves as the basis for an introduction for Lesson 3 of model inputs development and Lesson 5 for all the possibilities that occur when the schedule is not so straightforward.

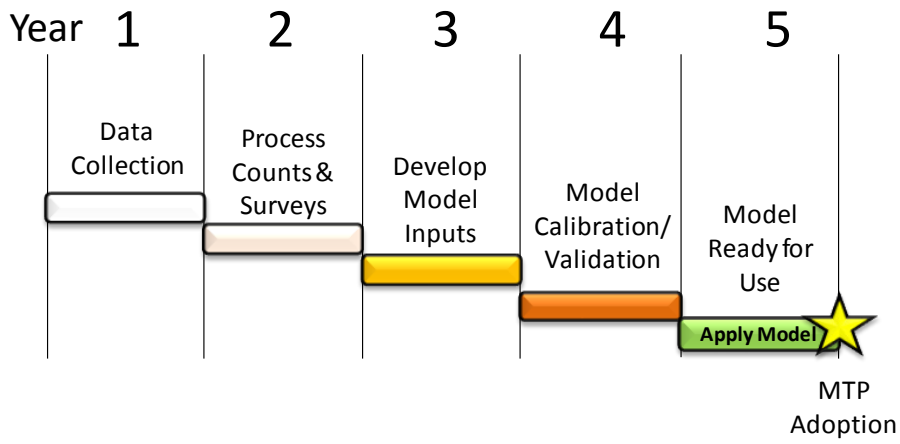


Figure 24. When MTP and Model Development Cycles Align.

Lesson 3 explores need-to-know concepts for the MPO director managing TDM model inputs development. An overview of the model inputs that the MPO is responsible for is included, to ensure that the MPO directors have a fundamental understanding of the technical process they are managing and have basic knowledge in order to provide guidance and feedback. One exhibit to assist MPO directors in this regard is shown in Figure 26.

A core concept presented and discussed is quality review, including the concepts of internal and external review of model inputs, as shown in Figure 25. An example internal MPO quality assurance protocol is also included in the Handbook, as shown in Figure 27, for discussion and consideration.

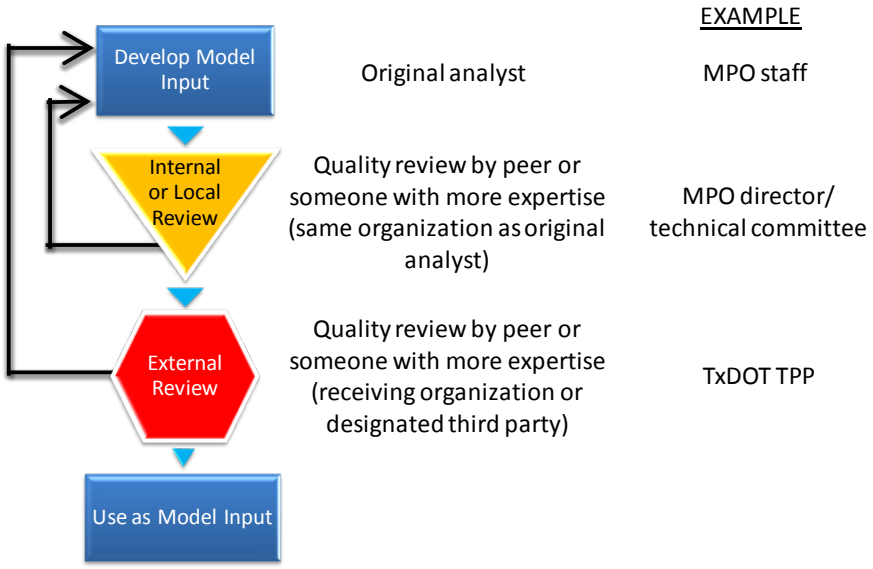


Figure 25. Quality Concept: Internal and External Review.

Exhibit 3.e Base Year and Forecast Year Demographic Approaches

	Base Year	Forecast Year
Description of Item	TransCAD shapefile with required attribute data representing the base year traffic analysis zones (TAZs) (typically provided by TxDOT)	Same geography, but data for forecast year
Possible Input Data Options	• TAZ geography • Population data estimates/control totals (Texas State Data Center) • One-Stop Demographic Data Analysis Tool • Most recent Census data by block group • Other ways to account (building permits or septic system permits) • Employment data (Texas Workforce Commission) • Local knowledge • 911 datasets	• SDC forecast year control totals • MPO needs to choose • Recommendation • Local plans/knowledge • Check with other agencies that have to do forecast planning
Suggested Skill Set of Technical Staff Doing the Work	• Attention to detail • Awareness of local data sources • General level of understanding of typical development patterns of region	• Understanding of expected economic growth and/or changes to drivers of population and employment change
Suggested Skill Set of Reviewer	• Same as technical staff or better understanding	• Understanding of relationship of population growth to employment growth
Common Issues to Avoid	• Employment by employment type not consistent with population or household characteristics	• Changes in employment total and mix from base year inconsistent w/ changes in population • Failure to match chosen control total (or neglecting to explain discrepancy)

Figure 26. Demographic Approaches.

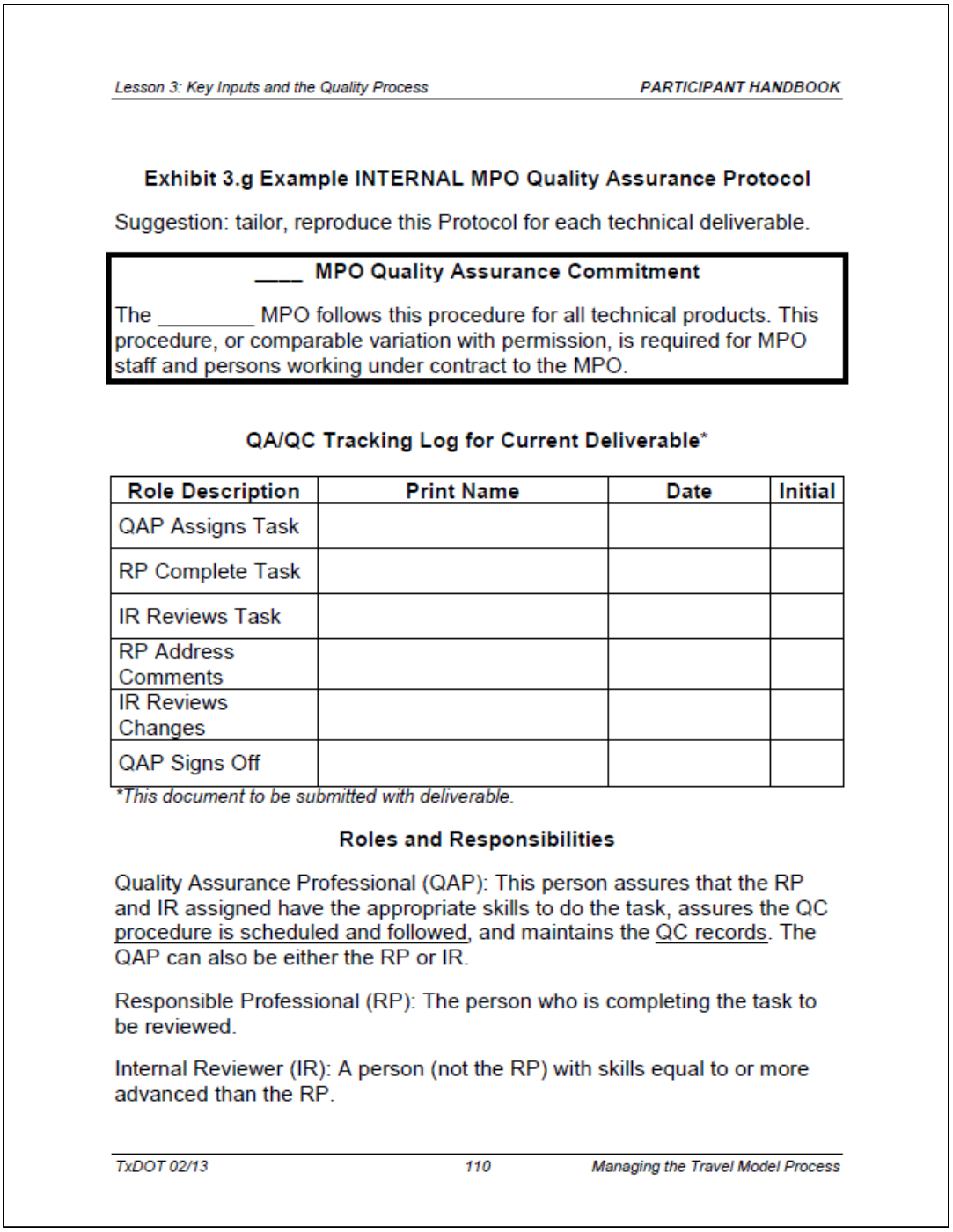


Exhibit 3.g Example INTERNAL MPO Quality Assurance Protocol

Suggestion: tailor, reproduce this Protocol for each technical deliverable.

____ MPO Quality Assurance Commitment

The _____ MPO follows this procedure for all technical products. This procedure, or comparable variation with permission, is required for MPO staff and persons working under contract to the MPO.

QA/QC Tracking Log for Current Deliverable*

Role Description	Print Name	Date	Initial
QAP Assigns Task			
RP Complete Task			
IR Reviews Task			
RP Address Comments			
IR Reviews Changes			
QAP Signs Off			

**This document to be submitted with deliverable.*

Roles and Responsibilities

Quality Assurance Professional (QAP): This person assures that the RP and IR assigned have the appropriate skills to do the task, assures the QC procedure is scheduled and followed, and maintains the QC records. The QAP can also be either the RP or IR.

Responsible Professional (RP): The person who is completing the task to be reviewed.

Internal Reviewer (IR): A person (not the RP) with skills equal to or more advanced than the RP.

Figure 27. Example Quality Assurance Protocol.

Lesson 4 was designed to present the various resources available to MPOs for modeling activities and explore options for expanding those resources creatively, including partnerships, flexible work arrangements, and looking outside the MPO. Figure 28 shows the spectrum of areas covered in Lesson 4. Example exhibits from the handbook are shown in Figure 29, Figure 30, and Figure 31.

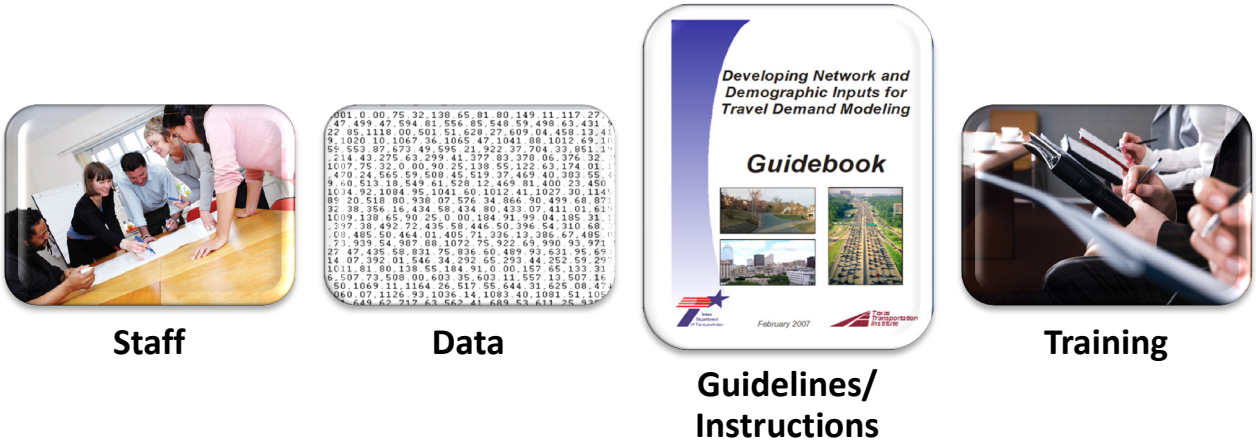


Figure 28. Identifying and Expanding the MPO's List of Resources.

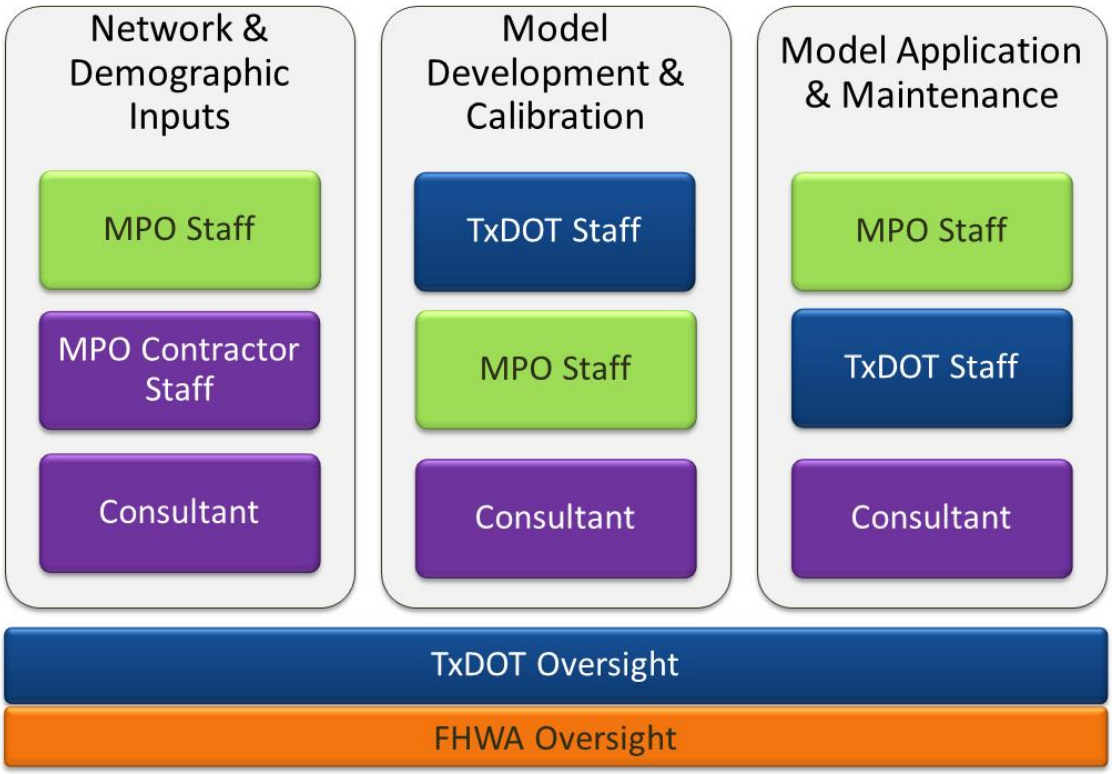
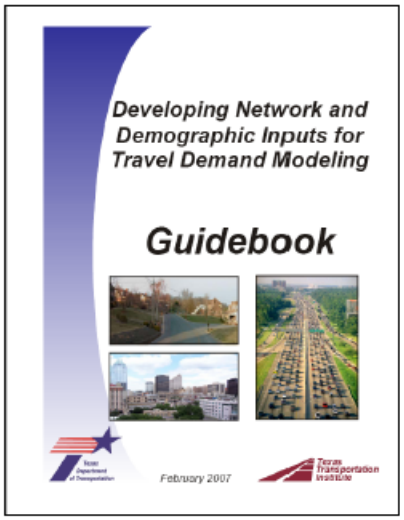


Figure 29. Model Staffing Options.

Exhibit 4.e Texas-Specific Guidelines and References Available to MPOs

Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook, TxDOT and TTI, February 2007.



Memo: Aggregating Census Data (January 2012)

Memo: Geo-coding TWC Data (January 2012)

Memo: Using Dataferret

Memo: Aggregating Census Data

ATOM2 User Manual, Texas Department of Transportation, February 2001.

Texas Travel Demand Model Applications Guidebook, Texas Department of Transportation, 2007.

TripCal5 Inputs Manual, Texas Transportation Institute, 1999.

TripCal5 User's Manual, Texas Department of Transportation, 1990.

Figure 30. Texas-Specific List of Resources.

Exhibit 4.g Model Training Available to MPOs

TxDOT (or under contract through Texas A&M Transportation Institute) A. General TransCAD Training (TTI) B. Introduction to Travel Demand Modeling (TTI) C. Model Inputs Development Training (TTI) D. Model Application/Alternatives Analysis Training (TTI) *Contact TxDOT-TPP staff or the TransCAD Help Desk:* TPP-TRANSCAD-HELPDDESK@txdot.gov or 512/486-5177
NHI Introduction to Urban Travel Demand Forecasting Course http://www.nhi.fhwa.dot.gov/training/course_detail.aspx?num=FHWA-NHI-152054&topicnum=151 *Free version of materials available, but for course to be offered in Texas, contact TxDOT-TPP staff or the TransCAD Help Desk:* TPP-TRANSCAD-HELPDDESK@txdot.gov or 512/486-5177
TMIP Webinars See http://tmiponline.org/Services.aspx
Caliper Corporation (TransCAD software developer) Travel Demand Modeling with TransCAD and On-site Training Options http://www.caliper.com/

Figure 31. Model Training Available to MPOs.

Lesson 5 puts all the lessons together, starting with an explanation of why MTP cycles and model development cycles do not necessarily align neatly on five-year schedules. For one reason, the saturation count cycle is every five years and the MTP cycle for MTP updates is every four years, as shown in one example used, depicted in Figure 32. This example addresses a common perception and frustration among Texas MPOs—they expect that there will always be a

new model for every MTP cycle, and yet there are clearly times when this is not the case. The reason is not the fault of either TxDOT TPP or the MPO.

Figure 32 also provides the opportunity for the instructor to walk participants through the three-model concept, that is, the idea that at any one period in time, there are three models: the current model, a model under development, and a future model for which data collection activities may already be occurring. In the interviews, many of the MPOs were unaware of all of these other processes simultaneously occurring.

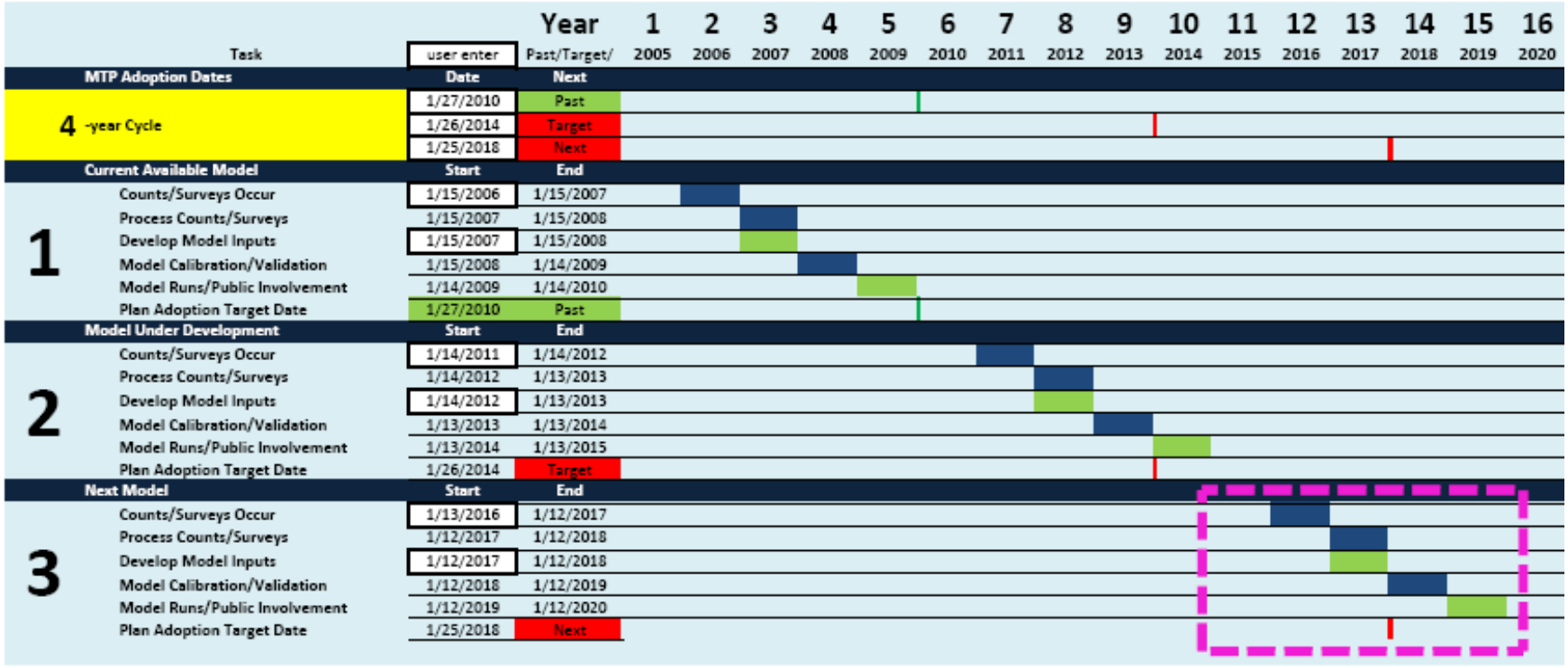


Figure 32. Example of How MTP and Model Cycles Get Unaligned for TMAs.

A very important message for the MPO directors is to consider the model as a project. They are used to considering the MTP this way but not typically the TDM activities. A project spans both organizational and functional activities, as shown in Figure 33. A project needs a project manager, someone who is invested in its successful completion and who can ensure that the project is progressing through the different challenges faced along these varied organizations and processes. This is a second key message arrived at through a group discussion using the activity page shown in Figure 34: the MPO director self-identifying themselves as the person most invested in the success of the model as a project. The MPO director is often a logical choice to be the model Project Manager.

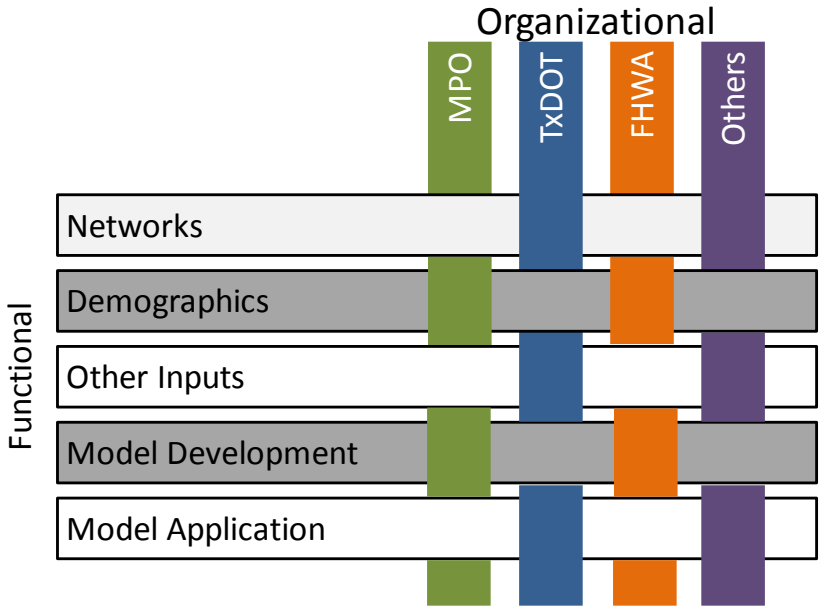


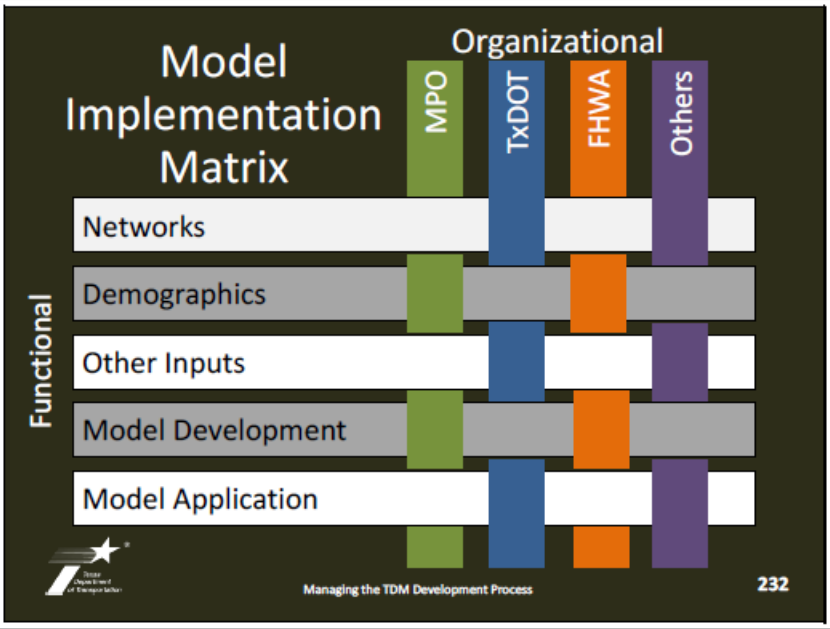
Figure 33. The Model as a Project.

Once the project manager is identified, the participants are asked to refer to information for their respective MPO, as shown in Figure 35, including dates of their current base year model and forecast year, and the date their upcoming MTP is due. They are walked through a series of exercises to apply what they learned in Lesson 2 about identifying:

- The model they have.
- The model they need.
- Any model that could be under development with newer data.
- Model refresh options.

Figure 36 illustrates the first exercise, Determining the Model You Need.

Activity 5.3 Identifying a Project Manager for the Model



Let's discuss some considerations for choosing the Project Manager for the model... Let's brainstorm the answers to the following questions as a group, but write-down names for your own MPO. Remember to not restrict yourself to MPO staff.

Who has the knowledge of how the model will be used as part of the MTP process?

Who has basic knowledge of a model purpose, use, and application, as well as basic knowledge of inputs?

What other relevant questions should we ask?

Who is most invested in a quality model being delivered on time for use to develop the MTP?

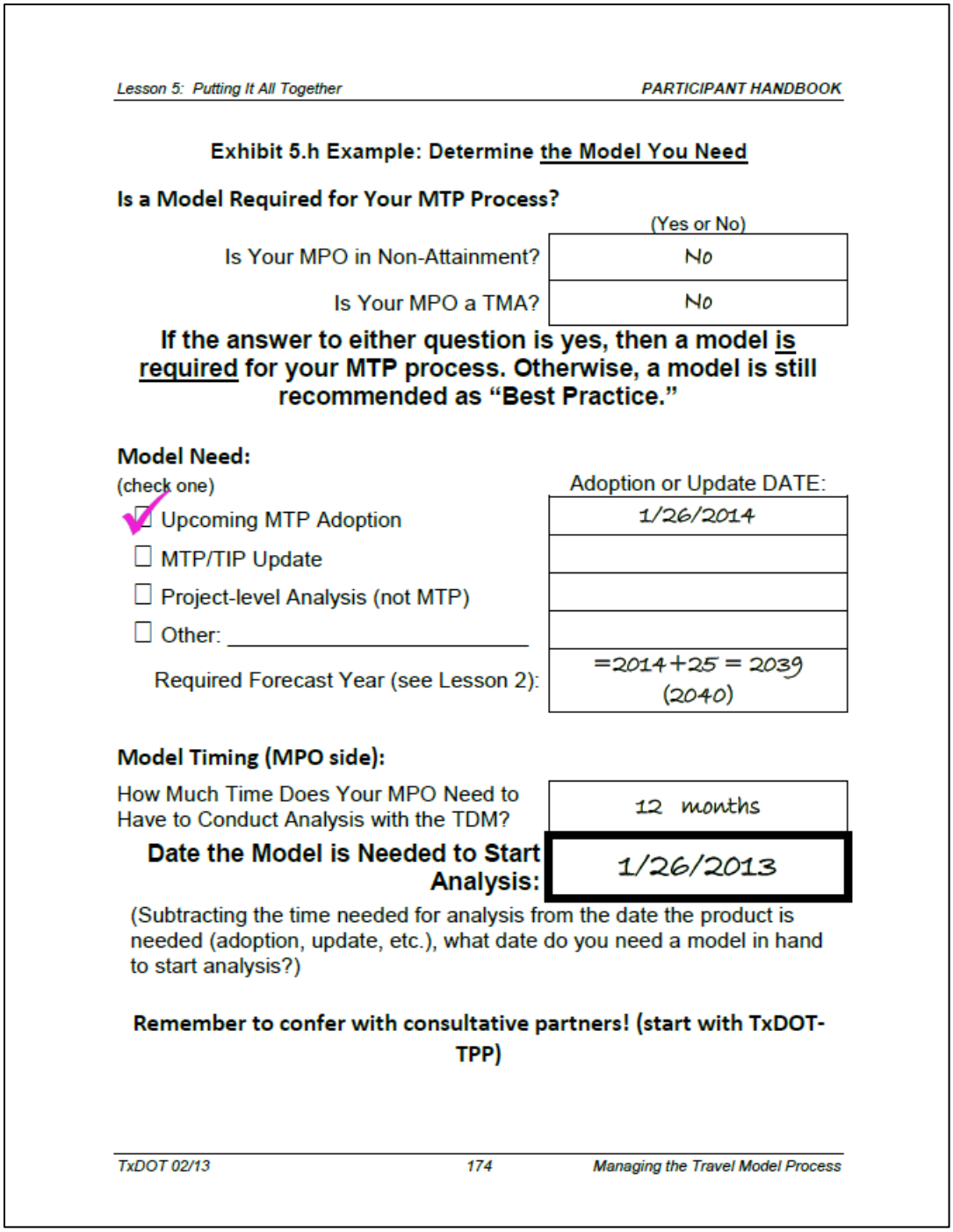
Figure 34. Activity to Identify the Project Manager.

Exhibit 5.g Information You Need to Know to Make Decisions

Decision Input Description	Example	Your MPO	
	Decision Input Information		Contact for Data
	Example	Your MPO	
Non-Attainment or Maintenance	No		TxDOT ENV
TMA?	No		TxDOT-TPP
When is the next LRP due?	1/27/2015		TxDOT-TPP
Current Model Available for Use (list Base Year)	2005		TxDOT-TPP
Model In Progress (list Base Year)	2010		TxDOT-TPP
Model In Progress -- Expected Completion Date	2015 assumed		TxDOT-TPP
Most Recent Data Ready for Use in Model Development			
Most Recent Saturation Count Dates	2010 assumed		TxDOT-TPP
HH Survey	11/09-10/11		TxDOT-TPP
WP Survey (incl. SG)	9/10-8/12		
CV Survey	6/10-5/12		
Ext Survey	2005		
Upcoming Data Collection Efforts for Future Model Efforts			
Saturation Counts Scheduled or Planned?	2015 assumed		TxDOT-TPP
HH Survey	2020-ish?		TxDOT-TPP
WP Survey (incl. SG)	2020-ish?		
CV Survey	2020-ish?		
Ext Survey	2020-ish?		
Other Notes			

Figure 35. Information Needed to Make TDM Decisions.

NOTE: Handbook and presentation slides communicate the need to confirm and coordinate with TxDOT TPP.



Lesson 5: Putting It All Together **PARTICIPANT HANDBOOK**

Exhibit 5.h Example: Determine the Model You Need

Is a Model Required for Your MTP Process?

	(Yes or No)
Is Your MPO in Non-Attainment?	No
Is Your MPO a TMA?	No

If the answer to either question is yes, then a model is required for your MTP process. Otherwise, a model is still recommended as "Best Practice."

Model Need:

(check one)	Adoption or Update DATE:
☑ Upcoming MTP Adoption	1/26/2014
☐ MTP/TIP Update	
☐ Project-level Analysis (not MTP)	
☐ Other: _____	
Required Forecast Year (see Lesson 2):	=2014+25 = 2039 (2040)

Model Timing (MPO side):

How Much Time Does Your MPO Need to Have to Conduct Analysis with the TDM?	12 months
Date the Model is Needed to Start Analysis:	1/26/2013

(Subtracting the time needed for analysis from the date the product is needed (adoption, update, etc.), what date do you need a model in hand to start analysis?)

Remember to confer with consultative partners! (start with TxDOT-TPP)

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Figure 36. Exercise to Determine the Model Need.

NOTE: Handbook and presentation slides communicate the need to confirm and coordinate with TxDOT TPP.

After working through similar additional exercises to identify their options between their current model and any model under development, participants are asked to make a preliminary choice of which is their Plan A approach and which is their Plan B approach. More detailed scheduling aspects are then presented for further consideration. In addition, a rare but occasional

advantageous strategy is introduced called "Moving the Finish Line." All of these activities are part of the "Plan the Work" approach advocated in the key course message shown in Figure 37.

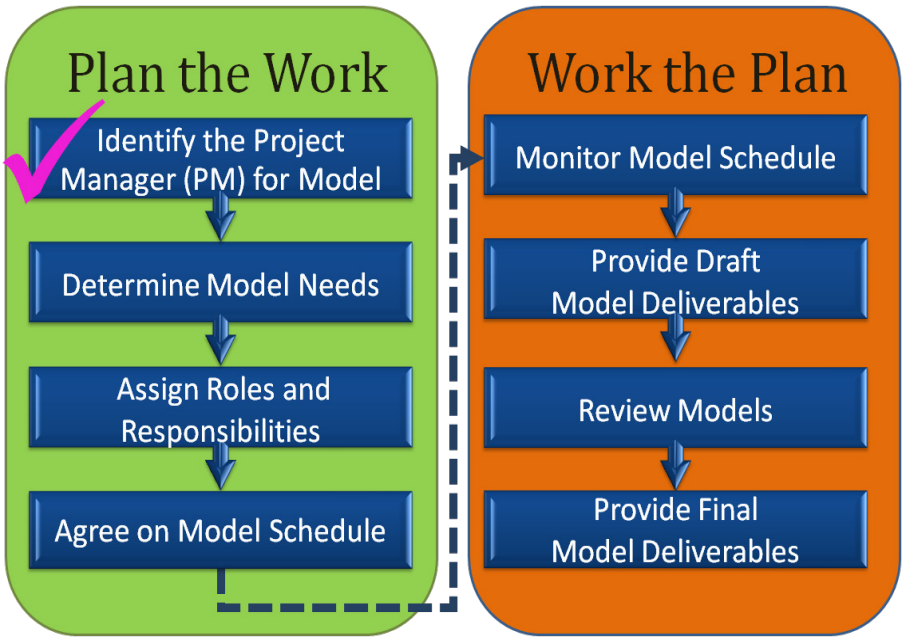


Figure 37. Plan the Work and Work the Plan.

The rest of Lesson 5 presents strategies, tools, and suggestions for assigning roles and responsibilities (including a discussion of the various options inside and outside an MPO), and setting up a model schedule. The scheduling aspect builds upon the TxDOT TPP Timeline Tool because of its familiarity and appropriate level of detail for process management and coordination purposes from the MPO perspective. One example of how the course uses the Timeline Tool as a foundation for MPO process management is shown in Figure 38. At the top is an example TDM Timeline; correspondingly, in the bottom half, are identified milestones for coordination meetings, training, quality control, etc.

The "working the plan" component of Lesson 5 addresses monitoring the TDM activities and addressing issues to ensure the schedule and quality expectations are met; various strategies and approaches are presented here, as well. Finally, Lesson 5 concludes with a discussion of the various groups an MPO director must talk with about models—TxDOT TPP, internal MPO staff, the Policy Board, Technical Committee, and public.

The course concludes with a restatement of the course objectives.

Exhibit 5.I Schedule Related Activities (EXAMPLE)

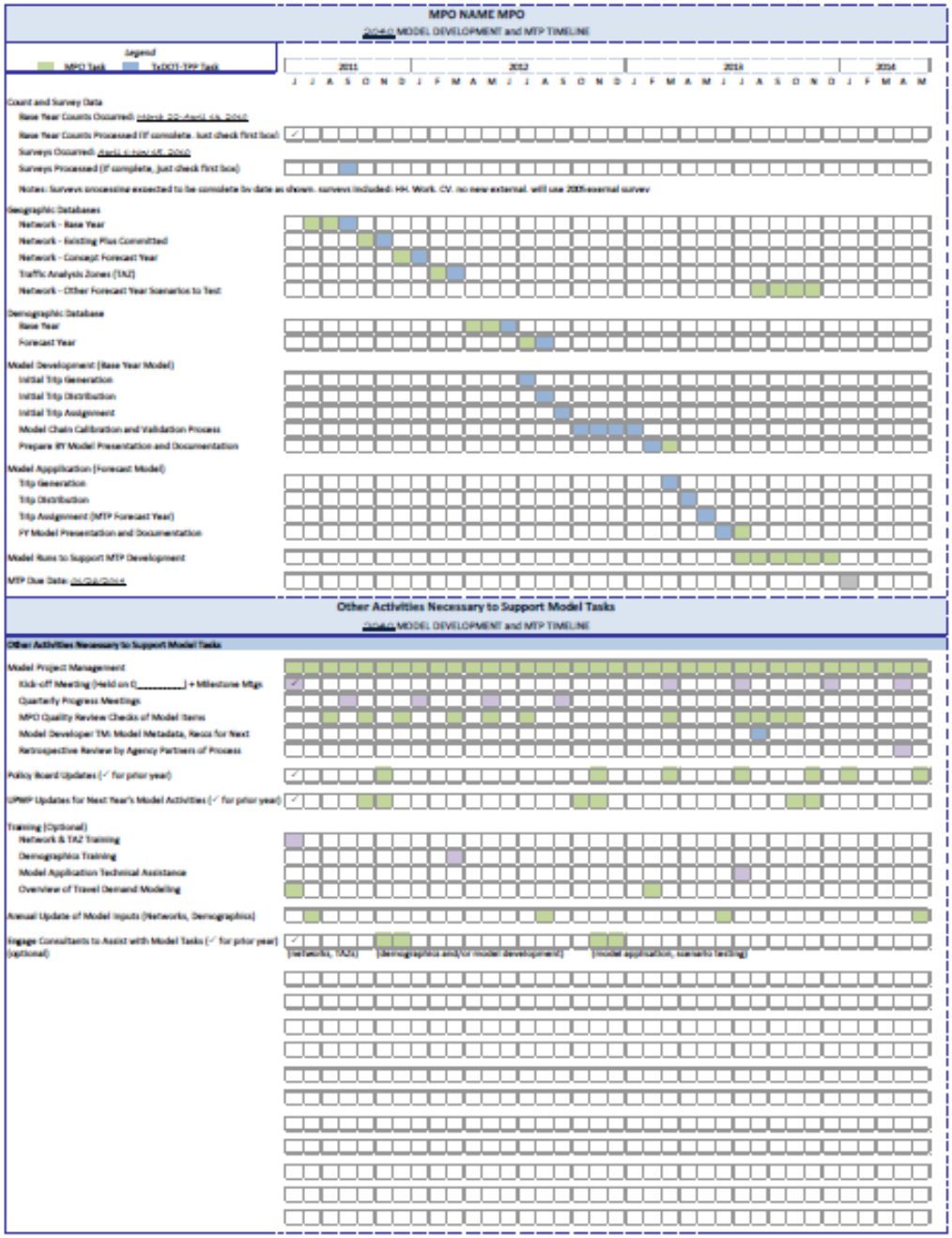


Figure 38. Example of Scheduling Activities Related to the TDM Process.

NOTE: Handbook and presentation slides communicate the need to confirm and coordinate with TxDOT TPP.

4.6 PILOT COURSE IMPLEMENTATION– SEPTEMBER 18–20, 2012 (KILLEEN-TEMPLE MPO)

As mentioned previously, by the time for testing the pilot, and as shown in Figure 39, the researchers had received an exhaustive amount of input on the course materials. In addition, the latest refined materials underwent two extensive work sessions with the PMC in the weeks prior.

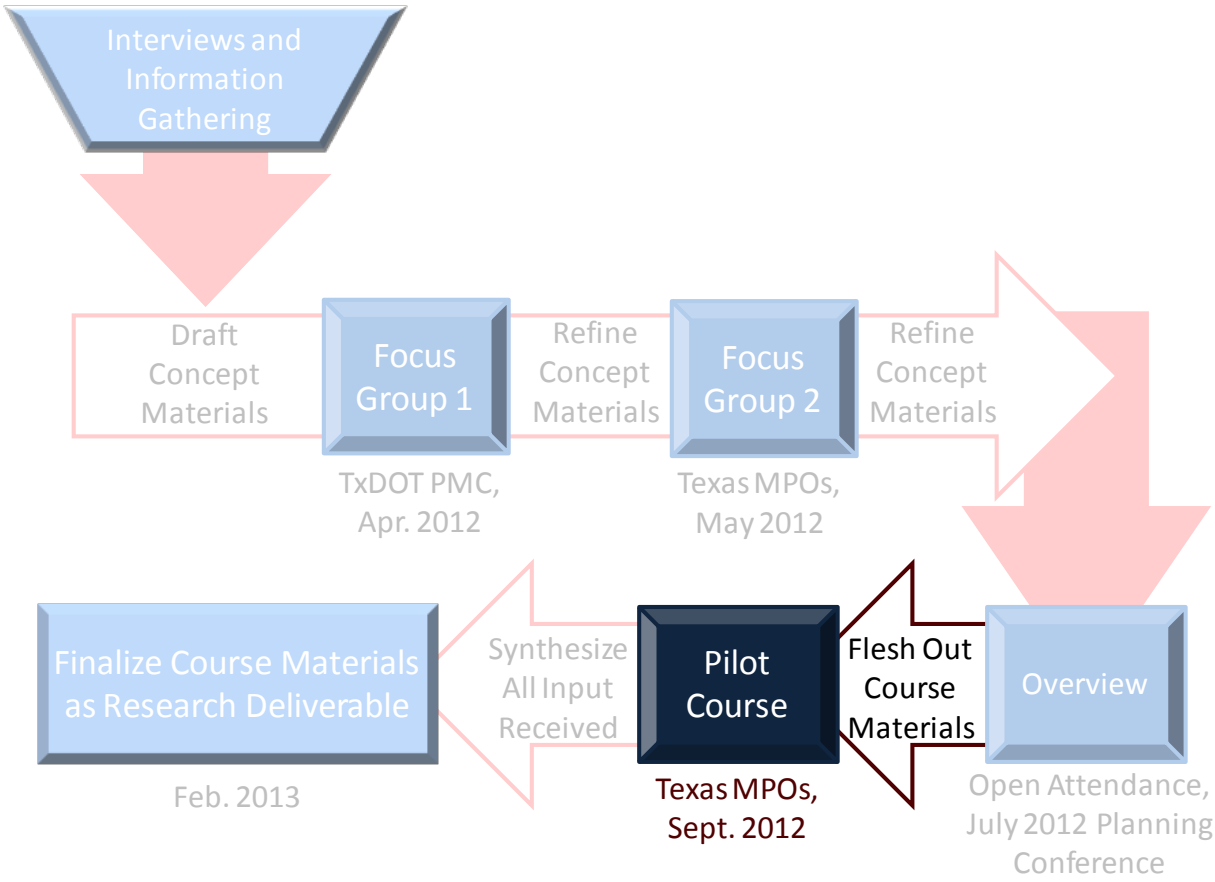


Figure 39. Pilot Course in Context.

The Pilot Course scoped under Task 6 of the research effort was held on September 18–20, 2012, at the Killeen-Temple MPO Building at 2180 North Main Street, Belton, Texas. The purpose of the pilot was to test the training course materials developed under the research effort. Because of their involvement in previous research study activities, MPO directors and staff were aware already that the pilot course was scheduled in the fall of 2012. A target time period of September 2012 was highlighted at a study overview conducted on July 17, 2012, at the TxDOT Planning Conference. A calendar item with the specific dates of the pilot was emailed on August 24, 2012, to Texas MPO directors to invite them to the pilot, and follow-up calls were made to invite each director or a designate. MPO directors were encouraged to attend, however MPO staff designates were also welcome.

For attendance, TxDOT TPP staff provided presence and full coverage of the pilot course. Janie Temple introduced the course on Day 1. Mike Schofield attended Days 1 and 2 of the course; Greg Lancaster attended Day 3. Pilot Course attendees are listed in Table 13.

Table 13. Pilot Course Attendance.

Name	Representing
Lin Barnett	Wichita Falls MPO
Bart Benthul	Bryan-College Station MPO
Tom Cook	Abilene MPO
Salvador Gonzalez-Ayala	El Paso MPO
Doray Hill	San Angelo MPO
Cheryl Maxwell	Killeen-Temple MPO
Brad McCaleb	Texarkana MPO
Raymond Sanchez	TxDOT South Region Representative
Annette Shepherd	Killeen-Temple MPO

Based upon the findings from the research conducted above, including input from the stakeholders through the two Focus Groups and the Overview presentation at the July 2012 TxDOT Planning Conference, the pilot course materials for "Managing the Travel Model Process" were finalized for testing as part of this research effort. Materials included:

- Pilot course overview handout.
- Course presentation (approximately 300 slides).
- Instructor- and participant-version handbook, including the presentation slides, additional reference material, exhibits, and activities, as well as instructor notes. The handbook, approximately 250 pages in length, was provided as a three-ring binder.
- Pilot course participant input forms, printed on bright yellow paper so the facilitator could see and encourage participants to fill them out and turn them in.
- CD with all of the native files to produce the above items, as well as a draft scheduling tool in Excel.

Participants expressed overall positive response to the course concept, content, and administration, as summarized in Table 14. The pilot evaluation results are included in Appendix C.

Table 14. Pilot Course Findings Overview.

Course Objectives	Participants indicated that course objectives were met, with an average response of 4.8 out of 5.0 possible.
Target Audience	The core target audience is MPO directors or those responsible for MPO modeling (at larger MPOs). Most of the attendees fit this target group; one attendee was a TxDOT region representative who closely coordinates with MPO directors on modeling. Participants indicated that the materials fit this group well. They also indicated that it would be helpful if other audiences also took the course, specifically: MPO modeler, TxDOT region/district staff involved with MPOs and the MTP process, TxDOT TPP modelers/planners involved with MPOs and the MTP process. The researchers and the participants agreed that the Introduction section might be appropriate in a more generalized version for MPO Policy Board, but only the Introduction section.
Content	Question on appropriateness of the level of course content for participant background and expertise: average response of 3.8 (out of 1-5 from "Much below my level" to "Much above my level, with 3 being "ideal"). The research team notes that the participants included mostly non-modelers, so this response is acceptable. Question on relevance to participant's job: average response of 4.6 out of 5. Specific comments by lesson provided in Appendix C. Besides several minor comments on wording and one activity worksheet that should be reworked, the only substantial comment pertained to the addition of a new strategy for an MPO director to consider: "Moving the Finish Line." This strategy was pointed out by one MPO director for another MPO director to consider in their particular case. This section will be added to the final version of course materials, along with the other minor changes.
Length of Course	The pilot was conducted over a period of 3 days. The participants' average response indicated that a length of 4 days is more appropriate for the material, and the research team concurs.

4.7 CHAPTER SUMMARY AND RECOMMENDATIONS

The findings documented in the previous chapters demonstrated a need for a training course to address the non-technical, managerial aspects of travel demand modeling in support of MPO activities. As detailed above and in the detailed evaluation results provided in Appendix C, the research team found the pilot course to be very well received, with very few improvements suggested overall. The participants who attended gave positive verbal and written reviews, leading the research team to recommend that TxDOT proceed with offering the course "Managing the Travel Model Process" in the future.

CHAPTER 5. CONCLUSION

5.1 RESEARCH SCOPE

When the travel demand model development and application process does not work at its optimal level, it is frustrating and challenging for many stakeholders across Texas. These stakeholders include, but are not limited to: MPO policy board members, MPO staff, local agencies such as cities and counties, as well as TxDOT division-level and regional and local-area staff who utilize these models for technical analysis to support transportation decision making and as inputs for other types of analyses including air quality, noise, and environmental justice analysis. In the end, but most importantly, an effective and efficient travel demand model development and application process serves a fundamental public interest: despite many in the public not being aware of these models or understanding how they work. These travel demand models are a critical tool to ensure a transportation planning process that utilizes state of practice—ideally best practice—quantitative assessment tools for making what are often large-scale and expensive transportation investment decisions.

Key to the research approach described in this report are the perspectives from the stakeholders themselves: Texas MPO staff and TxDOT staff from TxDOT TPP, the regions, and TxDOT districts who depend upon an efficient and successful travel demand model development and application process. Other parties from outside Texas, including MPOs, state DOTs, and FHWA representatives from several offices, also provided invaluable perspective on the challenges and potential solutions.

The overarching challenge for these stakeholders including TxDOT is addressing the managerial, workflow, and communication issues that impede the timely completion of the travel demand modeling process for Texas MPOs under TxDOT purview for modeling. The specific focus of the current effort is increasing institutional capacity at the MPO level, and yet because the approach included broad information and perspective-gathering, the research team was also able to identify potentially high-return procedural changes that TxDOT may wish to consider, as well. One of TxDOT's agency-wide goals is operating as a Best In Class State Agency, which necessarily includes adoption of best technical and process-management processes that further agency, stakeholder, and public objectives.

5.2 REPORT SUMMARY

Chapter 1, the report Introduction, describes the context for the research, including the impetus for study and the research approach. The research work plan flowed first from data and general input gathering stages, then to focused discussion with key stakeholders to gather their perspectives on issues and possible improvements for the current process. Stakeholders interviewed included:

- Texas MPO directors and staff involved with the TDM development process and TDM results incorporation in the metropolitan planning process.
- Other stakeholders with perspective to offer on the MPO-DOT TDM development and application process, including stakeholders from non-Texas MPOs, other state DOTs, and FHWA representatives from the Texas Division, national Planning office, and national Modeling Resource Center.

For additional perspective, the team researched approaches used in and outside of the transportation planning field for institutional capacity building, including previous research into the challenges faced by MPOs specifically and solutions and approaches proposed by others for this complex problem. These findings are summarized in Chapter 3.

Chapter 4 describes the process to conceive and refine materials for, and test, a pilot course aimed at increasing MPO institutional capacity with regard to the TDM development and application process. This effort included synthesizing findings from previous tasks in order to identify and recommend helpful approaches and conceptual-level materials for consideration by and discussion with the research PMC. These conceptual materials were then refined and used as the basis for discussion with a second round of focus group meetings with the Texas MPO stakeholders; these stakeholders provided invaluable input that the researchers incorporated into the development of a pilot course, manual, and training materials.

Finally, Chapter 5 summarizes findings for the entire research effort and makes recommendations for TxDOT consideration. Here are described the conclusions by the research team from the entirety of the process described above. These include recommendations for moving forward with the MPO-oriented TDM process training course, as well as bigger-picture recommendations for TxDOT and MPOs to consider, as well, for additional improvement to the TDM development and application process.

5.3 SUMMARY OF KEY FINDINGS

The key findings of the investigation into what exactly delays or impedes the MPO portion of the overall TDM process suggest that benefits are achievable across various fronts.

5.3.1 Issue #1: Resource Constraints

Resource constraints at the MPO, state DOT, and federal DOT levels are a substantial barrier. The primary constraint is funding. As funding becomes even scarcer there may be less value placed upon planning and analysis tasks. For Texas MPOs, these internal constraints were found:

- MPO director's lack of technical knowledge about TDMs, and the difficulty communicating model importance to policy boards to ensure program continuity.
- Insufficient MPO staff overall, including TDM tasks.
- MPO staff often lacks technical skills for TDM tasks.

For TxDOT, these internal constraints were identified:

- Insufficient TxDOT TPP staff for travel analysis responsibilities, including TDM tasks.
- Conflicting priorities, for example high priority, quick turnaround analysis requests interrupting the lengthy model development process.

For FHWA, these internal constraints were identified:

- Relative to decades past, decreasing level of support and guidance at the federal level for TDM tasks leaving more MPOs and state DOTs to assume these responsibilities.

- Travel demand model knowledge at an FHWA Texas Division office generally depends upon the interest of the individual assigned; travel demand model expertise is available, but must be sought out through the FHWA Modeling Resource Center.

From the interviews of stakeholders outside of Texas, as well as the research done and summarized in Chapter 4, it is clear that the resource constraint issue is a challenge nationwide. Solving the resource issue is outside the scope of this research; however, the research findings did provide ideas for leveraging existing resources.

5.3.2 Issue #2: Training Needs

Training is valued and needed on a regular basis. Various stakeholders referenced the need for continuous and consistent technical training, citing these reasons:

- Travel demand modeling involves complex analysis approaches and is constantly evolving.
- New staff needs training.
- Staff not regularly performing travel demand modeling need refreshers.

Texas stakeholders repeatedly referenced TxDOT-provided travel demand model training as valuable and helpful. Their only request was that it be offered more often and on a regular basis with advance notice so they can plan for it in their UPWPs.

With regard to non-technical process management training, some of the Texas MPOs have been visited by a TxDOT-contracted researcher providing MPO planning process training. This process-oriented training was quite well received. It was clear from the interviews with stakeholders that process-management training is also needed:

- MPO directors have varied backgrounds, most without technical TDM expertise or even a conceptual-level understanding of how a travel demand model works to manage the process.
- MPO directors seemed to have inconsistent baseline information regarding the general TxDOT travel demand model development process.
- MPO directors seemed to have inconsistent understanding regarding their own model's development and application process or how the model may be used to support a metropolitan transportation planning process.

Based upon these findings, the pilot training course developed as part of this research effort is timely. This training is oriented toward a Texas MPO director and/or planning manager to enable this staff to understand and manage the travel model process. Such a training course meets the specific objective of the current research effort to increase institutional capacity at the MPO level for travel demand model tasks. This training product has an additional advantage in remaining relevant for Texas MPOs even if, as is possible, there are future structural changes to the current collaborative partnership process between TxDOT and the MPOs under TxDOT purview for model development and assistance with model application tasks.

5.3.3 Issue #3: Communication and Process Issues

The challenge for the research team was to identify strategies that Texas stakeholders can adopt to improve the process within the existing and increasingly constrained resource scenario. In the

interviews and focus groups, MPO directors and TxDOT staff (TxDOT TPP, TxDOT district, and Regions) variously expressed frustration with the results of the current process. Indeed, it seemed to the researchers that most of the stakeholders interviewed did agree on the following: the subject of models is complex, the process to develop a model is complicated, and the task to use the models to develop an MTP is arduous. Many of those interviewed had suggestions or successful examples which echo general recommendations found in the literature on capacity building. These findings suggest there are actionable items which could potentially deliver broad, positive, and high impact improvement to the cooperative process between TxDOT and the MPOs under TxDOT purview for TDM activities.

5.4 RECOMMENDATIONS

The following recommendations are a result of the research conducted as described in Chapter 3, input from a broad spectrum of stakeholders both familiar with the Texas context and other state DOT-MPO approaches as summarized in Chapters 2 and 4, and assessment by the research team.

5.4.1 Recommendations for MPO Training Course

RECOMMENDATION 1. TxDOT could implement the course: Managing the Travel Model Process

The training course originally envisioned by TxDOT TPP as a strategy for increasing MPO institutional capacity for TDM tasks was developed and tested under this research effort. As documented in Chapter 4 and detailed in Appendix C, the pilot course was very well received by attendees. Thus, the research team does endorse the implementation by TxDOT of a stand-alone training course on managing the TDM process. Of note:

- Course could be implemented as a 4-day course owing to the complex content and participatory approach. The pilot course implementation of 2.5 days was insufficient and this was the primary complaint received about the course from participants.
- The opportunity for the MPO to apply the course material to their own model development timeline was a valuable exercise to the MPOs that attended, and clearly provided helpful perspective and discussion.
- Almost as important as the lesson content, the pilot course approach deliberately fosters a forum (both time and a facilitated discussion) for Texas MPO directors to share successful strategies for navigating the TDM process among their peer group.
- In addition to MPO directors or, in the case of larger MPOs the planning managers, the research team concurs with pilot attendees that opening up the training course to TxDOT district, Regional Planning Area, and TxDOT TPP staff (both planning and traffic analysis) who are involved in supporting the travel demand model development and application process could be beneficial.

RECOMMENDATION 2. TxDOT could empower each MPO Director who completes the TDM process training course with the title of "Model Project Manager." The concept of "Model as Project" was introduced in the pilot course materials and was well received. TxDOT TPP can facilitate this relationship between MPO director and their models through actions including deferring to the appropriate individual, typically the MPO director, as the Model Project Manager.

RECOMMENDATION 3. The Model Project Manager could institute regular model update meetings into model management process.

A low-tech strategy recommended in the course material is that the MPO director, as "Model Project Manager," institutes a monthly model status update meeting for any model in development or being applied by TxDOT TPP for use by the MPOs as part of their planning process. This ensures regular communication and updates occur on the model progress for both the MPOs developing model inputs and TxDOT TPP staff working on the models. These meetings may be conducted by teleconference or web-conference.

5.4.2 Other Recommendations

RECOMMENDATION 4. TxDOT and MPOs could seek to expand staff resources devoted to traffic analysis and travel modeling.

An issue cited by all stakeholders was the lack of funding and resources to accomplish modeling activities. Given the larger context of constrained funding for project implementation, planning activities have suffered from constraining forces, as well. And yet, this is precisely the necessity that is motivating decision makers to look more closely at performance measures of various projects competing for limited funds. The same limited funding context, as well as sustainability and environmental concerns, is also driving examination of solutions outside of the traditional capacity expansion projects. The complexity of this planning landscape demands greater use of quantitative analysis tools such as travel demand models, and therefore staff resources to run these models. Possibilities for expanded funding to conduct modeling activities include, but are not limited to: TxDOT TPP, MPOs, contracted resources through TxDOT or the MPOs, and cooperatives of MPOs to pool modeling staff and activities.

RECOMMENDATION 5. TxDOT and MPOs may be able to be more creative with the resources in hand.

Despite the above appeal for additional resources, the constrained funding context faced by both TxDOT and the MPOs has been identified in both the literature and interviews as a sustained and increasing challenge. As mentioned previously, solving the funding issue is well outside the scope of this research study. However, Chapter 3 explored how other similarly sized agencies and organizations cope with the underfunding challenges and out of that effort emerged several recommendations clearly applicable to Texas MPOs. In addition, several recommendations were gleaned from the interviews with stakeholders as successful strategies implemented by other MPOs. From TxDOT's perspective, many of these are up to the discretion of each MPO, and yet TxDOT can play a role in facilitating these actions through its oversight role in the UPWP and contracting processes.

RECOMMENDATION 6. TxDOT could provide technical modeling training courses on a regular schedule, publicized to the MPOs in advance of their UPWP process.

This suggestion was made several times by stakeholders familiar with the Texas modeling training schedule. As explained by one MPO director in a focus group, a regular training schedule facilitates programming of staff training activities into the UPWP. It also ensures that MPO staff have opportunities to freshen their modeling skills sets when they may not work on models consistently over the year. The current modeling courses offered by TxDOT received unprompted, positive reviews by many of the stakeholders interviewed.

RECOMMENDATION 6. TxDOT could incorporate web-based communication into the TDM management process.

A recommendation with potential immediate and positive impact on the current cooperative process between TxDOT and the MPOs under their purview for model activities is actually the simplest and easiest to implement: remove email as the primary method for communicating technical guidelines, TxDOT standards, and other resources. TxDOT can easily make their current information and guidelines available on a single-page webpage. An example of what this page might look like shown in Figure 40.

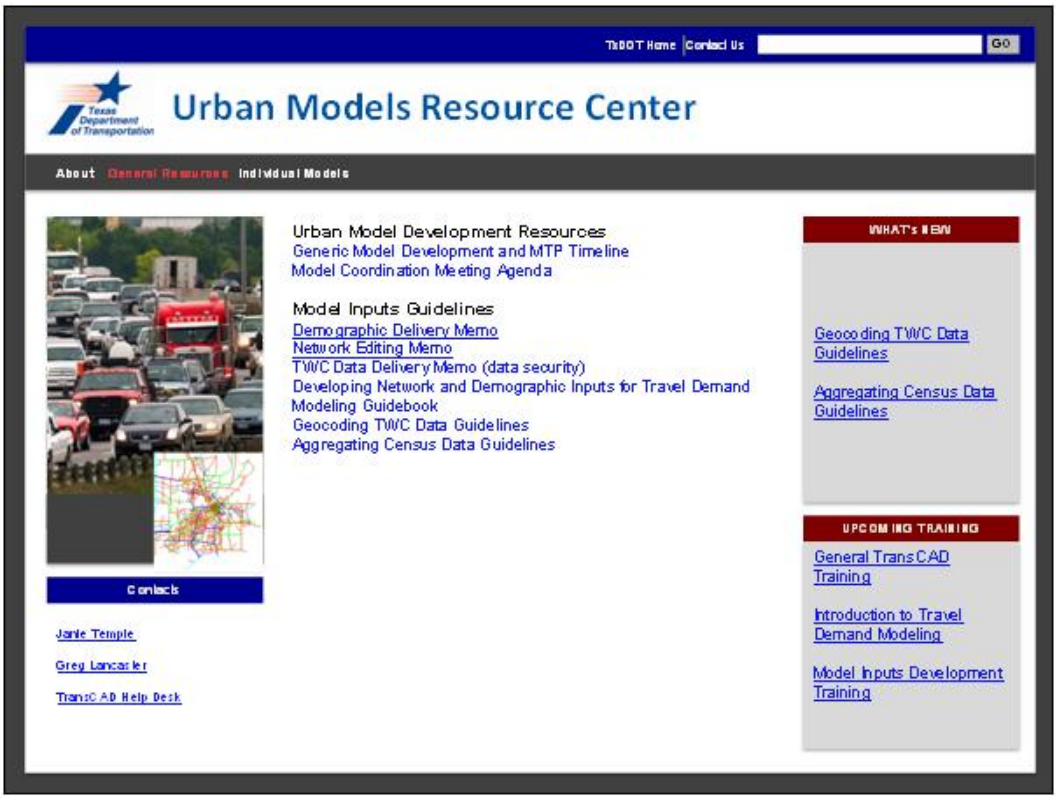


Figure 40. Single Webpage Example for Distribution of Statewide Model Information.

This simple strategy offers these immediate advantages:

- Centralizes the most up-to-date versions of documents in a single location, benefitting all users, including staff at TxDOT TPP.
- One-stop shopping for TxDOT TPP, MPOs, or contractors to access these materials without expending additional TxDOT TPP staff time.
- Listing available resources and training courses that TxDOT makes available to support model activities. Providing the schedule of upcoming training on this site ahead of MPO UPWP programming would facilitate MPO allocating resources for this activity.
- Directing users to appropriate contacts (TransCAD Help desk or TxDOT TPP staff) for any questions they may have.

- Avoids email issues such as guideline attachments being sent to junk mail or not otherwise arriving successfully.
- Saves on email server and local drive space when these documents are not sent as attachments.

Of course, using a webpage to facilitate distribution of information is not a new concept. As described in Chapter 2, the state of Florida has a robust web distribution center for it modeling standards and information. In addition, the Florida modeling program utilizes the web to distribute modeling software and utilities.

The above, short-term strategy web-based strategy is oriented toward general information and guidelines pertinent to the majority of Texas MPOs and their models. Clearly, web-based communications can be leveraged even more effectively to serve the communication and collaboration needs between individual MPOs and the TxDOT TPP staff assigned to each MPO, as well as document management. A mock-up example webpage of this concept is shown in Figure 41. As shown, this type of communication enables TxDOT and the MPOs to easily find the most recent model data and application files for the specific study area. This also is a location where TxDOT can provide user rights to a contractor to access these files, as appropriate, ensuring that all of the files in a model set are provided.

Figure 41. Example of a Single Webpage for an Individual MPO Model.

As an additional step to facilitate communication and manage the process to develop a model, TxDOT may consider a dashboard specifically for the purpose of monitoring the model development process, including fields which identify task responsibility, approval, and due dates, as shown in Figure 42. This type of dashboard enables all parties with access rights to the

webpage to stay current on the project status and critical path. Of course, this type of management tool is only as good as the data entered into it, requiring a necessary level of commitment by the staff responsible for it.

In the long term, given the present possibilities of software and computing power, it is a conceivable scenario that users such as MPO staff will be able to run travel model scenarios from a website, formulating scenarios themselves, but with the model and required inputs maintained in one cloud location. That future is one possibility of many, but certainly the web has proven invaluable to process management and is here to stay. The researchers' simple recommendation for the present is that TxDOT proceed with the single webpage distribution of documents and resources appropriate to the majority of MPOs. That single step will provide ample perspective for TxDOT to consider in assessing additional web-based communication and process management tools.

Figure 42. Example of a Model Development Process Tool Concept Webpage.

RECOMMENDATION 7. TxDOT could provide funding to support the administrative functions necessary for MPOs to establish regional or statewide model user groups.

Study participants from outside Texas described worthwhile benefits from their state's model users' group. A model user group concept was also discussed during one of the first group interviews of MPO directors and staff at a Texas MPO conference. Advantages mentioned included sharing experiences, strategies, knowledge, and datasets, perhaps being able to collaborate to get additional training. One of the issues is, of course, constrained staffing resources at the MPO level to administer a user group effectively; another is the disparity of technical modeling knowledge between the different MPOs across Texas. The researchers

recommend at a minimum that TxDOT TPP staff participate in a model user group effort, if one is organized and if TxDOT is invited to participate.

5.5 CHAPTER SUMMARY

This chapter summarizes the key findings regarding the challenges faced by Texas MPOs and TxDOT in the process of developing and applying travel demand models to support planning activities. These key findings include resource constraints at both TxDOT and the MPOs, training needs including validation of the need for model process management training, and communication and process issues. The reminder of the chapter provides recommendations for process improvement, spanning the resource, training, and communication and process arenas. Low-tech as well as web-based solutions are proffered, including the recommendation to implement the model management training course initially conceived by TxDOT TPP and tested with successful results as part of this research effort.

This research benefits TxDOT and Texas MPOs through the identification of issues which impede the timely completion of the travel demand modeling development and application process. Study findings provide TxDOT with approaches and strategies to share with MPO directors and MPO policy boards to better guide and manage the overall TDM process. Research outputs that are directly usable by TxDOT and MPOs to assist in managing the TDM process include:

- Training course materials for a 4-day workshop on Managing the Travel Model Process, including presentation and instructor and participant notebooks.
- Materials and methods for MPO directors to use to better organize and manage the flow of work within the TDM process.
- Identification of the staff skills necessary to complete the TDM process.
- Solutions a model project manager can use to improve the timely delivery of technical inputs for TDM.

Most fundamentally, this project provides a forum for engagement by TxDOT with the MPOs and other stakeholders in the TDM process.

APPENDIX A PROBLEM STATEMENT

RTI
Research Project Statement

RMC:	2	**OPR: (for RTI use)**	TPP	**Project #: (for RTI use)**	0-6691
Date:		12/21/2010		**Research Program Year:**	**2012**
Project Title:		Managing the TDM Process: Developing MPO Institutional Capacity			

Project Description:

What is the problem?
The Texas Department of Transportation (TxDOT) Transportation Planning and Programming Division (TxDOT-TPP) is committed to supporting Texas Metropolitan Planning Organizations (MPOs) in the development of accurate and reliable travel demand modeling procedures. A primary TxDOT-TPP goal is to assist Texas MPOs in developing the institutional capacity to manage the MPO portion of the overall travel demand modeling process. Within the cooperative process between TxDOT-TPP and the MPOs this includes the MPO responsibilities of:

- Development of base and forecast year demographic databases
- Development of base and forecast year networks
- Applying the model to perform travel related technical analyses in support of MTP development

One key aspect in developing institutional capacity is the development and training of MPO management and technical staff.

TxDOT-TPP is currently addressing MPO institutional capacity needs by providing individualized training and/or tailored workshops that cover specific topics. The MPO training options and available technical assistance is worthwhile and needed. As it currently stands, however, they are also merely provided sporadically when requested by individual MPOs.

Currently, there is no means of ensuring that an MPO is fully acquainted with all facets of MPO responsibilities within the travel demand modeling process. In addition, periodic staff turnover at MPOs inevitably necessitates TxDOT staff providing MPOs additional support and guidance regarding the travel demand modeling process and MPO roles and responsibilities.

Who is impacted by the problem?
TxDOT-TPP and Texas Metropolitan Planning Organizations

What is the significance / scope of the problem?
To fully support TPP's commitment and goal of developing MPO institutional capacity requires three items:

1. An investigation of what exactly delays or impedes the MPO portion of the overall travel demand modeling process,
2. What guidance can be provided to support MPOs in managing the process, and
3. What methodologies or guidance can be implemented by the MPOs to better manage that process?

What are the technical objectives of this project?
The objectives of this research are to develop methods and guidelines so that MPO directors and managers will better manage the MPO portion of the overall travel demand modeling process, currently a three to five year process. This problem statement envisions a detailed interview of Texas MPO staff to ascertain and document the following:

- The various MPO approaches for managing their portion of the overall travel demand modeling process
- The actual or perceived factors that hinder the MPO planning process
- What MPO Directors think could be done to improve the process

The research will also assess the role and effect of MPO structure, resource availability and resource allocation in the planning process and detail MPO best practices for managing the MPO portion of the overall travel demand modeling process. Finally, the research will attempt to document the best means of improving MPO technical proficiency within the purview of their roles and responsibilities while keeping in mind the distinct learning needs of such a varied audience.

RMC:	2	OPR: (for RTI use)	TPP	Project #: (for RTI use)	0-6691
		What benefits would this project deliver, and how would the results be used within TxDOT? By providing viable methods and guidelines to MPO leaders, TxDOT-TPP will help assure their application of standard TxDOT procedures and methodologies regarding the travel demand modeling process as currently practiced within Texas.			
Minimum Deliverables:		**Stand-alone Products:** - The development of a week-long pilot course, relevant training materials and reference manual. **Reports:** - Complete documentation of work performed, methods used, and results achieved. - Project Summary Report			
Proposals Requirements:		1. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in Chapters 3 and 4 of RTI's *University Handbook*. 2. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project number and university abbreviation. 3. All proposals should be submitted through the university's Research Liaison to RTI, as instructed in the RFP announcement.			
Pre-proposal Meeting:		Thursday, February 10, 2011, 3:30pm – 5:00pm Austin Riverside Campus 118 E. Riverside Dr. RTI Conference Room, 1st Floor Austin, Texas 78704 Attendance through Teleconference or Webinar is available.			
Notifying RTI of Intent to Propose:		Individuals interested in proposing are encouraged to contact **Sylvia R. Medina** at **Sylvia.medina@txdot.gov** by **January 25, 2011,** so you can be notified if additional project information is distributed by TxDOT, or make arrangements for teleconferencing a pre-proposal meeting.			
Proposal Deadline:		Proposals are due to RTI by **4:00 p.m. Central Time**, **March 24, 2011**. Email submissions should be sent to rtimain@txdot.gov.			

APPENDIX B PILOT COURSE PRESENTATION SLIDES

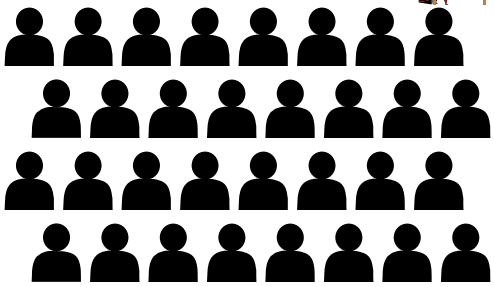
Managing the TDM Development Process

Small and Medium-Sized MPOs

Instructors:

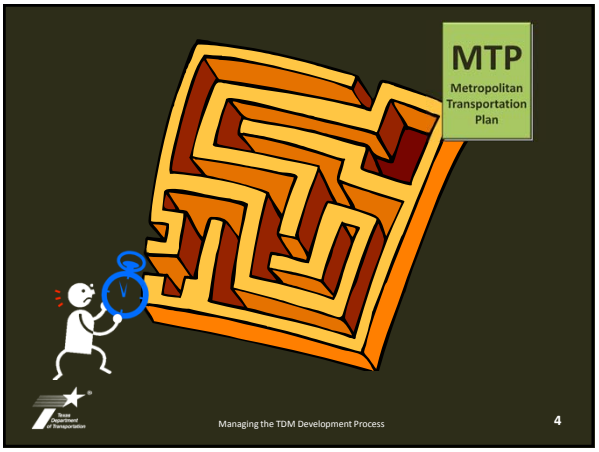
July 2013

Introductions

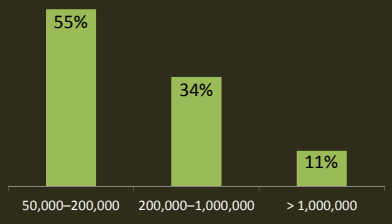


What Is an MPO? TMA?

- A Metropolitan Planning Organization (MPO) is designated for urbanized areas with population over 50,000.
- A Transportation Management Area (TMA) is an MPO with population over 200,000.



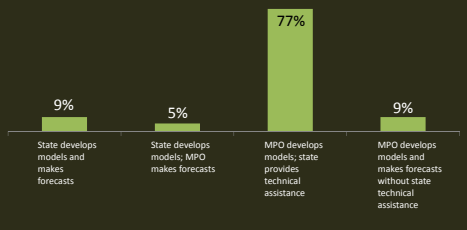
Texas Is Not Alone: Types of MPOs



MPOs by Population

Source: *SR 288 Metropolitan Travel Forecasting: Current Practice and Future Direction*, 2007

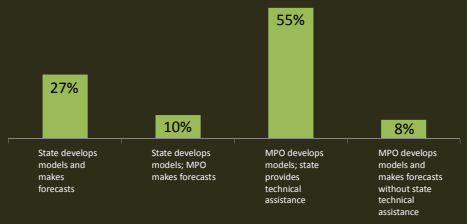
Modeling Approach: Large MPOs



MPOs with Population over 1 Million Modeling Approach

Source: *SR 288 Metropolitan Travel Forecasting: Current Practice and Future Direction*, 2007

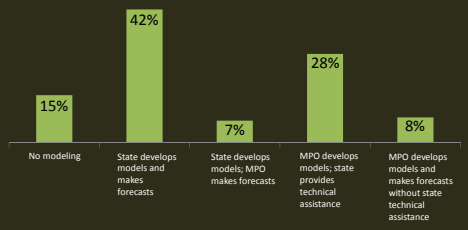
Modeling Approach: Medium MPOs



MPOs with Population 200,000 to 1 Million Modeling Approach

Source: SR 288 Metropolitan Travel Forecasting: Current Practice and Future Direction, 2007

Modeling Approach: Small MPOs



MPOs with Population 50,000 to 200,000, Modeling Approach

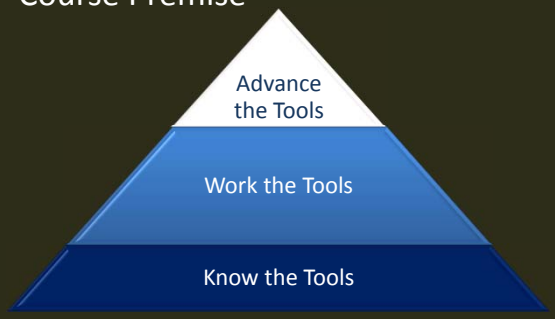
Source: SR 288 Metropolitan Travel Forecasting: Current Practice and Future Direction, 2007

MPOs' General Issues with Models

Process	Resource Constraints	Policy Board Understanding
Technical Complexity	Staff	Model Use
Multiple Players	Technical Expertise	Process Complexity

Not All Texas MPOs Have a Modeler, but All Texas MPOs Have a Director

Course Premise



Learning Objectives

- Explain Fundamental Travel Model Concepts
- Describe the Model Development Process
- Identify Key Inputs & Describe the QC Process
- Identify & Manage Resources
- Put It All Together

Lessons & Course Materials

1. Travel Model Fundamentals
2. Model Development Process
3. Key Inputs & Quality Process
4. Resources
5. Putting It All Together

Managing the TDM Development Process 13

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch:
11:30 a.m. – 1:00 p.m.

Breaks:
10:15 a.m. & 2:45 p.m.

Day 1
1. Travel Model Fundamentals
2. Model Development Process
3. Key Inputs & Quality Process

Day 2
4. Resources

Day 3
5. Putting It All Together

Day 4

Managing the TDM Development Process 14

Questions?

Managing the TDM Development Process 15

Lesson 1 Learning Objectives

Travel Model Fundamentals

- Describe Purpose
- Identify Uses
- Explain Limitations

Managing the TDM Development Process 16

Why Do Travel Modeling?

- "Quantitative"
- "Objective"
- "Conformity"
- "Required"

Managing the TDM Development Process 17

Who Does Travel Modeling?

- "MPOs"
- "DOTs"
- "Consultants"
- "Local Jurisdictions"
- "Bond Houses"

Managing the TDM Development Process 18

We know what traffic is today. What will it be like in 10-, 20-, 30-years?

Travel models consider:
- **Through-traffic changes**
- **Local-traffic changes**

What if Local Area Develops?

- **If yellow areas are likely to become residential and the red commercial…**
- **Travel models forecast traffic considering both local and through traffic changes.**

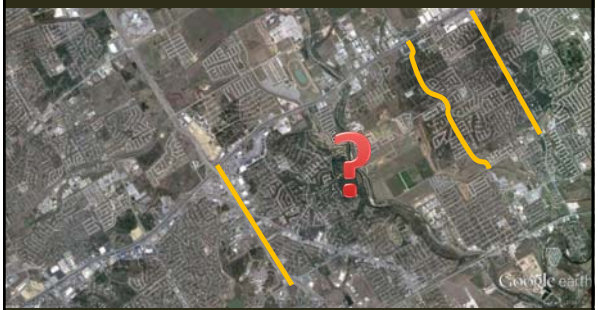
How Will Traffic Change across Network with a Demographic Change?

Travel models are used to forecast traffic changes in a complex world.

Or, What Happens in Response to a Capacity Addition or Improvement?

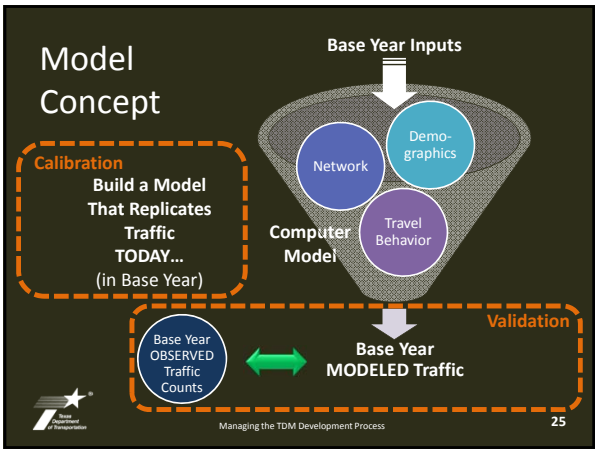
Travel models are used to test the impact of different projects.

Or, How Do We Compare Projects?



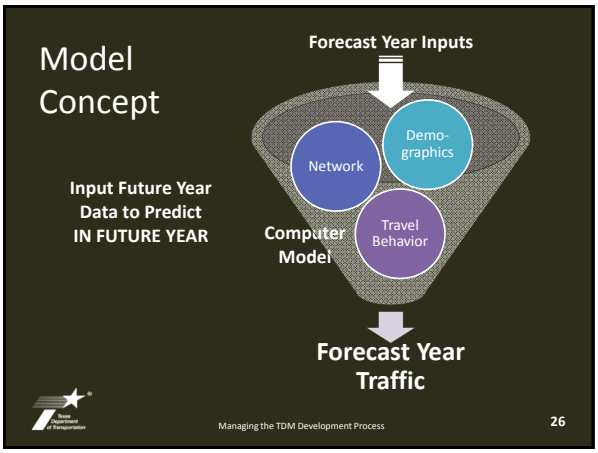
Travel model results are one consideration to compare projects.

Model Concept



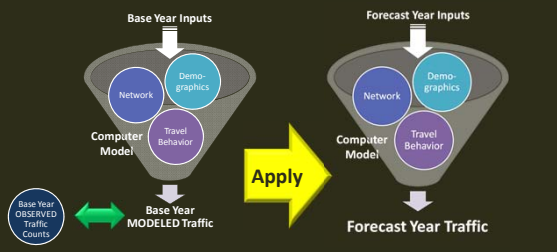
Managing the TDM Development Process 25

Model Concept



Managing the TDM Development Process 26

"Develop" versus "Apply"



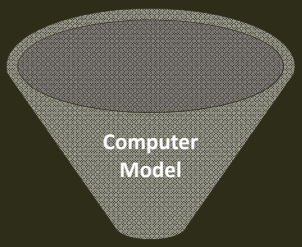
Develop a Model. Then:

Apply the Model to a Future Year or Alternative Analysis Scenario

Managing the TDM Development Process 27

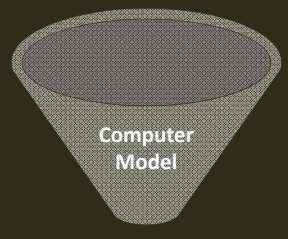
Travel Demand Model (TDM) = Texas Package

- Developed by TxDOT for small and medium-sized MPOs
- Standardized approach
- Supported by TxDOT TPP



Managing the TDM Development Process 28

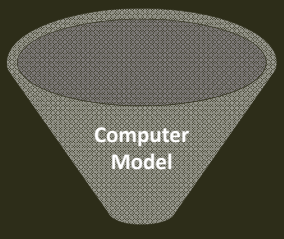
The Texas Package Is a Trip-Based Model, Generally 3 Steps



- Trip Generation (TRIPCAL5)
- Trip Distribution (ATOM2)
- Highway Assignment

Managing the TDM Development Process 29

A 4-Step Model Includes Mode Choice



- Trip Generation (TRIPCAL5)
- Trip Distribution (ATOM2)
- **Mode Choice**
- Highway Assignment

Managing the TDM Development Process 30

Typical Performance Measures from Texas Package

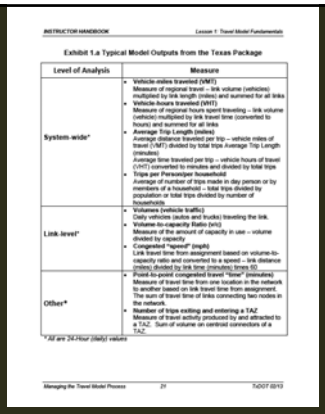


Exhibit 1.a Typical Model Outputs from the Texas Package

Level of Analysis	Measure
System-wide*	• Vehicle-miles traveled (VMT) Measure of regional travel – link volume (vehicles) multiplied by link length (miles) and summed for all links • Vehicle-hours traveled (VHT) Measure of regional hours spent traveling – link volume (vehicles) multiplied by link travel time (converted to hours) and summed for all links • Average Trip Length (miles) Average distance traveled per trip – vehicle miles of travel (VMT) divided by total trips Average Trip Length (minutes) Average time traveled per trip – vehicle hours of travel (VHT) converted to minutes and divided by total trips • Trips per Person/per household Average of number of trips made in day person or by members of a household – total trips divided by population or total trips divided by number of households
Link-level*	• Volumes (vehicle traffic) Daily vehicles (autos and trucks) traveling the link. • Volume-to-capacity Ratio (v/c) Measure of the amount of capacity in use – volume divided by capacity • Congested "speed" (mph) Link travel time from assignment based on volume-to-capacity ratio and converted to a speed – link distance (miles) divided by link time (minutes) times 60
Other*	• Point-to-point congested travel "time" (minutes) Measure of travel time from one location in the network to another based on link travel time from assignment. The sum of travel time of links connecting two nodes in the network. • Number of trips exiting and entering a TAZ Measure of travel activity produced by and attracted to a TAZ. Sum of volume on centroid connectors of a TAZ

* All are 24-Hour (daily) values

Other Performance Measures from Texas Package

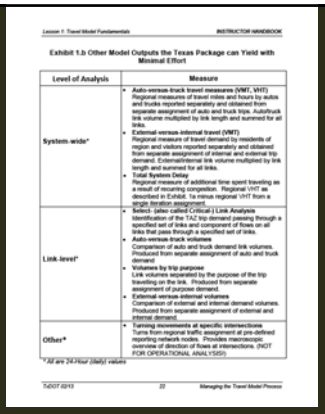


Exhibit 1.b Other Model Outputs the Texas Package can Yield with Minimal Effort

Level of Analysis	Measure
System-wide*	• Auto-versus-truck travel measures (VMT, VHT) Regional measures of travel miles and hours by autos and trucks reported separately and obtained from separate assignment of auto and truck trips. Auto/truck link volume multiplied by link length and summed for all links. • External-versus-internal travel (VMT) Regional measure of travel demand by residents of region and visitors reported separately and obtained from separate assignment of internal and external trip demand. External/internal link volume multiplied by link length and summed for all links. • Total System Delay Regional measure of additional time spent traveling as a result of recurring congestion. Regional VHT as described in Exhibit. 1a minus regional VHT from a single iteration assignment.
Link-level*	• Select- (also called Critical-) Link Analysis Identification of the TAZ trip demand passing through a specified set of links and component of flows on all links that pass through a specified set of links. • Auto-versus-truck volumes Comparison of auto and truck demand link volumes. Produced from separate assignment of auto and truck demand • Volumes by trip purpose Link volumes separated by the purpose of the trip traveling on the link. Produced from separate assignment of purpose demand. • External-versus-internal volumes Comparison of external and internal demand volumes. Produced from separate assignment of external and internal demand.
Other*	• Turning movements at specific intersections Turns from regional traffic assignment at pre-defined reporting-network nodes. Provides macroscopic overview of direction of flows at intersections. (NOT FOR OPERATIONAL ANALYSIS)

* All are 24-Hour (daily) values

Other Texas Package Approaches for Specific Analysis Needs

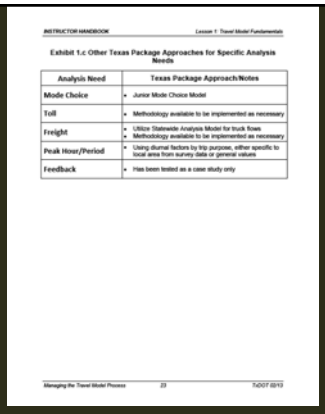


Exhibit 1.c Other Texas Package Approaches for Specific Analysis Needs

Analysis Need	Texas Package Approach/Notes
Mode Choice	• Junior Mode Choice Model
Toll	• Methodology available to be implemented as necessary
Freight	• Utilize Statewide Analysis Model for truck flows • Methodology available to be implemented as necessary
Peak Hour/Period	• Using diurnal factors by trip purpose, either specific to local area from survey data or general values
Feedback	• Has been tested as a case study only

MTP Applications

MTP
Metropolitan Transportation Plan

Other Applications

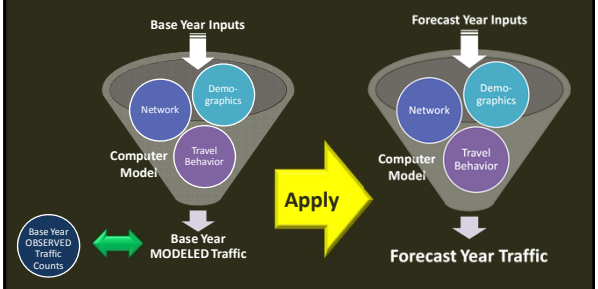
MTP
Metropolitan Transportation Plan

Other Applications

MTP
Metropolitan Transportation Plan

- Air Quality
- Corridor Analyses
- Development Analyses
- Other "What Ifs"

Model Limitations



Micro-level Analysis? NO

Texas Package Applications

Activity 1.4 "Would You Use the Texas Package for This?"

Analysis Question	Yes	No
What future traffic will be on road based on changes in demographics?		
What might be the projected bicycle/pedestrian usage along a future trail?		
Will flex-time incentives reduce future traffic?		
Which roadway should we build first of two potential projects?		
Will lengthening a certain bus route help congestion along that roadway?		
Will the projects in the MTP maintain metropolitan air quality status?		
Will additional lanes in a corridor attract more traffic?		
How many left turn lanes are needed at a particular intersection?		
How long should a merge length be between particular on- and off-ramps?		
How much traffic will a bypass remove from other facilities?		

Lesson 1 Learning Objectives

Travel Model Fundamentals

- Describe Purpose
- Identify Uses
- Explain Limitations

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch:
11:30 a.m. – 1:00 p.m.

Breaks:
10:15 a.m. & 2:45 p.m.

- Day 1
  1. Travel Model Fundamentals ✓
  2. Model Development Process
  3. Key Inputs & Quality Process
- Day 2
  4. Resources
- Day 3
- Day 4
  5. Putting It All Together

Lesson 2 Learning Objectives

Model Development Process

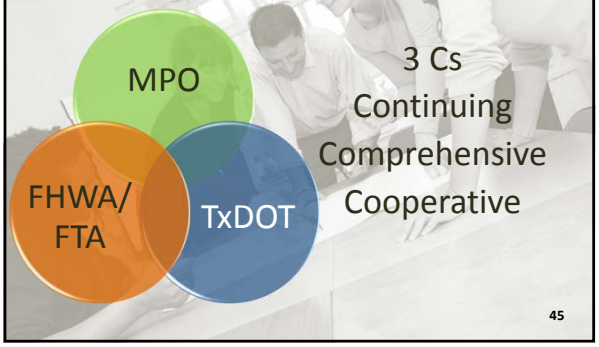
- Identify When Model Is Required
- Explain When Model Update Is Needed
- List 5 Phases of Model Development

MPO Responsibilities Related to Models

What Is an MPO? TMA?

- A Metropolitan Planning Organization (MPO) is designated for urbanized areas with population over 50,000.
- A Transportation Management Area (TMA) is an MPO with population over 200,000.

Planning Process

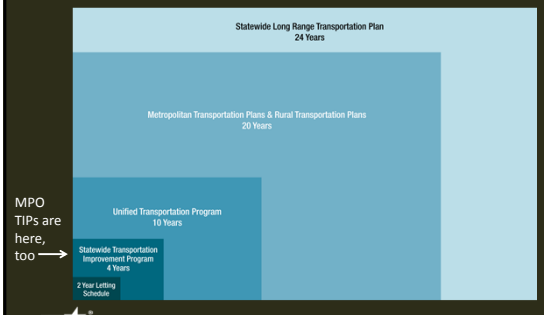


Five Core MPO Functions*

1. Provide a setting for regional decision making
2. Identify and evaluate alternative transportation improvement options
3. Prepare and maintain a Metropolitan Transportation Plan (MTP)
4. Develop a Transportation Improvement Program (TIP)
5. Involve the public

**Transportation Planning Process: Key Issues A Briefing Book for Transportation Decisionmakers, Officials, and Staff,* USDOT

MTPs in Statewide Planning Context



Metropolitan Transportation Plan

MTP
Metropolitan Transportation Plan

- Long-range: 20-year planning horizon
- Federal requirement of the metropolitan transportation planning process
- Cooperatively developed with consultative partners (TxDOT, FHWA, TCEQ, etc.) and local
- Financially-constrained component is required, illustrative purposes component is optional

Transportation Improvement Program

- Short-range: list of projects programmed for implementation within 4 years
- A "management tool for monitoring progress in implementation" of the MTP
- Fiscally constrained
- Must be updated and approved every 2 years

TIP
Transportation Improvement Program

TIP Must Be Consistent with MTP

MTP
Metropolitan Transportation Plan

20-year planning horizon

4-year "management tool"

TIP
Transportation Improvement Program

TIP must be consistent with the MTP

TIP Amendment Triggers (Exhibit)

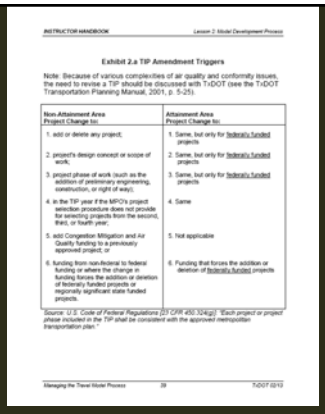


Exhibit 2.a TIP Amendment Triggers

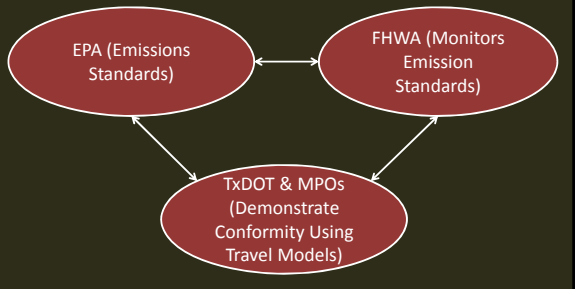
Note: Because of various complexities of air quality and conformity issues, the need to revise a TIP should be discussed with TxDOT (see the TxDOT Transportation Planning Manual, 2001, p. 5-25).

Non-Attainment Area Project Change to:	Attainment Area Project Change to:
1. add or delete any project;	1. Same, but only for federally funded projects
2. project's design concept or scope of work;	2. Same, but only for federally funded projects
3. project phase of work (such as the addition of preliminary engineering, construction, or right of way);	3. Same, but only for federally funded projects
4. in the TIP year if the MPO's project selection procedure does not provide for selecting projects from the second, third, or fourth year;	4. Same
5. add Congestion Mitigation and Air Quality funding to a previously approved project; or	5. Not applicable
6. funding from non-federal to federal funding or where the change in funding forces the addition or deletion of federally funded projects or regionally significant state funded projects.	6. Funding that forces the addition or deletion of federally funded projects

Source: U.S. Code of Federal Regulations [23 CFR 450.324(g)]: "Each project or project phase included in the TIP shall be consistent with the approved metropolitan transportation plan."

Additional MPO Responsibilities Related to Models

Air Quality Conformity



Unified Planning Work Program (UPWP)

- Describes planning work tasks, including those in support of the MTP
- Basis for identifying state and federal sources of funding
- Typically developed every 1-2 years

Certification Review (Activity & Exhibit)

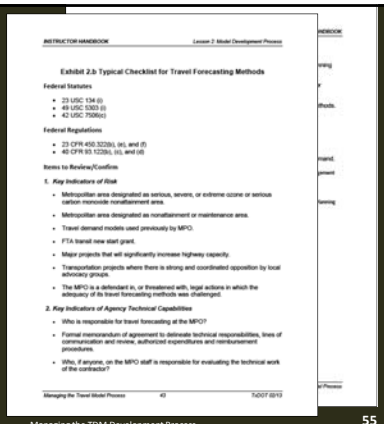


Exhibit 2.b Typical Checklist for Travel Forecasting Methods

Federal Statutes

- 23 USC 134 (i)
- 49 USC 5303 (i)
- 42 USC 7506(c)

Federal Regulations

- 23 CFR 450.322(b), (e), and (f)
- 40 CFR 93.122(b), (c), and (d)

Items to Review/Confirm

1. *Key Indicators of Risk*
   - Metropolitan area designated as serious, severe, or extreme ozone or serious carbon monoxide nonattainment area.
   - Metropolitan area designated as nonattainment or maintenance area.
   - Travel demand models used previously by MPO.
   - FTA transit new start grant.
   - Major projects that will significantly increase highway capacity.
   - Transportation projects where there is strong and coordinated opposition by local advocacy groups.
   - The MPO is a defendant in, or threatened with, legal actions in which the adequacy of its travel forecasting methods was challenged.
2. *Key Indicators of Agency Technical Capabilities*
   - Who is responsible for travel forecasting at the MPO?
   - Formal memorandum of agreement to delineate technical responsibilities, lines of communication and review, authorized expenditures and reimbursement procedures.
   - Who, if anyone, on the MPO staff is responsible for evaluating the technical work of the contractor?

Managing the TDM Development Process 55

How Does MAP-21 Change Things?

Managing the TDM Development Process 56

MAP-21

- Federal transportation bill signed into law July 6, 2012
- Initial findings are discussed
- Timing of pilot in September allows additional time for examination of Texas policy implications (e.g., considering Texas Administrative Code, as well)

Managing the TDM Development Process 57

Performance-Based Planning (PBP)

- Included in MAP-21
- Will include in pilot to the extent possible
- General concept:
  - Constraints are increasing
  - Measuring performance results of decisions made demonstrates accountability
  - Flexibility of local (state) approach

Managing the TDM Development Process 58

When Is a Model Necessary? Start with: When Is a Model Required?

Managing the TDM Development Process 59

Why Do Travel Modeling?

"Quantitative"

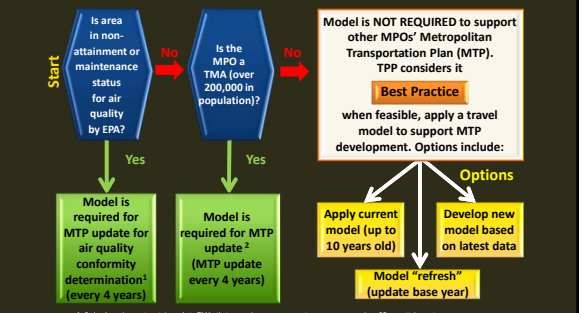
"Objective"

"Conformity"

"Required"

Managing the TDM Development Process 60

When Is a Model Required for MTP?

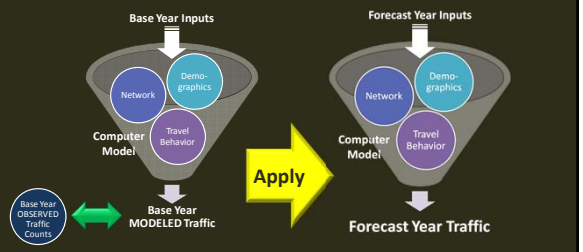


[1] Federal requirement pertains only to TMAs that are serious, severe, or extreme ozone, or serious CO, nonattainment areas (http://www.fhwa.dot.gov/planning/certcheck.htm). State of Texas requires that all nonattainment area plans be based on travel demand models, with more stringent model requirements for the areas that fall into the federal model requirement category (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20). See also TAC Title 30, Part 1, Rule 114.260.

[2] Under federal rule, all other TMAs (not in first group) must meet minimum travel model standards under Conformity Rule if already previous practice ("no backsliding"). State of Texas requires that long-range plans by TMAs be based on "estimates of travel demand" and that "development of long-range transportation plans relies on computer travel demand forecasting" (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20).

When Is a Model Update Required for an Application Scenario?

What Kind of Update?



Develop a Model. Then:

Apply the Model to a Future Year or Alternative Analysis Scenario

When Is a Model Update Necessary? (Reminder)

MTP Metropolitan Transportation Plan

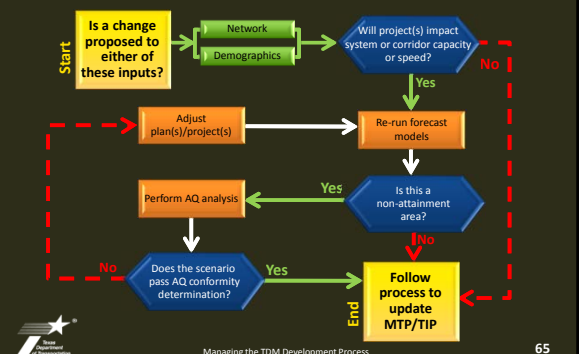
MTP:
20-year planning horizon (financially constrained)

TIP:
4-year fiscally constrained "management tool for monitoring progress in implementation" of MTP

TIP Transportation Improvement Program

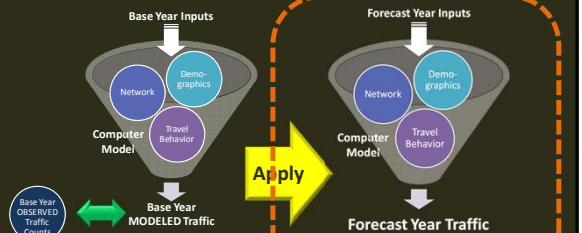
TIP must be consistent with the MTP

When Is a Model Update Necessary?



New Concept: Re-apply

Re-apply Model to Forecast Year



Develop a Model. Then:

Apply the Model to a Future Year or Alternative Analysis Scenario

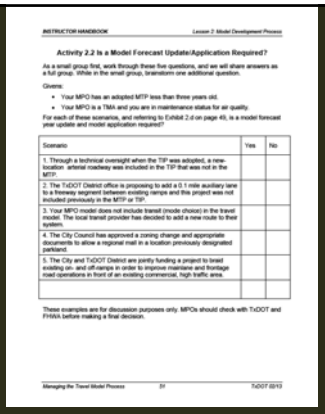
When Is a Model Required Otherwise?

Examples include:

- Major investments/NEPA analyses
- Environmental justice examination of tolling projects (current and future)
- Mobile source air toxics analysis

MPOs should confer with TxDOT in these cases

Activity: Is a Model Update Required?



Activity 2.2 Is a Model Forecast Update/Application Required?

As a small group first, work through these five questions, and we will share answers as a full group. While in the small group, brainstorm one additional question.

Given:

- Your MPO has an adopted MTP less than three years old.
- Your MPO is a TMA and you are in maintenance status for air quality.

For each of these scenarios, and referring to Exhibit 2-2 on page 49, is a model forecast year update and model application required?

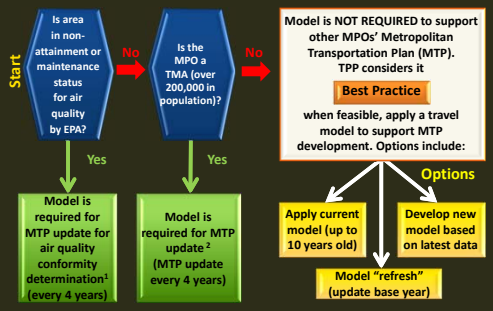
Scenario	Yes	No
1. Through a technical oversight when the TIP was adopted, a new-location arterial roadway was included in the TIP that was not in the MTP.		
2. The TxDOT District office is proposing to add a 0.1 mile auxiliary lane to a freeway segment between existing ramps and this project was not included previously in the MTP or TIP.		
3. Your MPO model does not include transit (mode choice) in the travel model. The local transit provider has decided to add a new route to their system.		
4. The City Council has approved a zoning change and appropriate documents to allow a regional mall in a location previously designated parkland.		
5. The City and TxDOT District are jointly funding a project to braid existing on- and off-ramps in order to improve mainline and frontage road operations in front of an existing commercial, high traffic area.		

These examples are for discussion purposes only. MPOs should check with TxDOT and FHWA before making a final decision.

So, If a Model Is Not Required…

When Is a Model Best Practice?

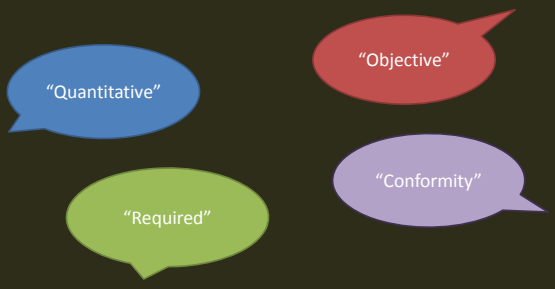
When Is a Model Required for MTP?



[1] Federal requirement pertains only to TMAs that are serious, severe, or extreme ozone, or serious CO, nonattainment areas (http://www.fhwa.dot.gov/planning/certcheck.htm). State of Texas requires that all nonattainment area plans be based on travel demand models, with more stringent model requirements for the areas that fall into the federal model requirement category (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20). See also TAC Title 30, Part 1, Rule 114.260.

[2] Under federal rule, all other TMAs (not in first group) must meet minimum travel model standards under Conformity Rule IF already previous practice ("no backsliding"). State of Texas requires that long-range plans by TMAs be based on "estimates of travel demand" and that "development of long-range transportation plans relies on computer travel demand forecasting" (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20).

Why Do Travel Modeling?



Best Practice Model Uses for MTP

- Scenario testing
- Project prioritization
- To support performance measure examination under MAP-21
  (specifics still being explored)

Scenarios for Testing

- Fiscally-constrained forecast year (as required)
- No build (really: existing plus committed)
- Other test scenarios to define plan
  - To prioritize projects
  - To determine project implementation year
  - Etc.
- Needs plan/illustrative purposes

Project Prioritization

How Does an MPO Decide Which Projects to Include in the Financially Constrained Plan?

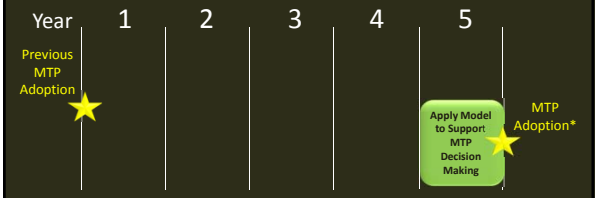
- Run existing plus committed scenario to identify needs
- Test projects to address needs
  - Projects with existing funding/schedule
  - New projects not previously identified
- Examine measures of effectiveness

Performance Measures

- More to come as MAP-21 is interpreted
- One possible approach:
  - MPO, with public, identifies goals to meet
  - Performance measures are used to evaluate how well the MTP meets those goals
    - o Total regional delay reduction
    - o Hot spots addressed
    - o More people using sustainable modes
  - Other goals/measures not from a travel model

MTP Development Model Need

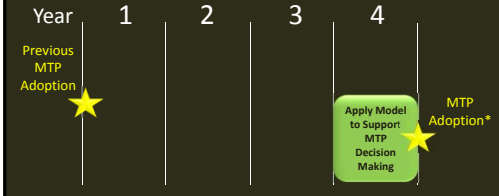
(5-Year MTP Adoption Cycle)



* (a) …In attainment areas, the effective date of the transportation plan shall be its date of adoption by the MPO…
(c) The MPO shall review and update the transportation plan at least every four years in air quality nonattainment and maintenance areas and at least every five years in attainment areas…" (23 CFR 450.322)

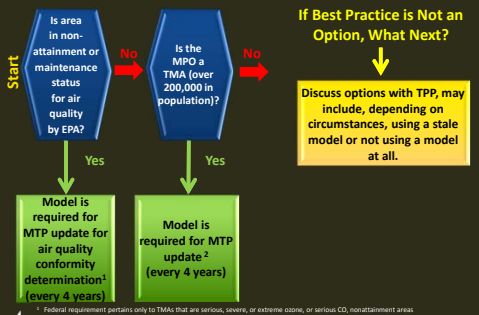
MTP Development Model Need

(4-Year MTP Adoption Cycle)



* "In nonattainment and maintenance areas, the effective date of the transportation plan shall be the date of a conformity determination issued by the FHWA and the FTA." (23 CFR 450.322)

When is a Model Required for MTP?



[1] Federal requirement pertains only to TMAs that are serious, severe, or extreme ozone, or serious CO, nonattainment areas (http://www.fhwa.dot.gov/planning/certcheck.htm). State of Texas requires that all nonattainment area plans be based on travel demand models, with more stringent model requirements for the areas that fall into the federal model requirement category (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20). See also TAC Title 30, Part 1, Rule 114.260.

[2] Under federal rule, all other TMAs (not in first group) must meet minimum travel model standards under Conformity Rule IF already previous practice ("no backsliding"). State of Texas requires that long-range plans by TMAs be based on "estimates of travel demand" and that "development of long-range transportation plans relies on computer travel demand forecasting" (*TxDOT Traffic Data and Analysis Manual*, 2001, pp. 2-20).

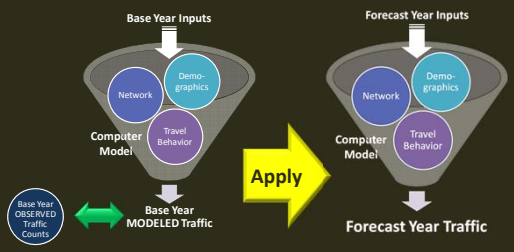
BREAK

Key Dates for Modeling and the MTP

3-Model Concept

- Current model available
- Model under development
- Data collection for next model after that

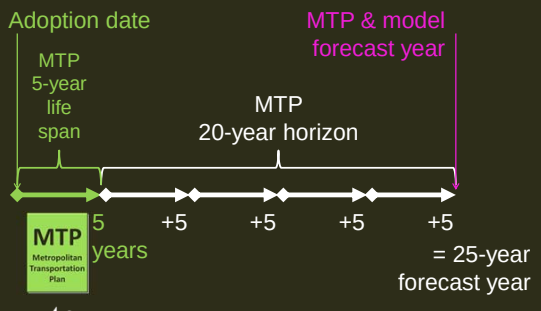
Reminder: Base Year and Forecast Year



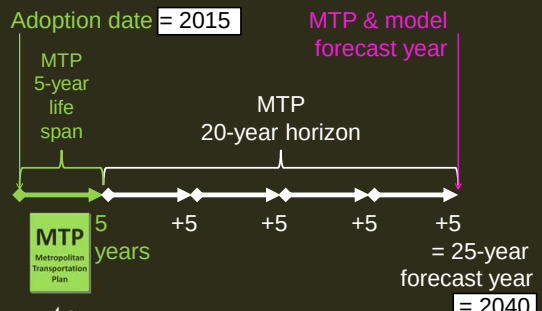
Develop a Model. Then:

Apply the Model to a Future Year or Alternative Analysis Scenario

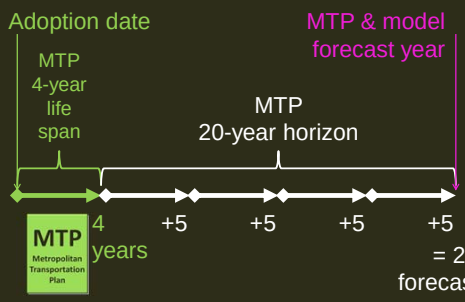
Adoption, Forecast Years: 5-Year Cycle



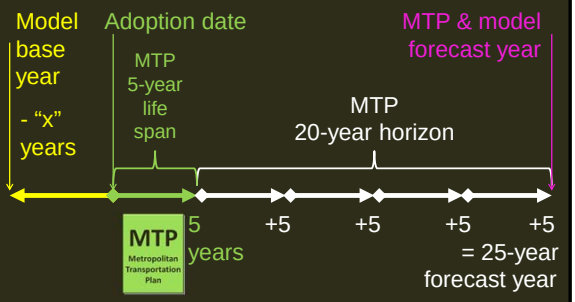
Example



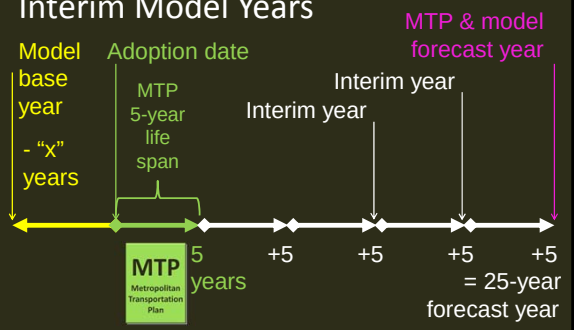
Adoption, Forecast Years: 4-Year Cycle



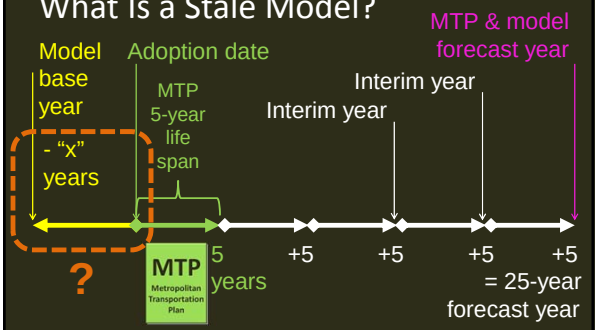
Model Base Year Precedes MTP



Interim Model Years



What Is a Stale Model?



Models: 5 Years Old versus New

2007 4 Runner

2012 4 Runner

"Kicking the Tires" Exhibit

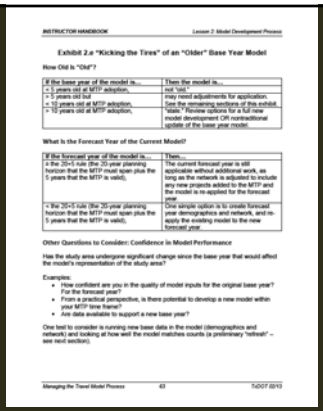


Exhibit 2.e "Kicking the Tires" of an "Older" Base Year Model

How Old Is "Old"?

If the base year of the model is...	Then the model is...
< 5 years old at MTP adoption,	not "old."
> 5 years old but	may need adjustments for application.
< 10 years old at MTP adoption,	See the remaining sections of this exhibit.
> 10 years old at MTP adoption,	"stale." Review options for a full new model development OR nontraditional update of the base year model.

What Is the Forecast Year of the Current Model?

If the forecast year of the model is...	Then...
≥ the 20+5 rule (the 20-year planning horizon that the MTP must span plus the 5 years that the MTP is valid),	The current forecast year is still applicable without additional work, as long as the network is adjusted to include any new projects added to the MTP and the model is re-applied for the forecast year.
< the 20+5 rule (the 20-year planning horizon that the MTP must span plus the 5 years that the MTP is valid),	One simple option is to create forecast year demographics and network, and re-apply the existing model to the new forecast year.

Other Questions to Consider: Confidence in Model Performance

Has the study area undergone significant change since the base year that would affect the model's representation of the study area?

Examples:

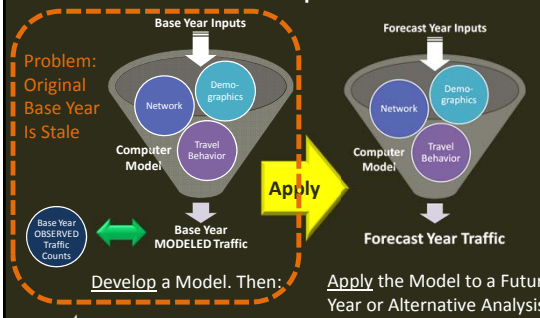
- How confident are you in the quality of model inputs for the original base year? For the forecast year?
- From a practical perspective, is there potential to develop a new model within your MTP time frame?
- Are data available to support a new base year?

One test to consider is running new base data in the model (demographics and network) and looking at how well the model matches counts (a preliminary "refresh" – see next section).

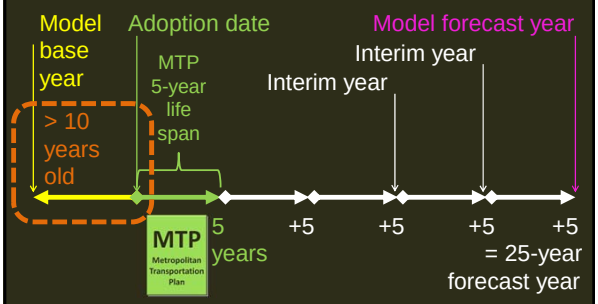
Models: Older than 10 Years

2002 Camry

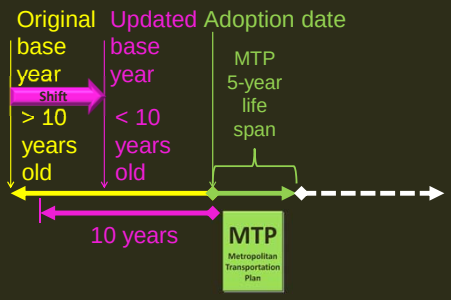
Another Kind of Update: Refresh



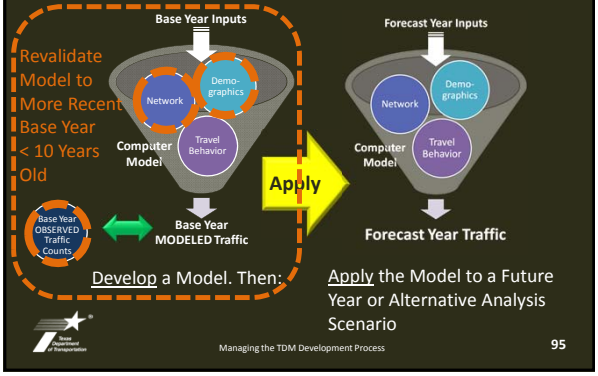
Base Year Model Is/Will Be Stale



Nontraditional Refresh of Base Year



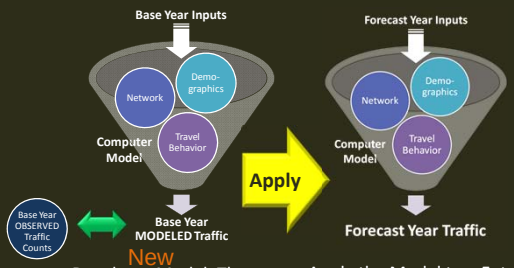
Nontraditional Refresh



3-Model Concept

- Current model available
- Model under development
- Data collection for next model after that

Calibration of New Model

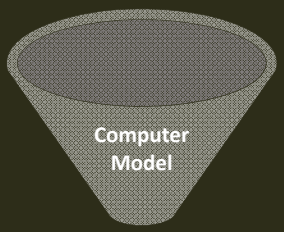


New

Develop a Model. Then:

Apply the Model to a Future Year or Alternative Analysis Scenario

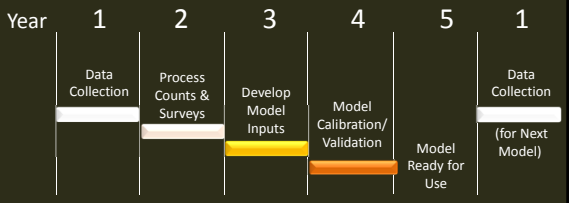
From Lesson 1: The Texas Package Is a Trip-Based Model, Generally 3 Steps



- Trip Generation (TRIPCAL5)
- Trip Distribution (ATOM2)
- Highway Assignment

New Model Development Schedule

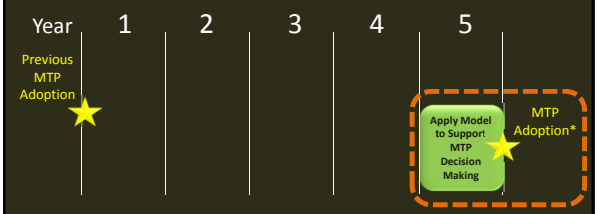
(All MPOs are on a 5-Year Count Cycle)



This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

Reminder: MTP Model Need

(5-Year MTP Adoption Cycle)



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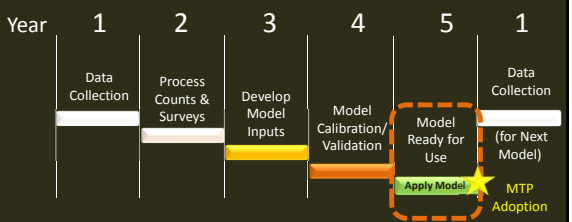
When MTP & Model Cycles Align



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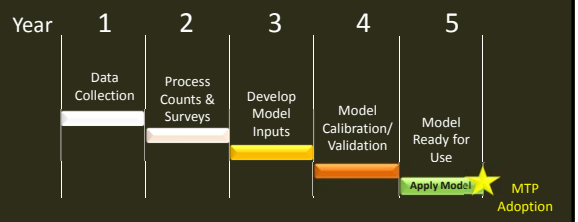
Hard Deadlines?



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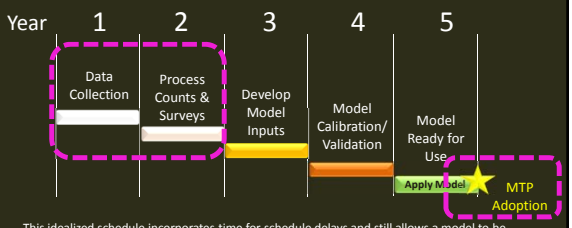
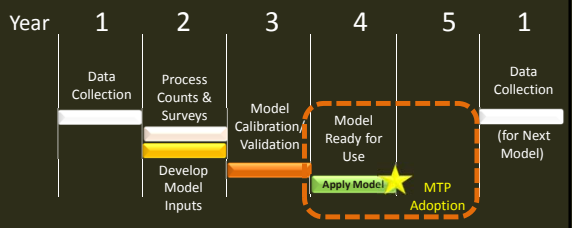
Hard Deadlines?

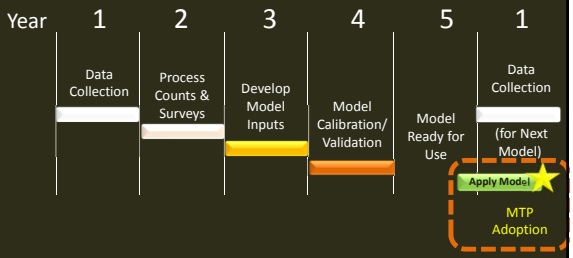


This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

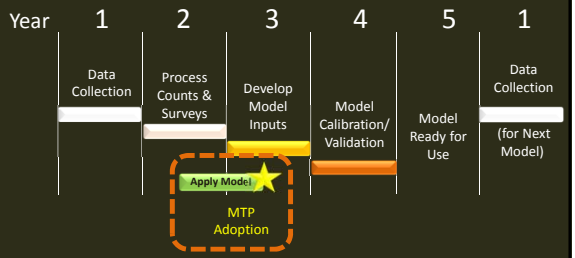
Room for Some Flexibility



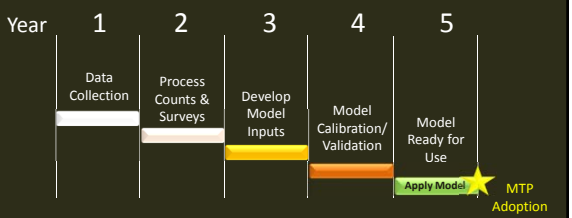
What If the Schedules Don't Align?
(Example 1)



What If the Schedules Don't Align?
(Example 2)



Other Potential Schedule Issues?



This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

Lesson 2 Learning Objectives

Model Development Process

- Identify When Model Is Required
- Explain When Model Update Is Needed
- List 5 Phases of Model Development

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch:
11:30 a.m. – 1:00 p.m.

Breaks:
10:15 a.m. & 2:45 p.m.

Day 1
1. Travel Model Fundamentals ✓
2. Model Development Process ✓
3. Key Inputs & Quality Process

Day 2
4. Resources

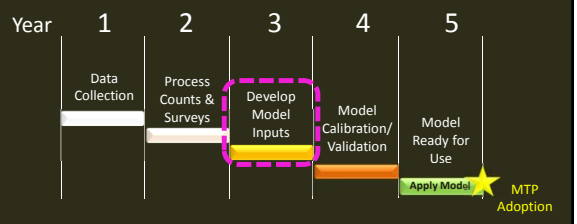
Day 3
Day 4
5. Putting It All Together

Lesson 3 Learning Objectives

Key Inputs & Quality Process

- Identify Key Inputs
- Describe Internal vs. External Quality Control
- Explain Why Iterative Review Occurs

Ideal MTP/Model Schedule



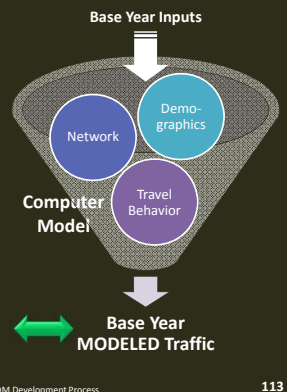
This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

Plan for Lessons 3, 4, and 5

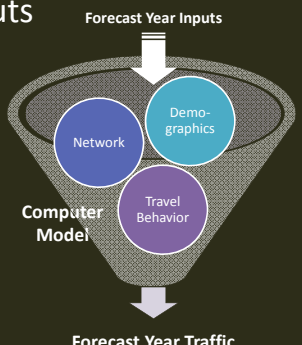
- WHAT
- WHO & HOW
- WHEN

Lessons
3. Key Inputs & Quality Process
4. Resources
5. Putting It All Together

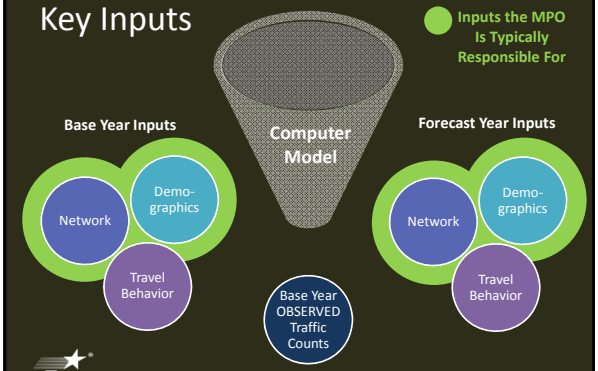
Base Year Inputs



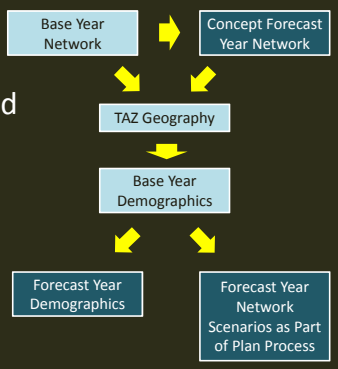
Future Year Inputs



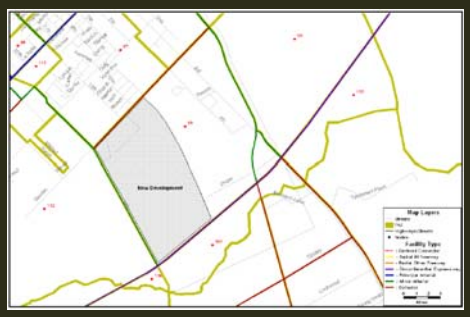
Key Inputs



Recommended Order to Develop Key Inputs



Start: Base Year Network

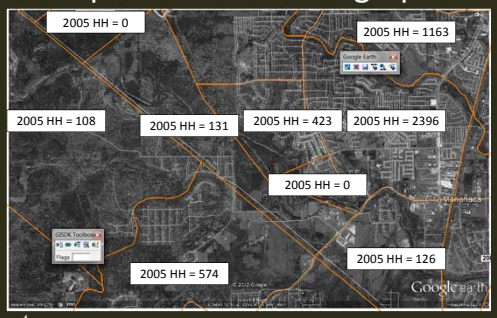


Code: Concept Forecast Year Network

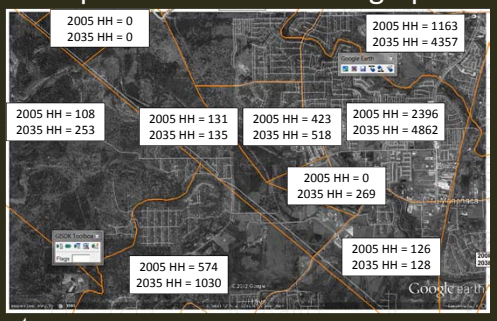
Code: Concept Forecast Year Network

Define Traffic Analysis Zones (TAZs)

Develop Base Year Demographics

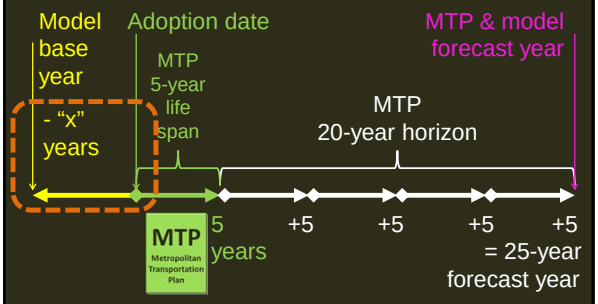


Develop Forecast Year Demographics

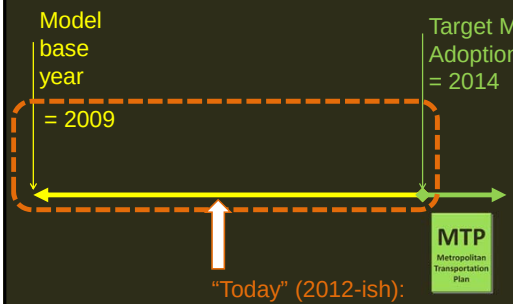


Base Year —Need to Know

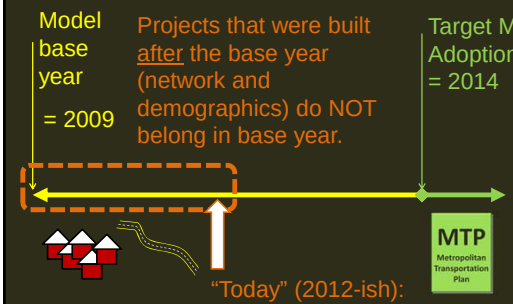
Reminder: Key Dates



Back to the Future: Developing Inputs



Back to the Future: Developing Inputs



Networks—Need to Know

Network Key Concepts Exhibit

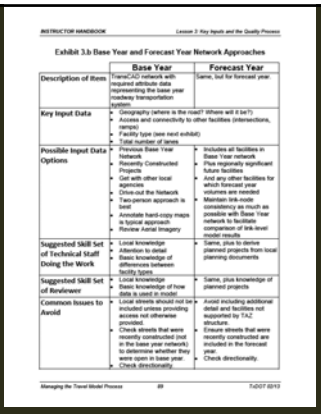


Exhibit 3.b Base Year and Forecast Year Network Approaches

	Base Year	Forecast Year
Description of Item	TransCAD network with required attribute data representing the base year roadway transportation system.	Same, but for forecast year.
Key Input Data	▸ Geography (where is the road? Where will it be?) ▸ Access and connectivity to other facilities (intersections, ramps) ▸ Facility type (see next exhibit) ▸ Total number of lanes	
Possible Input Data Options	▸ Previous Base Year Network ▸ Recently Constructed Projects ▸ Get with other local agencies ▸ Drive-out the Network ▸ Two-person approach is best ▸ Annotate hard-copy maps is typical approach ▸ Review Aerial Imagery	▸ Includes all facilities in Base Year network ▸ Plus regionally significant future facilities ▸ And any other facilities for which forecast year volumes are needed ▸ Maintain link-node consistency as much as possible with Base Year network to facilitate comparison of link-level model results.
Suggested Skill Set of Technical Staff Doing the Work	▸ Local knowledge ▸ Attention to detail ▸ Basic knowledge of differences between facility types	▸ Same, plus to derive planned projects from local planning documents
Suggested Skill Set of Reviewer	▸ Local knowledge ▸ Basic knowledge of how data is used in model	▸ Same, plus knowledge of planned projects
Common Issues to Avoid	▸ Local streets should not be included unless providing access not otherwise provided. ▸ Check streets that were recently constructed (not in the base year network) to determine whether they were open in base year. ▸ Check directionality.	▸ Avoid including additional detail and facilities not supported by TAZ structure. ▸ Ensure streets that were recently constructed are included in the forecast year. ▸ Check directionality.

Network Facility Types Exhibit

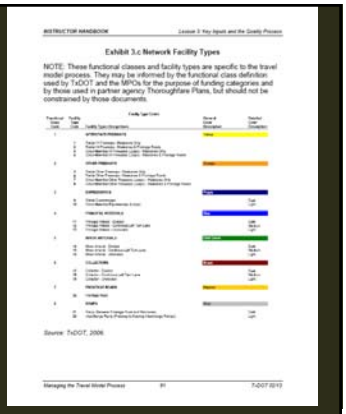


Exhibit 3.c Network Facility Types

NOTE: These functional classes and facility types are specific to the travel model process. They may be informed by the functional class definition used by TxDOT and the MPOs for the purpose of funding categories and by those used in partner agency Thoroughfare Plans, but should not be constrained by those documents.

Source: TxDOT, 2006

Networks Activity

Activity 3.1 Networks*

As a large group, discuss these and different types of facilities that an MPO might question whether or not to include in a model network. The sources are citations only, the facilities are shown to provoke discussion only.

Should this alley be included in the MPO base year network?

Why or why not?

What facility type might this be?

Should this dirt road be included in the MPO base year network?

Why or why not?

What facility type might this be?

What other types of roadways have you had trouble deciding whether or not to include in a roadway network?

*General concepts only. This is not definitive of any particular area and judgment will need to be applied to particular situations.

TAZs—Need to Know

TAZ Development Approaches Exhibit

Activity 3.1 Networks*

As a large group, discuss these and different types of facilities that an MPO might question whether or not to include in a model network. The sources are citations only, the facilities are shown to provoke discussion only.

Should this alley be included in the MPO base year network?

Why or why not?

What facility type might this be?

Should this dirt road be included in the MPO base year network?

Why or why not?

What facility type might this be?

What other types of roadways have you had trouble deciding whether or not to include in a roadway network?

*General concepts only. This is not definitive of any particular area and judgment will need to be applied to particular situations.

TAZ Development Example

Demographics—Need to Know

What Do Demographics Include?

- Population in households
- Households
- Population in group quarters (institutionalized and not)
- Median income
- Employment by basic, retail, and service categories
- Special generators data (covered separately)

Example Demographics Submittal

								REGULAR EMPLOYMENT					SG EMPLOYMENT				
TAZ	PopinHH	GQ_INST	GQ_NON	HH	Pop/HH	Income35		Subtot. Reg	BAS	RET	SERV	EDUC	Subtotal SG	BAS	RET	SERV	EDUC
	113527	5482	5713	46704	2.43			49548	11426	14632	21022	2468	20893	5136	2232	11937	1588
1	0	1	0	0	0.00	0		49	2	2	45	0	75	0	0	75	0
2	0	0	0	0	0.00	0		15	6	2	7	0	0	0	0	0	0
3	19	0	0	5	3.80	13234		15	2	9	4	0	0	0	0	0	0
4	31	0	0	14	2.21	13234		66	8	6	52	0	0	0	0	0	0
5	0	12	0	0	0.00	0		8	2	2	4	0	0	0	0	0	0
6	0	0	0	0	0.00	0		8	2	2	4	0	11	0	0	11	0
7	0	0	0	0	0.00	0		90	6	76	8	0	0	0	0	0	0
8	0	0	0	0	0.00	0		21	7	2	12	0	0	0	0	0	0
9	0	0	0	0	0.00	0		42	33	4	5	0	0	0	0	0	0
10	0	0	0	0	0.00	0		13	2	7	4	0	108	0	0	108	0
11	14	0	0	13	1.08	20614		293	59	3	231	0	0	0	0	0	0
12	0	202	0	0	0.00	0		8	2	2	4	0	580	0	0	580	0
13	0	0	0	0	0.00	0		64	2	58	4	0	0	0	0	0	0
14	0	0	0	0	0.00	0		48	2	42	4	0	0	0	0	0	0
15	0	0	0	0	0.00	0		54	3	2	49	0	0	0	0	0	0
16	0	0	0	0	0.00	0		4	2	2	0	0	178	0	0	178	0
17	27	0	0	12	2.25	20614		8	2	2	4	0	0	0	0	0	0
18	41	0	0	19	2.16	20614		31	24	2	5	0	0	0	0	0	0
19	0	0	0	0	0.00	0		48	9	2	37	0	0	0	0	0	0
20	0	0	0	0	0.00	0		32	26	2	4	0	0	0	0	0	0
21	0	0	0	0	0.00	0		221	123	25	73	0	50	0	0	50	0

Demographics Key Concepts Exhibit

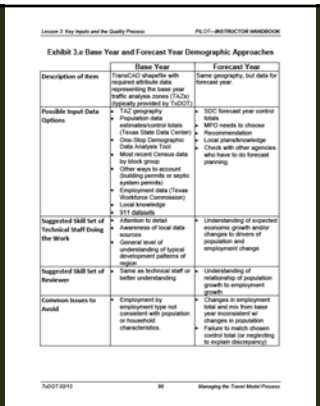


Exhibit 3.e Base Year and Forecast Year Demographic Approaches

Description of Item	Base Year	Forecast Year
Possible Input Data Options	TransCAD shapefile with required attribute data representing the base year traffic analysis zones (TAZs) (typically provided by TxDOT) TAZ geography Population data estimates/control totals (Texas State Data Center) One-Stop Demographic Data Analysis Tool Most recent Census data by block group Other ways to account (building permits or septic system permits) Employment data (Texas Workforce Commission) Local knowledge 911 datasets	Same geography, but data for forecast year. SDC forecast year control totals MPO needs to choose Recommendation Local plans/knowledge Check with other agencies who have to do forecast planning.
Suggested Skill Set of Technical Staff Doing the Work	Attention to detail Awareness of local data sources General level of understanding of typical development patterns of region	Understanding of expected economic growth and/or changes to drivers of population and employment change
Suggested Skill Set of Reviewer	Same as technical staff or better understanding	Understanding of relationship of population growth to employment growth
Common Issues to Avoid	Employment by employment type not consistent with population or household characteristics.	Changes in employment total and mix from base year inconsistent w/ changes in population Failure to match chosen control total (or neglecting to explain discrepancy)

Demographics Development: Base Year Estimate

Past Known Demographics Point

- U.S. Census Data for Local Area

What Happened Up until Base Year?

- Local Knowledge
- Aerial Photography
- Other Resource (See Local Agencies, e.g., Water, Permitting, ISDs)

Demographics Development: Forecast Year

Establish Control Totals

- Base Year Estimate is "Base"
- Examine State Data Center Scenarios
- Make Local Decision Which to Use

Allocation to TAZs

- Enter known development that occurred since base year
- Developable Areas (Consider Physical, Political, and Typical Densities)
- Land Use Modeling
- Other Agency Input (see Local Agencies, e.g., Water, Permitting, ISDs)

Median Income

Base Year

- U.S. Census Data
- Aerial Imagery (Size of Homes, Swimming Pools, Gates, Etc.)
- Local Knowledge

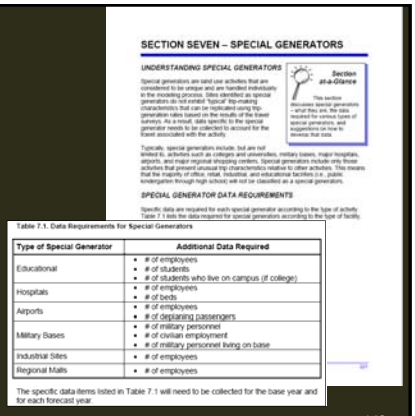
Forecast Year

- In Base Year $
- Real Income Change ONLY (Not Inflation Change)
- Regional Economic Change (Examine Trends)
- TAZ Level
  - New Development
  - Adjacent TAZ Incomes

Special Generators (SGs)

- Travel behavior is not adequately described by general travel rates (too low, too high)
- Suggested approach
  - Identify potential SGs during demographics development
  - Model developer has the discretion to treat as SG
- As for other demographics, base year and future year characteristics must be identified

Special Generators Section in Guidebook



SECTION SEVEN – SPECIAL GENERATORS

UNDERSTANDING SPECIAL GENERATORS

Section at-a-Glance

SPECIAL GENERATOR DATA REQUIREMENTS

Table 7.1. Data Requirements for Special Generators

Type of Special Generator	Additional Data Required
Educational	• # of employees • # of students • # of students who live on campus (if college)
Hospitals	• # of employees • # of beds
Airports	• # of employees • # of originating passengers
Military Bases	• # of military personnel • # of civilian employment • # of military personnel living on base
Industrial Sites	• # of employees
Regional Malls	• # of employees

The specific data items listed in Table 7.1 will need to be collected for the base year and for each forecast year.

Special Generators Activity

Activity 3.2 Discussion: Special Generators

Should this airport be annotated as a potential Special Generator?

Why or why not?

Should this large employer be annotated as a potential Special Generator?

Why or why not?

Should this military base be annotated as a potential Special Generator?

Why or why not?

BREAK

Best Practice Strategies for Developing Model Inputs

Minimum and Desirable Model Input Data Exhibit

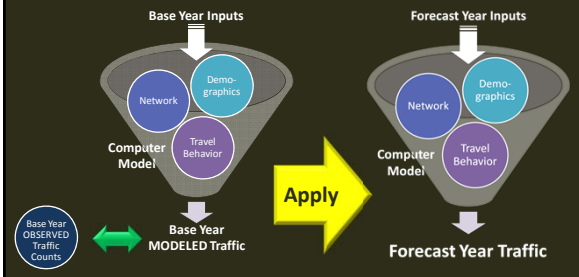
Exhibit 3.f Minimum and Desirable Model Input Data*

Model Aspect	Minimum	Desirable
Count Data	▸ Reasonable stratification of count data across facility and area types	▸ 40% link coverage with observed count data (not estimated)
Travel Surveys	▸ Small-area rates	Local survey data: ▸ Workplace ▸ Household ▸ Commercial Vehicle ▸ External
TAZ Layer	▸ Should cover geographic area that represents 90% of residents who travel in region	▸ Should cover geographic area that represents 90% of residents who travel in region
Networks	▸ Arterial and higher facilities	▸ Collector and higher facilities
Demographics	▸ TAZ data updated for each model base year: ▪ Number of households ▪ Population in households ▪ Group Quarters Population (institutional versus not) ▪ Employment by type ▪ Other Special Generators ▪ Median income	▸ Tracked and updated annually
Census Journey-to-Work Data	▸ County-county flows	▸ Sector-sector flows (or percentages)

* Flexible dependent upon challenges of particular model; discuss with TxDOT as part of model development scheduling and planning process ahead of time.

Quality

Input Data Quality Is Important



Quality Discussion

Activity 3.3 Discussion: Effective and Efficient Quality Procedures

Who does quality start with?
Can an individual ensure quality on a complex, technical product alone?
Is a reviewer always correct?
Does reviewing a product always find all mistakes made?
Based on the above discussion, given a model input deliverable (a network or demographics), describe an effective and efficient quality procedure that you would feel confident in.

Internal MPO Quality Assurance Protocol Example

Best Practice

Exhibit 3.g Example INTERNAL MPO Quality Assurance Protocol

Suggestion: tailor, reproduce this Protocol for each technical deliverable.

MPO Quality Assurance Commitment

The _____ MPO follows this procedure for all technical products. This procedure, or comparable variation with permission, is required for MPO staff and persons working under contract to the MPO.

QA/QC Tracking Log for Current Deliverable*

Role Description	Print Name	Date	Initial
QAP Assigns Task			
RP Complete Task			
IR Reviews Task			
RP Address Comments			
IR Reviews Changes			
QAP Signs Off			

*This document to be submitted with deliverable

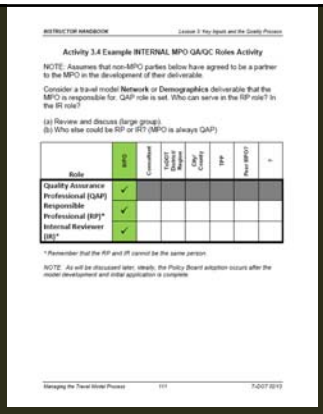
Roles and Responsibilities

Quality Assurance Professional (QAP): This person assures that the RP and IR assigned have the appropriate skills to do the task, assures the QC procedure is scheduled and followed, and maintains the QC records. The QAP can also be either the RP or IR.

Responsible Professional (RP): The person who is completing the task to be reviewed.

Internal Reviewer (IR): A person (not the RP) with skills equal to or more advanced than the RP.

QA/QC Roles Exercise


Activity 3.4 Example INTERNAL MPO QA/QC Roles Activity

NOTE: Assumes that non-MPO parties below have agreed to be a partner to the MPO in the development of their deliverable.

Consider a travel model **Network** or **Demographics** deliverable that the MPO is responsible for. QAP role is set. Who can serve in the RP role? In the IR role?

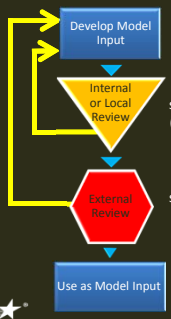
(a) Review and discuss (large group)
(b) Who else could be RP or IR? (MPO is always QAP)

Role	MPO	Consultant	District Staff / Region	City / County	TPP	Peer MPO(*)	?
Quality Assurance Professional (QAP)	✓						
Responsible Professional (RP)*	✓						
Internal Reviewer (IR)*	✓						

* Remember that the RP and IR cannot be the same person.

NOTE: As will be discussed later, ideally, the Policy Board adoption occurs after the model development and initial application is complete.

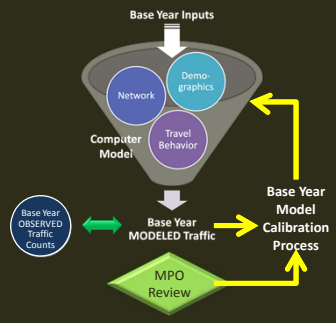
Internal versus External Review



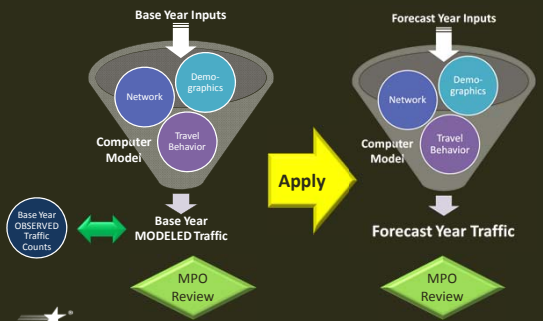
	EXAMPLE
Original analyst	MPO staff
Quality review by peer or someone with more expertise (same organization as original analyst)	MPO director/ technical committee
Quality review by peer or someone with more expertise (receiving organization or designated third party)	TxDOT TPP

"Revisit" Phenomenon

Base Year Testing (Calibration)



Does Model Work for Forecast?



Minimum & Desirable Checks for Base Year Model (Exhibit)

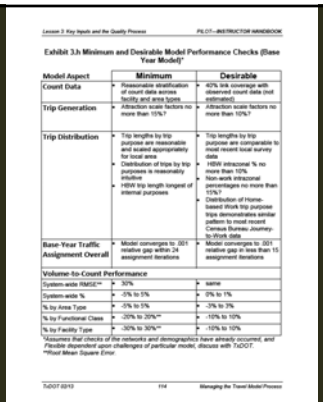


Exhibit 3.h Minimum and Desirable Model Performance Checks (Base Year Model)*

Model Aspect	Minimum	Desirable
Count Data	▸ Reasonable stratification of count data across facility and area types	▸ 40% link coverage with observed count data (not estimated)
Trip Generation	▸ Attraction scale factors no more than 15%?	▸ Attraction scale factors no more than 10%?
Trip Distribution	▸ Trip lengths by trip purpose are reasonable and scaled appropriately for local area ▸ Distribution of trips by trip purposes is reasonably intuitive ▸ HBW trip length longest of internal purposes	▸ Trip lengths by trip purpose are comparable to most recent local survey data ▸ HBW intraznal % no more than 10% ▸ Non-work intrazonal percentages no more than 15%? ▸ Distribution of Home-based Work trip purpose trips demonstrates similar pattern to most recent Census Bureau Journey-to-Work data
Base-Year Traffic Assignment Overall	▸ Model converges to .001 relative gap in 24 assignment iterations	▸ Model converges to .001 relative gap in less than 15 assignment iterations
Volume-to-Count Performance		
System-wide RMSE**	▸ 30%	▸ same
System-wide %	▸ -5% to 5%	▸ 0% to 1%
% by Area Type	▸ -5% to 5%	▸ -3% to 3%
% by Functional Class	▸ -20% to 20%**	▸ -10% to 10%
% by Facility Type	▸ -30% to 30%**	▸ -10% to 10%

*Assumes that checks of the networks and demographics have already occurred, and Flexible dependent upon challenges of particular model, discuss with TxDOT.
**Root Mean Square Error.

Minimum & Desirable Checks for Forecast Year Model (Exhibit)

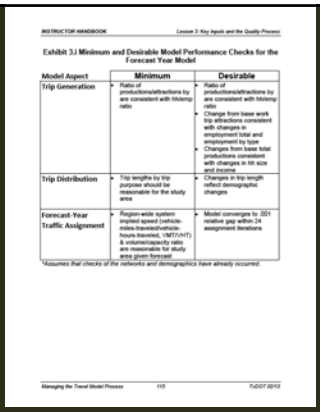


Exhibit 3.i Minimum and Desirable Model Performance Checks for the Forecast Year Model

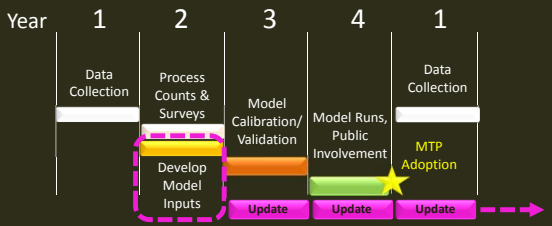
Model Aspect	Minimum	Desirable
Trip Generation	Ratio of productions/attractions by are consistent with trip/emp ratio	Ratio of productions/attractions by are consistent with trip/emp ratio Change from base work trip attractions consistent with changes in employment total and employment by type Changes from base total productions consistent with changes in hh size and income
Trip Distribution	Trip lengths by trip purpose should be reasonable for the study area	Changes in trip length reflect demographic changes
Forecast-Year Traffic Assignment	Region-wide system implied speed (vehicle-miles-traveled/vehicle-hours-traveled, VMT/VHT) & volume/capacity ratio are reasonable for study area given forecast	Model converges to .001 relative gap within 24 assignment iterations

*Assumes that checks of the networks and demographics have already occurred.

Other Best Practice Strategies

Best Practice

Update Model Inputs More Often



This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

Coordinating Model Data with MPO's GIS

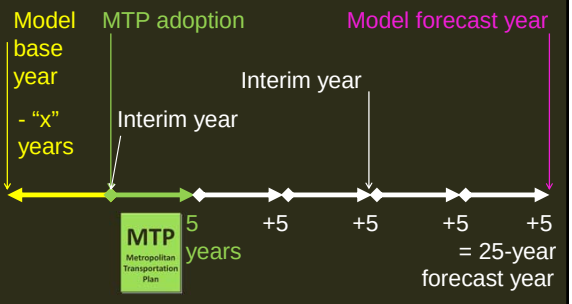
Start here:

Previous Model Base Year → New Model Base Year

MPO GIS Planning Data

Use MPO Data to Inform Base Year (Make Sure Not Current Year)

Strategic Interim Model Years



Other Strategies for Data Inputs

- Avoid getting demographics or networks adopted by MPO board until the model is complete
- Specific to MPOs hiring consultants
  - Product is not final until TPP has reviewed it with respect to demographic reasonableness *and* model format
  - Adjustments may still be necessary as issues are uncovered during model calibration and application

Lesson 3 Learning Objectives

Key Inputs & Quality Process

- Identify Key Inputs
- Describe Internal vs. External Quality Control
- Explain Why Iterative Review Occurs

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch:
11:30 a.m. – 1:00 p.m.

Breaks:
10:15 a.m. & 2:45 p.m.

Day 1
1. Travel Model Fundamentals ✓
2. Model Development Process ✓
3. Key Inputs & Quality Process ✓

Day 2
4. Resources

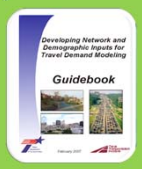
Day 3
Day 4
5. Putting It All Together

Lesson 4 Learning Objectives

Resources


Staff


Data



Guidelines/ Instructions


Training

Plan for Lessons 3, 4, and 5

- WHAT
- WHO & HOW
- WHEN

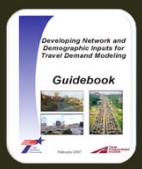
Lessons

3. Key Inputs & Quality Process
4. Resources
5. Putting It All Together

Overview of Resources


Staff


Data



Guidelines


Training

Typical Staffing Options for All Model Tasks

Staff Resources for Models

MPO/ Contractor Staff | TxDOT | Consultant

Identify Model Staffing Options

Three General Tasks

- Network & Demographic Inputs — **Typically MPO Responsibility**
- Model Development & Calibration
- Model Application & Maintenance

TxDOT Oversight

FHWA Oversight

Key Inputs

Inputs the MPO Is Typically Responsible For

Base Year Inputs

Network, Demo-graphics, Travel Behavior

Computer Model

Base Year OBSERVED Traffic Counts

Forecast Year Inputs

Network, Demo-graphics, Travel Behavior

Identify Model Staffing Options

Network & Demographic Inputs

MPO Staff

MPO Contractor Staff

Consultant

TxDOT Staff

- Traditionally the MPO staff at small and medium-sized MPOs prepare these inputs
- Occasionally temporary contractor staff or a consultant
- TxDOT staff role is to provide data, guidance, assistance, review, and oversight

Identify Model Staffing Options

Model Development & Calibration

TxDOT Staff

MPO Staff

Consultant

- Traditionally the TPP staff for small and medium-sized MPOs
- Options under prior agreement with consultative partners (FHWA and TxDOT):
  - Some large MPOs have modeling staff
  - Some MPOs hire a consultant
- TxDOT staff role of review and oversight still pertains

Identify Model Staffing Options

Model Application & Maintenance

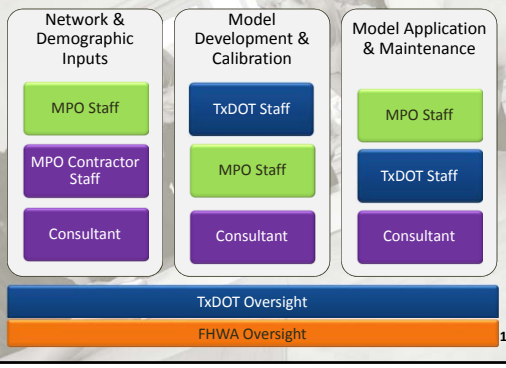
MPO Staff

TxDOT Staff

Consultant

- Traditionally intended to be MPO staff; often TPP staff under deadline
- Options under prior agreement with consultative partners (FHWA and TxDOT):
  - Some large MPOs have modeling staff
  - Some MPOs hire a consultant
- TxDOT staff role of review and oversight still pertains

Identify Model Staffing Options



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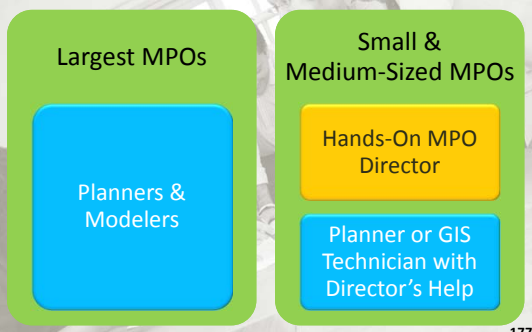
Focus on Internal MPO Staffing

Managing the TDM Development Process 176

MPO Staff Doing Modeling



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Talent Management Framework

Managing the TDM Development Process 178

Competency and Workforce Planning

- Develop an inventory of required competences and available competences
- Prepare a workforce plan
- MPOs will benefit by:
  - Identifying competency inadequacy
  - Recognize existing talent
  - Seek appropriate training
  - Hire the right people (local more likely to stay)

Managing the TDM Development Process 179

Recruitment

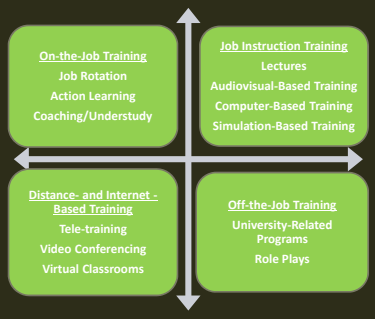
- Augment the talent pipeline
  - Fellowship and internship programs
- MPO positioning and branding
  - Attract talent
  - Inspire current employees
- Screening system
  - Collaboration with TxDOT TPP and academia

Managing the TDM Development Process 180

Learning Management

- Two types of innate talents—actualized talent and potential talent
- Potential talent—development required to fully realize the MPOs investment in hiring someone

Training Options



Outsourcing *vs.* In-House Training

Outsourcing	In-House Training
• Develops a broad and deep understanding of the issues. • Offers stronger diagnosis ability. • Provides a fresh and out-of-the-box perspective.	• Integrity of information is maintained. • In line with the organization's core values and vision.

TxDOT Staff

- TPP model management
- TPP staff assigned to model
- TransCAD Help Desk
  - TPP-TRANSCAD-HELPDDESK@txdot.gov
  - 512/486-5177
- TxDOT TPP planning staff
- TxDOT field planning staff

Other Staff Resources

- Local agency partners
- Temporary contractor staff
- Consultant contracts
- Universities doing research

What Is FHWA's Role?

- Federal Planning Team, including the Travel Model Improvement Program (TMIP)
- Travel Model Resource Center
- Texas division
  - Oversee MPO planning through certification review
  - In Texas, division staff tend to limit direct modeling input to non-attainment areas
  - Division staff have gotten involved in project studies in other areas upon request

General Model Staffing Options by Model Stage

Identify Model Staffing Options

Network & Demographic Inputs	Model Development & Calibration	Model Application & Maintenance
MPO Staff	TxDOT Staff	MPO Staff
MPO Contractor Staff	MPO Staff	TxDOT Staff
Consultant	Consultant	Consultant

TxDOT Oversight

FHWA Oversight

Matching Staff Skill Sets to Model Tasks (Exhibit)

Exhibit 4.a General Guidelines for Assigning Staff to Modeling Tasks, by Staff Skill Set

Data Resources Overview

- Data needs
  - Network, TAZs, demographics
  - Other data for models
- Data resources
  - Public
  - Private

Typically MPO Responsibility

Data Base Year Network

- Previous base year network
- Recently constructed projects
  - Get with other local agencies
- Drive out the network
  - Two-person approach is best
  - Annotating hard-copy maps is typical approach
- Review aerial imagery

Data Forecast Year Network

- Base year network
- Funded projects
- Not-funded-but-under-consideration projects
  - High-priority projects

Data TAZ Geography

- Prior model traffic analysis zones
- Base year model network
- Forecast year model network
- Most recent census data block group geography
- Other helpful boundaries
  - Major water features
  - Rail

Data Base Year Demographics

- TAZ geography
- Population data estimates/control totals (Texas State Data Center)
- One-Stop Demographic Data Analysis Tool
- Most recent Census data by block group
- Other ways to account (building permits or septic system permits)
- Employment data (Texas Workforce Commission)
- Local knowledge

Data Forecast Year Demographics

- SDC forecast year control totals
  - MPO needs to choose
  - Recommendation
- Local plans/knowledge

Data Package Typically Provided to MPOs for Inputs Development (Exhibit)

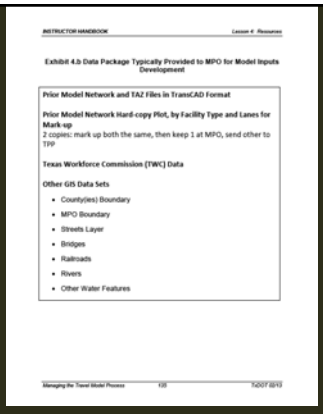


Exhibit 4.b Data Package Typically Provided to MPO for Model Inputs Development

Prior Model Network and TAZ Files in TransCAD Format

Prior Model Network Hard-copy Plot, by Facility Type and Lanes for Mark-up
2 copies: mark up both the same, then keep 1 at MPO, send other to TPP

Texas Workforce Commission (TWC) Data

Other GIS Data Sets

- County(ies) Boundary
- MPO Boundary
- Streets Layer
- Bridges
- Railroads
- Rivers
- Other Water Features

Census Data Resources

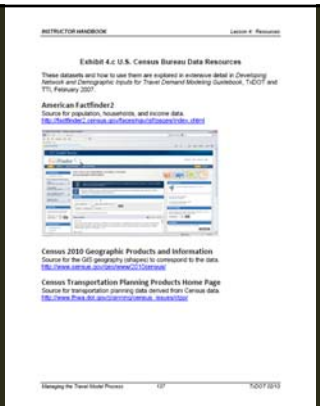


Exhibit 4.c U.S. Census Bureau Data Resources

American Factfinder2
Source for population, households, and income data.

Census 2010 Geographic Products and Information
Source for the GIS geography (shapes) to correspond to the data.

Census Transportation Planning Products Home Page
Source for transportation planning data derived from Census data.

State of Texas Data Resources

Exhibit 4.d State of Texas Data/Analysis Resources Available to MPOs

A. Population Data (Texas State Data Center)
B. Employment Data (Texas Workforce Commission) (coordinate use agreement through TxDOT-TPP)
C. Traffic Data and Analysis (TxDOT)
1. Base Year Saturation Counts
2. Counts for Freeway Facilities – mainlanes, ramps, frontage roads
3. External Station Counts and Forecasts
4. Vehicle Classification Data
D. Travel Survey Data and Analysis (TxDOT)
1. Trip production and attraction rates by trip purpose (vehicle and person)
2. Average trip lengths
3. External travel
4. Commercial vehicles
5. Special generator trip rates
6. Auto occupancy factors
7. Mode of travel
E. Functional Classification Data (coordinated effort with District and MPO)
F. Texas Statewide Analysis Model (TxDOT) (for externals in some cases)
G. Air Quality Analysis for Non-Attainment and Maintenance Areas (TxDOT)

Activity: Other Potential Data Sources


Activity 4.1 Other Data Resources

What are some other agencies, online, or other resources for data for modeling?

Suggested Break Here

Texas-Specific References & Guidelines (Exhibit)

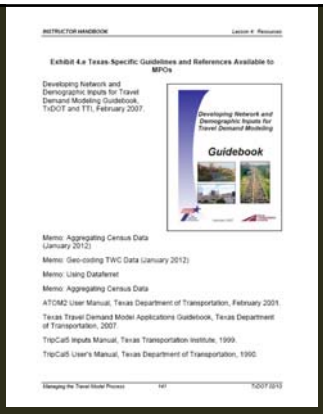


Exhibit 4.e Texas-Specific Guidelines and References Available to MPOs

Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook. TxDOT and TTI, February 2007.

Guidebook

Memo: Aggregating Census Data (January 2012)

Memo: Geo-coding TWC Data (January 2012)

Memo: Using Dataferret

Memo: Aggregating Census Data

ATOM2 User Manual, Texas Department of Transportation, February 2001.

Texas Travel Demand Model Applications Guidebook, Texas Department of Transportation, 2007.

TripCal5 Inputs Manual, Texas Transportation Institute, 1999.

TripCal5 User's Manual, Texas Department of Transportation, 1990.

General References & Guidelines (Exhibit)

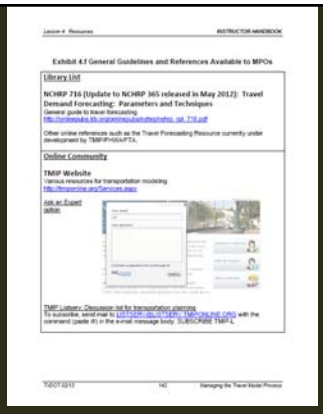


Exhibit 4.f General Guidelines and References Available to MPOs

Library List

NCHRP 716 (Update to NCHRP 365 released in May 2012): Travel Demand Forecasting: Parameters and Techniques

Online Community

TMIP Website

Training Available to MPOs on Modeling (Exhibit)


Exhibit 4.g Model Training Available to MPOs

TxDOT (or under contract through Texas A&M Transportation Institute)

A. General TransCAD Training (TTI)

B. Introduction to Travel Demand Modeling (TTI)

C. Model Inputs Development Training (TTI)

D. Model Application/Alternatives Analysis Training (TTI)

Contact TxDOT TPP staff or the TransCAD Help Desk TPP-TRANSCAD-HELPDDESK@txdot.gov or 512/486-5177

NHI Introduction to Urban Travel Demand Forecasting Course

Free version of materials available, but for course to be offered in Texas, contact TxDOT TPP staff or the TransCAD Help Desk. TPP-TRANSCAD-HELPDDESK@txdot.gov or 512/486-5177

TMIP Webinars

Caliper Corporation (TransCAD software developer)

Travel Demand Modeling with TransCAD and On-site Training Options

http://www.caliper.com/

Texas Package & TransCAD Licensing Explained (Exhibit)


Exhibit 4.h The Texas Package and TransCAD Software

"Texas Package"

Trip Generation: TransCAD, TripCal5

Trip Distribution: TransCAD, ATOM2

Highway Assignment: TransCAD

Minimum Software Needs to Run the Texas Package

TransCAD: The software should be loaded on one computer only, for the user most likely to do the modeling work.

- Typically the person who does GIS work, if applicable
- When the software is loaded, write down here:

TransCAD license serial number off the installation disk: _____

TransCAD USB Key serial number here: _____

TransCAD Version _____ and Build Number: _____ (these are on the installation disc or from the Help menu)

TransCAD USB Key

- The TransCAD USB Key is VALUABLE and EASILY LOST
- Find a large, highly visible key chain to attach to it
- During times when TransCAD is not being used consistently, identify a location where it should be kept

Texas Package Program Suite (Add-on Menu)

(see next page for more info)

Other Texas Package Software Requests (Exhibit)

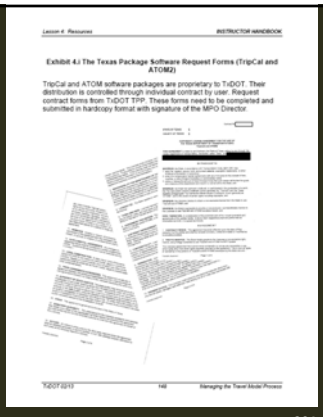


Exhibit 4.j The Texas Package Software Request Forms (TripCal and ATOM2)

TripCal and ATOM software packages are proprietary to TxDOT. Their distribution is controlled through individual contract by user. Request contract forms from TxDOT TPP. These forms need to be completed and submitted in hardcopy format with signature of the MPO Director.

Other Resources & Assistance

One-Stop Demographic Data Analysis Tool

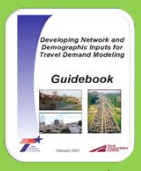
Other Assistance

Lesson 4 Learning Objectives

Resources

Staff

Data



Guidelines/ Instructions

Training

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch: 11:30 a.m. – 1:00 p.m.

Breaks: 10:15 a.m. & 2:45 p.m.

Day 1
1. Travel Model Fundamentals
2. Model Development Process
3. Key Inputs & Quality Process

Day 2
4. Resources

Day 3
5. Putting It All Together

Day 4

Lesson 5 Learning Objectives

Putting It All Together

- Identify Unique MPO Challenges
- Map the Critical Path
- Make It Work

Plan for Lessons 3, 4, and 5

- WHAT
- WHO & HOW
- WHEN

Lessons

3 Key Inputs & Quality Process

4 Resources

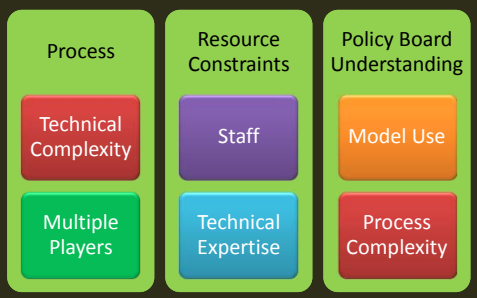
5 Putting It All Together

Lesson 5 Components

- One size does not fit all
- The model as a project
  - Choosing a project manager
  - Plan the work and work the plan (then check it)
- Best practice strategies
- Key talking points by audience

One Size Does Not Fit All

MPOs' General Issues with Models



One Size Does Not Fit All

- Largest MPOs
  - Independent with respect to model development
  - Work with TxDOT to gather travel surveys and count data
- Other large MPOs are developing models with TxDOT data resources and limited TxDOT help
- Some MPOs have staff resources/interest
- Some MPOs have little staff resources/interest

One Size Does Not Fit All, cont.

- Even among small and medium-sized MPOs, there is variation:
  - One MPO has a separate IAC with TTI to provide guidance on model inputs
  - Several MPOs use consultants to develop model inputs
  - Many of the MPOs develop their model inputs in-house with current staff

Specific Issue

For small and medium-sized MPOs across the United States, there is a ***well-documented resource constraint,*** hence the necessity for other strategies—developing innovative methodologies, scaling efforts to the resources available, and prioritizing.

What Are Your MPO's Unique Challenges? (Activity)

What Does Success Mean for You? (Activity)

Challenge: Travel Model Scheduling

Ideal Timeline
(5-Year Count Cycle = 5-Year MTP Cycle)

Example Timeline
(5-Year Count Cycle, 4-Year MTP Cycle)

Example Timeline
(5-Year Count Cycle, 4-Year MTP Cycle, More PI)

Schedule the Process
(3 Models)

Ideal Timeline—3 Models
(5-Year Count Cycle = 5-Year MTP Cycle)

Example Timeline—3 Models
(5-Year Count Cycle, 4-Year MTP Cycle)

Example Timeline
(5-Year Count Cycle, 4-Year MTP Cycle, After Fix)

Is This Reason to Despair?

No.

Knowing the 3-models concept empowers the MPO to plan ahead for future model activities.

The Model as a Project

What Is a Project?

A project is a one-time or cyclic endeavor involving:

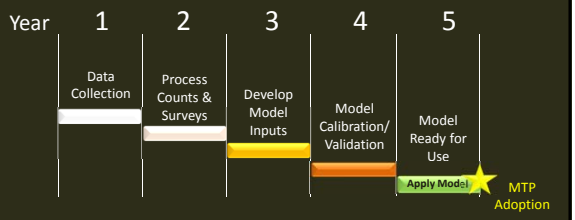
- An established objective
- A defined life span with a beginning and an end
- Usually, the involvement of several departments and professionals
- Specific time, cost, and performance requirements

The Model as a Project

MPO model development is cyclic, involving:

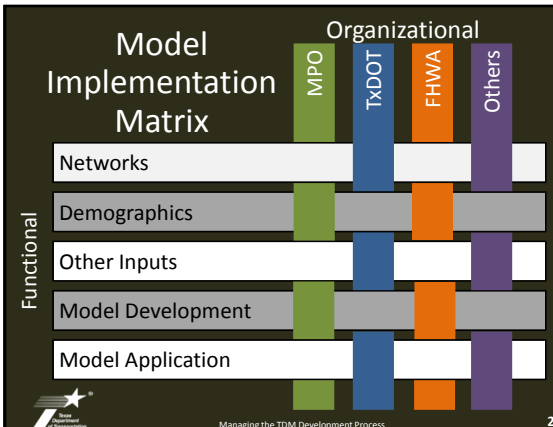
- An established objective—to apply for MTP
- A defined life span with a beginning and an end
- Usually, the involvement of several departments and professionals—and agencies
- Specific time, cost, and performance requirements

Ideal MTP/Model Schedule

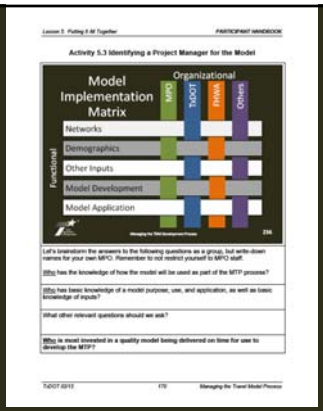


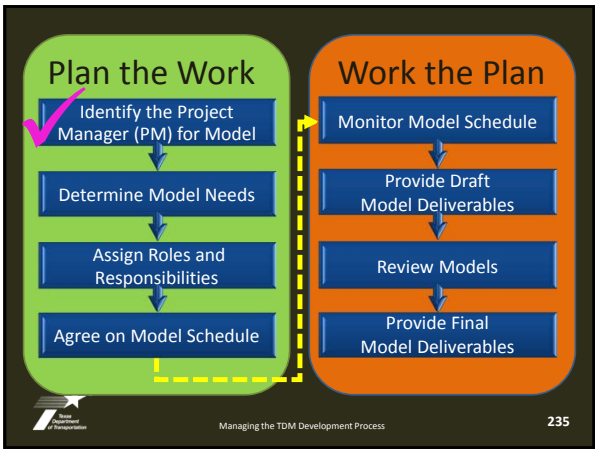
This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

Model Implementation Matrix



Who Is the Project Manager for Your MPO's Model? (Activity)




Plan the Work
Identify the Project Manager (PM) for Model
Determine Model Needs
Assign Roles and Responsibilities
Agree on Model Schedule
Work the Plan
Monitor Model Schedule
Provide Draft Model Deliverables
Review Models
Provide Final Model Deliverables
Managing the TDM Development Process
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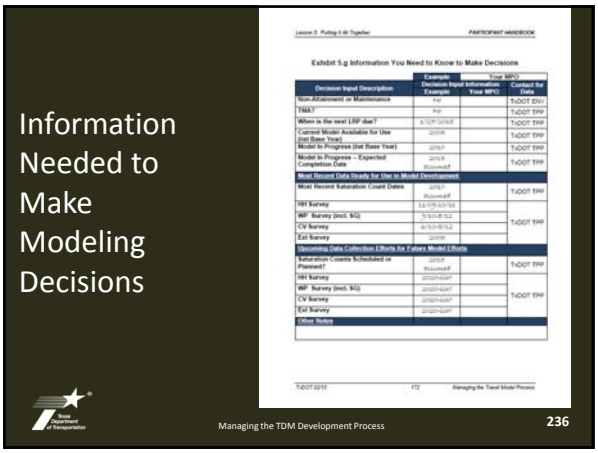
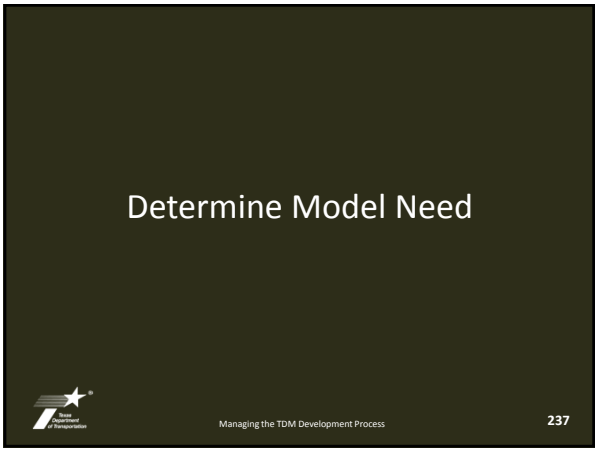
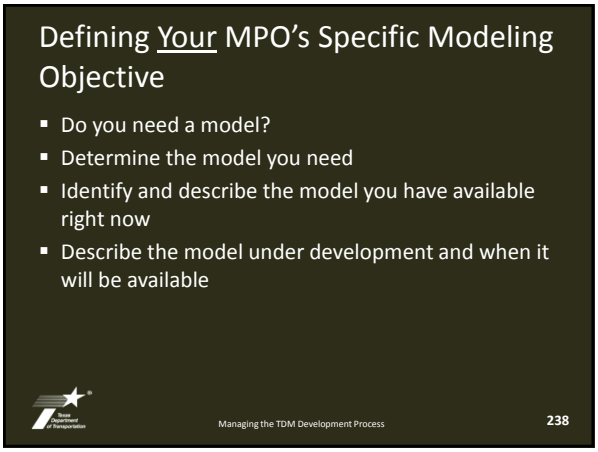
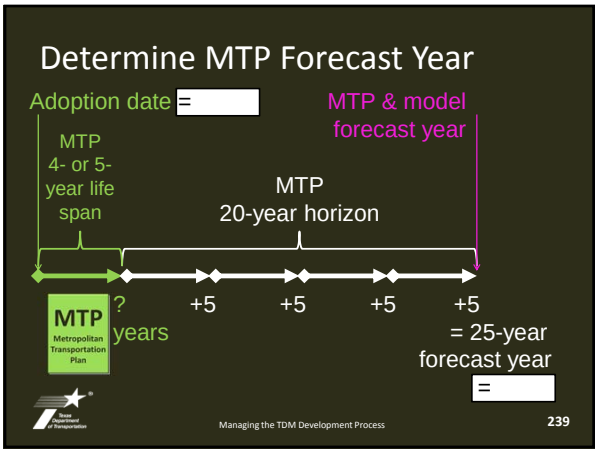
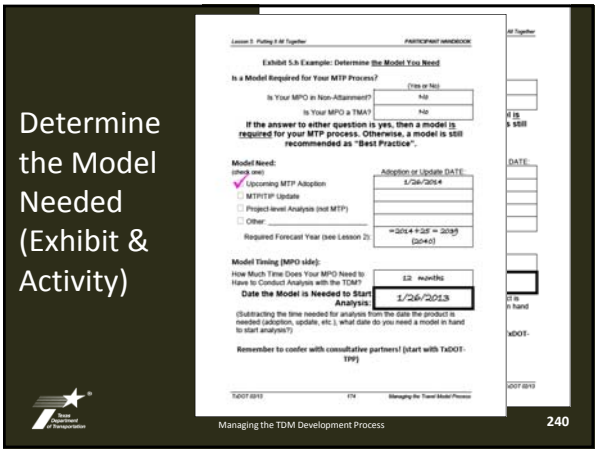

Information Needed to Make Modeling Decisions
Exhibit 5.g Information You Need to Know to Make Decisions
Managing the TDM Development Process
236


Determine Model Need
Managing the TDM Development Process
237


Defining Your MPO's Specific Modeling Objective
Do you need a model?
Determine the model you need
Identify and describe the model you have available right now
Describe the model under development and when it will be available
Managing the TDM Development Process
238


Determine MTP Forecast Year
Adoption date =
MTP & model forecast year
MTP 4- or 5-year life span
MTP 20-year horizon
MTP
Metropolitan Transportation Plan
? years
+5
+5
+5
+5
= 25-year forecast year
=
Managing the TDM Development Process
239


Determine the Model Needed (Exhibit & Activity)
Exhibit 5.h Example: Determine the Model You Need
Managing the TDM Development Process
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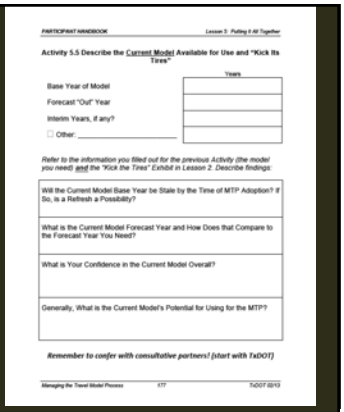
3-Model Concept

- Current model available
- Model under development
- Data collection for next model after that

Identify and Describe Model "In Hand"

- What travel model do you have available right now?
- Does it meet above needs?
- What level of effort is necessary to get the model to meet above needs?

Describe YOUR Current Available Model (Activity)


PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Activity 5.5 Describe the Current Model Available for Use and "Kick Its Tires"

	Years
Base Year of Model	
Forecast "Out" Year	
Interim Years, if any?	
☐ Other: _____	

Refer to the information you filled out for the previous Activity (the model you need) and the "Kick the Tires" Exhibit in Lesson 2. Describe findings:

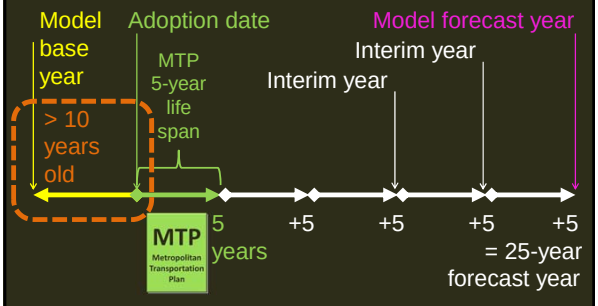
Will the Current Model Base Year be Stale by the Time of MTP Adoption? If So, is a Refresh a Possibility?
What is the Current Model Forecast Year and How Does that Compare to the Forecast Year You Need?
What is Your Confidence in the Current Model Overall?
Generally, What is the Current Model's Potential for Using for the MTP?

Remember to confer with consultative partners! (start with TxDOT)

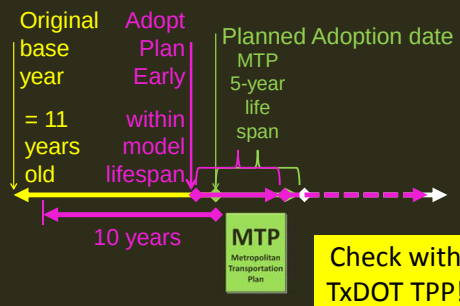
Managing the Travel Model Process ATT TxDOT 02/13

"Moving the Finish Line"

Reminder: "Stale" Model Concept



"Moving the Finish Line" Strategy



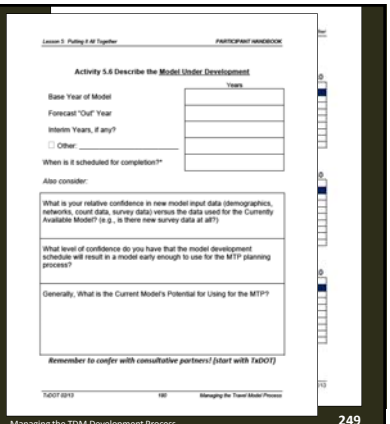
3-Model Concept

- Current model available
- Model under development
- Data collection for next model after that

Describe the Model Currently under Development

- When it will be available for application?
- What is the risk that the model development schedule will not be achieved?
- Is the model under purview of TxDOT for model development?
- Model advantages compared to model currently available

Describe YOUR Model under Development (Activity)



Activity 5.6 Describe the Model Under Development

Base Year of Model
Forecast "Out" Year
Interim Years, if any?
Other:
When is it scheduled for completion?*
Also consider:

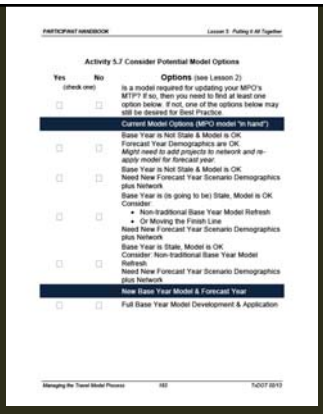
What is your relative confidence in new model input data (demographics, networks, count data, survey data) versus the data used for the Currently Available Model? (e.g., is there new survey data at all?)

What level of confidence do you have that the model development schedule will result in a model early enough to use for the MTP planning process?

Generally, What is the Current Model's Potential for Using for the MTP?

Remember to confer with consultative partners! [start with TxDOT]

Consider Options (Activity)



Activity 5.7 Consider Potential Model Options

Yes (check one) | No | Options (see Lesson 2)

Is a model required for updating your MPO's MTP? If so, then you need to find at least one option below. If not, one of the options below may still be desired for Best Practice.

Current Model Options (MPO model "in hand")

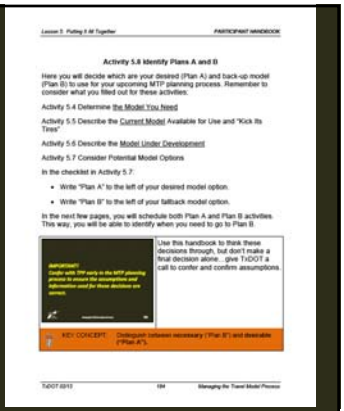
- Base Year is Not Stale & Model is OK
  Forecast Year Demographics are OK
  Might need to add projects to network and re-apply model for forecast year.
- Base Year is Not Stale & Model is OK
  Need New Forecast Year Scenario Demographics plus Network
- Base Year is (is going to be) Stale, Model is OK
  Consider:
  - Non-traditional Base Year Model Refresh
  - Or Moving the Finish Line

  Need New Forecast Year Scenario Demographics plus Network
- Base Year is Stale, Model is OK
  Consider Non-traditional Base Year Model Refresh
  Need New Forecast Year Scenario Demographics plus Network

New Base Year Model & Forecast Year

- Full Base Year Model Development & Application

Identify Plans A and B (Activity)



Activity 5.8 Identify Plans A and B

Here you will decide which are your desired (Plan A) and back-up model (Plan B) to use for your upcoming MTP planning process. Remember to consider what you filled out for these activities:

Activity 5.4 Determine the Model You Need

Activity 5.5 Describe the Current Model Available for Use and "Kick Its Tires"

Activity 5.6 Describe the Model Under Development

Activity 5.7 Consider Potential Model Options

In the checklist in Activity 5.7:

- Write "Plan A" to the left of your desired model option.
- Write "Plan B" to the left of your fallback model option.

In the next few pages, you will schedule both Plan A and Plan B activities. This way, you will be able to identify when you need to go to Plan B.

IMPORTANT! Confer with TPP early in the MTP planning process to ensure the assumptions and information used for these decisions are correct.

Use this handbook to think these decisions through, but don't make a final decision alone... give TxDOT a call to confer and confirm assumptions.

KEY CONCEPT: Distinguish between necessary ("Plan B") and desirable ("Plan A").

IMPORTANT!
Confer with TPP early in the MTP planning process to ensure the assumptions and information used for these decisions are correct.

Schedule the Activities for Each Plan

First, Identify Specific Model Tasks (Exhibit, Simple)

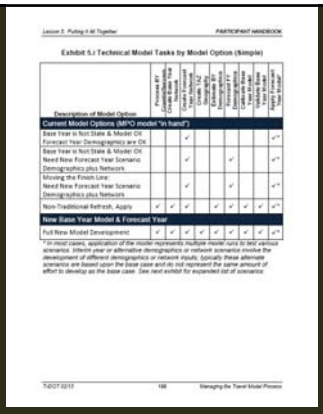
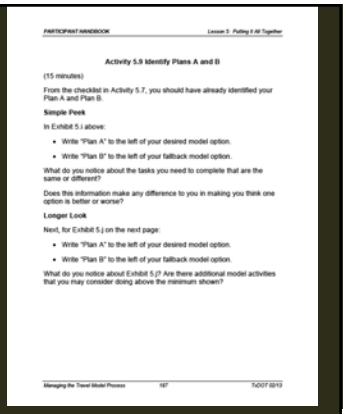


Exhibit 5.j Technical Model Tasks by Model Option (Simple)

Identify Plans A and B (Activity)


Activity 5.9 Identify Plans A and B

(15 minutes)

From the checklist in Activity 5.7, you should have already identified your Plan A and Plan B.

Simple Peek

In Exhibit 5.j above:

- Write "Plan A" to the left of your desired model option.
- Write "Plan B" to the left of your fallback model option.

What do you notice about the tasks you need to complete that are the same or different?

Does this information make any difference to you in making you think one option is better or worse?

Longer Look

Next, for Exhibit 5.j on the next page:

- Write "Plan A" to the left of your desired model option.
- Write "Plan B" to the left of your fallback model option.

What do you notice about Exhibit 5.j? Are there additional model activities that you may consider doing above the minimum shown?

Identify Specific Model Tasks (Tabloid)

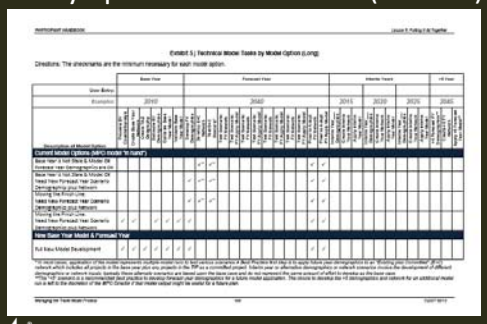


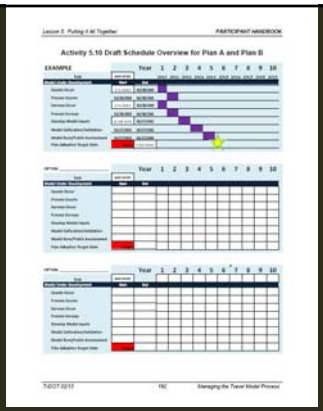
Exhibit 5.j Technical Model Tasks by Model Option (Long)

Schedule Tasks for Plans A & B

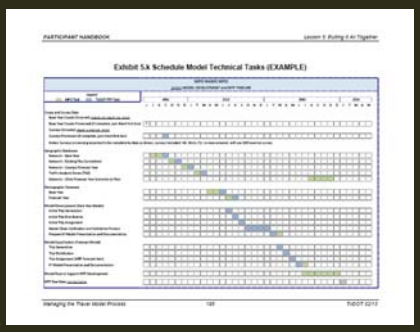
Plan A

Plan B

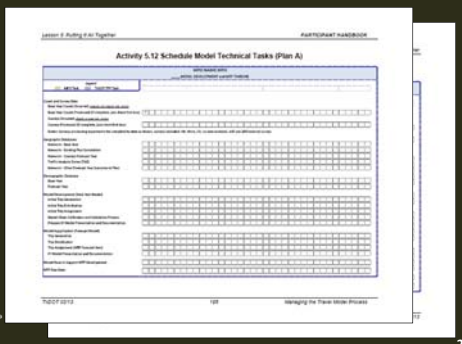
Draft Schedule Overview (Exhibit)


Activity 5.10 Draft Schedule Overview for Plan A and Plan B

Recommended Level of Detail



Activities: Plan A and Plan B



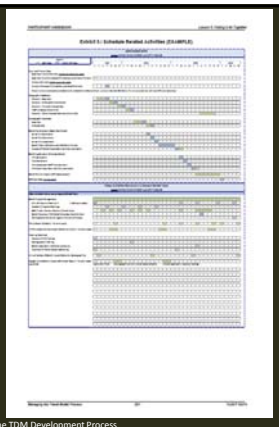
Deciding a Trigger Point

- Desirable (Plan A)
- Fall-back (Plan B)
- What triggers the fall-back?
  - Make decision now what/when trigger occurs
  - Decide whom you tell

Activities That Should Be Scheduled

- Communication milestones/regular check-ins
- QA/QC activities
- Incorporating model tasks into UPWP
- Staff training prior to anticipated tasks
- Tasks related to engaging consultants
- Post-MTP retrospective (lessons learned)

Schedule Related Activities (Example)

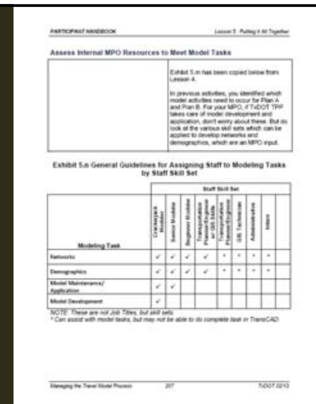


Determine & Agree to Roles & Responsibilities

Understand the Various TxDOT-MPO Relationships for TDM (Exhibit)

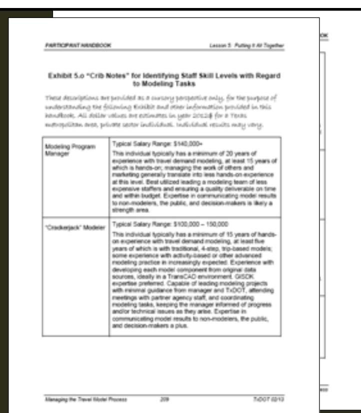
Texas Department of Transportation — Managing the TDM Development Process — 265

Matching Staff Skill Sets to Model Tasks (Exhibit from Lesson 4)



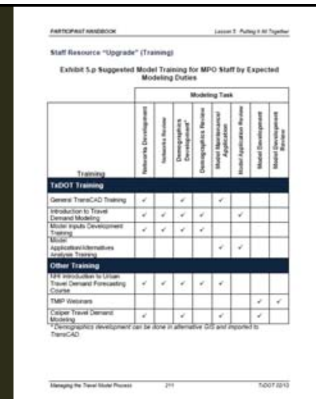
Texas Department of Transportation — Managing the TDM Development Process — 266

Staff Skill Sets "Crib Notes" (Exhibit)



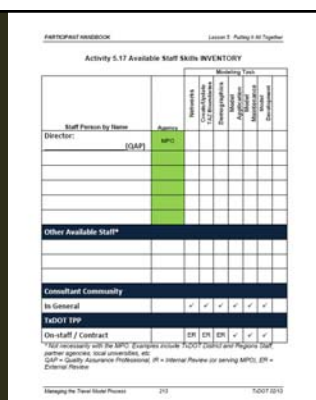
Texas Department of Transportation — Managing the TDM Development Process — 267

Suggested Model Training for MPO Staff (Exhibit)



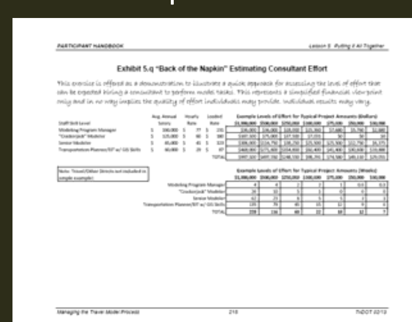
Texas Department of Transportation — Managing the TDM Development Process — 268

Available MPO Staff for Model Tasks (Exhibit)



Texas Department of Transportation — Managing the TDM Development Process — 269

"Back of the Napkin" Peek

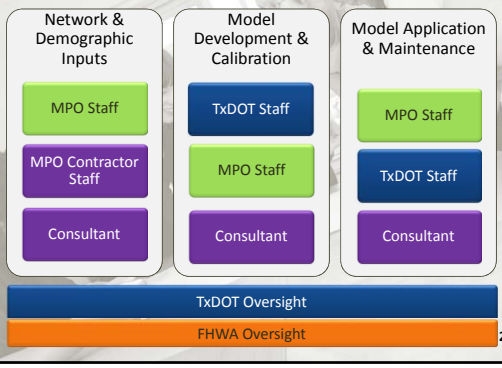


Texas Department of Transportation — Managing the TDM Development Process — 270

Pros and Cons of Using Consultants (Activity)


Activity 5.18 What Are the Pros and Cons of Using Consultants?
(discuss as group)

Reminder: Model Staffing Options



Developing Partnerships

- With other local agencies
  - Data
  - Technical support
- Partnership with universities doing research
- On-call consultant advisors

What Is MPO's Long-Term Strategy? (Activity)


Activity 5.19 What are Your MPO's Long-Term Modeling Goals?
(as large group, brainstorm 3 relevant questions)
(as small group, discuss for 5 minutes, then share)

Assigning Roles & Responsibilities

TPP Timeline Tool

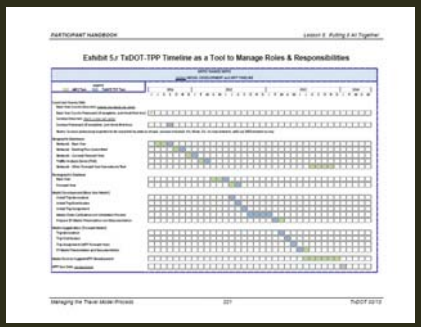


Exhibit 5.7 TxDOT-TPP Timeline as a Tool to Manage Roles & Responsibilities

Best Practice: Formalizing the Process

- Formalize agreements with agency partners, e.g.:
  - UPWP task agreement between MPO and TxDOT TPP(T)
  - Formal scope and schedule for TDM development process, including responsibilities for TxDOT and the MPO

UPWP Staff Planning

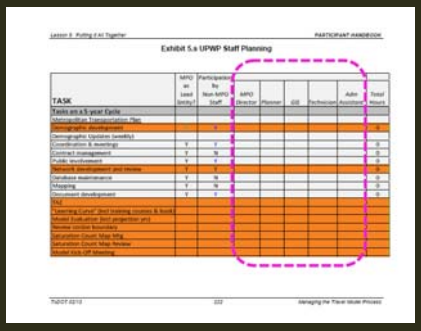
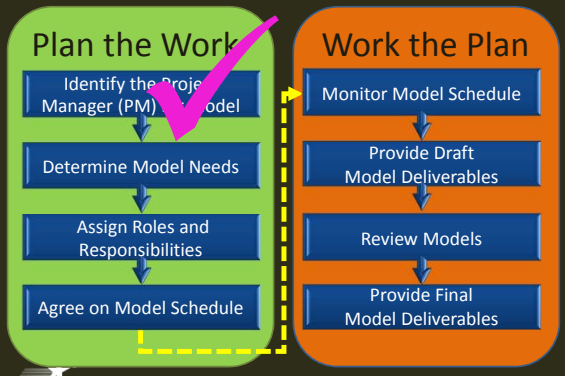


Exhibit 5.s UPWP Staff Planning



Managing the Schedule

Best Practice: Communica-tion Protocol (Activity)

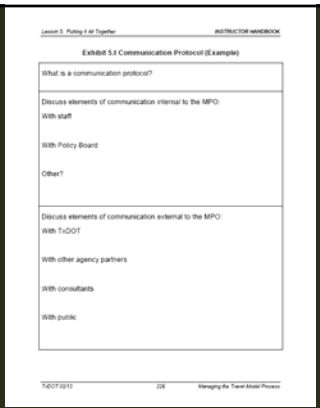


Exhibit 5.t Communication Protocol (Example)

What is a communication protocol?

Discuss elements of communication internal to the MPO:
With staff
With Policy Board
Other?

Discuss elements of communication external to the MPO:
With TxDOT
With other agency partners
With consultants
With public

Monitoring Schedule

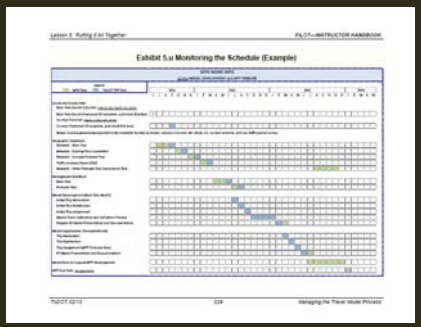


Exhibit 5.u Monitoring the Schedule (Example)

Monitoring Deliverables

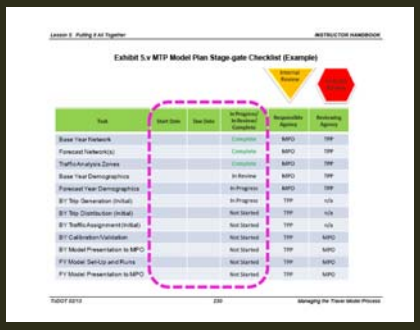


Exhibit 5.v MTP Model Plan Stage-gate Checklist (Example)

Strategies for Managing the Process Effectively (Activity)


Activity 5.20 What Strategies Might You Employ to Manage the Model Development Schedule?
(discuss as group, 5 minutes)

Keeping in Touch Strategies

MPO Director Is the Model Champion

- Advocates for timeline
- Manages deadlines

MPO Coordinates with TxDOT TPP Regularly

- Identify and resolve issues early
- Monthly model update meetings during longer tasks
- If TPP staff is involved, copy the help desk on emails

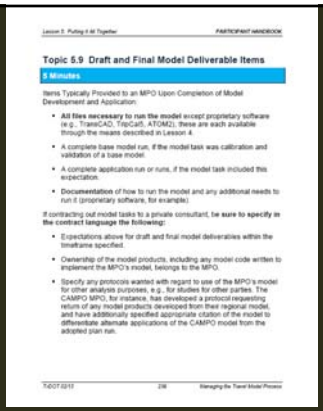
What Types of Challenges Do You Anticipate? (Activity)


Activity 5.21 What Challenges do You Anticipate with Managing the Model Development Schedule?
(discuss as group, 5 minutes)

How Do You Plan to Manage Non-performers? (Activity)


Activity 5.22 How Do You Manage Non-Performers? (within MPO and outside it)
(discuss as group)

Draft and Final Model Deliverables


Topic 5.9 Draft and Final Model Deliverable Items
5 Minutes

Integrating Model Application into the MTP Planning Process

Best Practice Model Uses for MTP

- Scenario testing
- Project prioritization
- To support performance measure examination under MAP-21
  (specifics still being explored)

Performance Measures

- More to come as MAP-21 is interpreted
- One possible approach:
  - MPO, with public, identifies goals to meet
  - Performance measures are used to evaluate how well the MTP meets those goals
    - o Total regional delay reduction
    - o Hot spots addressed
    - o More people using sustainable modes
  - Other goals/measures not from a travel model

Looking Backward and Forward

Retrospective Review (concept)

- Pre-planned, systematic
- Reassurance to all that focus is on future
- Format established prior, possibly including:
  - Independent facilitator
  - Simple questionnaire to participants
  - Discussion format if appropriate
  - Follow-up by facilitator if necessary
- Summary of actionable items for future

Plan for Next MTP (and Model Needs)

Key Talking Points by Audience (Activities)

Lesson 5 Learning Objectives

Putting It All Together

- Identify Unique MPO Challenges
- Map the Critical Path
- Make It Work

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch:
11:30 a.m. – 1:00 p.m.

Breaks:
10:15 a.m. & 2:45 p.m.

Day 1
1. Travel Model Fundamentals ✓
2. Model Development Process ✓
3. Key Inputs & Quality Process ✓

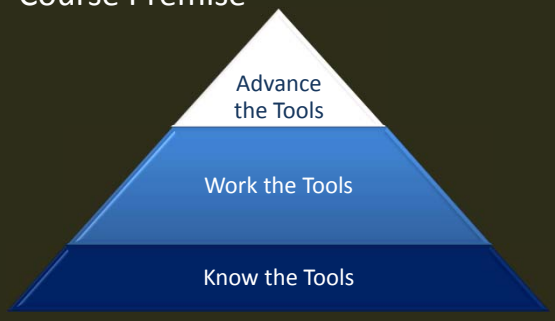
Day 2
4. Resources ✓

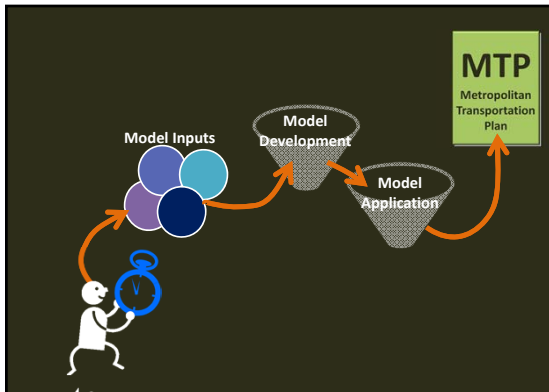
Day 3 / Day 4
5. Putting It All Together ✓

Learning Objectives

- Explain Fundamental Travel Model Concepts
- Describe the Model Development Process
- Identify Key Inputs & Describe the QC Process
- Identify & Manage Resources
- Put It All Together

Course Premise





APPENDIX C PILOT COURSE EVALUATION RESULTS

Participant Evaluation Results from the Pilot Course, September 2012

Overall Course Evaluation

Based on this PILOT COURSE, please indicate your reaction to the following statements:

Avg. Score	Statement
4.8	41. The FIVE course objectives above meet the overall course purpose.
4.6	42. The FIVE lessons in this PILOT meet the above course learning objectives.
3.8 (out of 5)	43. The length of this PILOT of the workshop is long enough to effectively cover the material.
3.8	44. How many days would you be willing to devote to this course.

Open Questions

Input

45. What information in this course as presented in the PILOT will benefit you the most?

All chapters.
QA/QC issues, contracts (scopes of work), scheduling issues, reference (web links) and guidelines.

The overall importance of the TDM and the process it takes to develop a model.
All of the information was useful. I feel better prepared to tackle my next model update.
Especially, who the project manager should be and what inputs are expected from the MPO.

46. What can we do to improve this course as presented in the PILOT?

Revisions were presented during course.
See below.
More examples and checklists.

Please provide additional input about the course overall.

Overall, this type of tool with a course instruction is needed to understand the TDM process. TDM is very technical and a training would be useful for MPO directors. MPO directors would also understand where the TDM fits within the MTP update process. Thank you.

I have learned a lot from this course and appreciate you offering this training. One thing I think would be helpful for the course is having a blank notebook page for each lesson for notes. Unrelated to this course, I think it would be great to offer courses from the very beginning of the TDM process. Maybe every few months offer a couple days of TDM training. For example, Training 1, Training 2, etc. Something for the Directors that begins wtih the data collection to using the model and finally a class where we use computers to run the models.
Overall Wonderful Class. The content was easy to understand and broken down in a manner that I was able to understand.
This was a great course! Thank you!!

Participant Evaluation Results from the Pilot Course, September 2012

Participant Info

47. Please indicate your role in transportation planning (If "other," please describe).

Role
Other Public Academic: TxDOT - South Region
Other Public/Academic: TxDOT - TPP
MPO Staff: MPO Travel Modeler
MPO Staff: MPO Director
MPO Staff: MPO Director
MPO Staff: MPO Director

Avg. Score	Question
3.8	**48. How appropriate was the level of course content for your background and expertise?**

Scale: 1-5 from "Much Below My Level" to "Much Above My Level" **(3 is ideal)**

4.6	**49. Overall, how relevant is the course content to your job?**

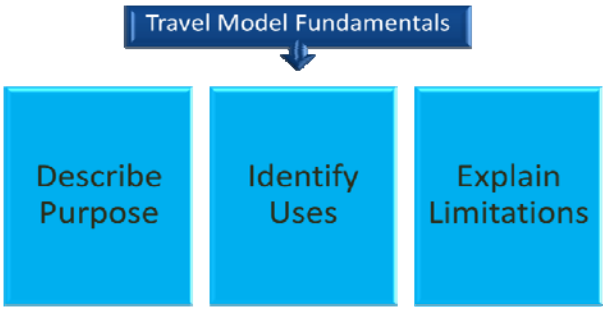
Scale: 1-5 from "Not Relevant" to "Extremely Relevant" **(5 is ideal)**

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

1

Overall



Avg. Score	Statement
4.8	1. The learning objectives above are appropriate for this lesson and stage of the course.
4.2	2. This lesson's content meets the lesson learning objectives (above).
4.3	3. This lesson's handbook material meets the lesson learning objectives.
4.6	4. This lesson's activities meet the lesson learning objectives.
(out of 5)	
2.0	5a. The length of time spent on this lesson was___ hours
2.0	5b. And should be___ hours

Open Questions

Input

6. What information in the lesson will benefit you the most?

What is a Travel Demand Model?
Working for TPP, it was good to hear the MPO perspective of the uses they need and the limitations they feel.
Uses of the Texas package and its limitations.
Learning what the model won't/can't tell you (limitations) to explain to Policy Boards, the public, etc.

Easy methods to explain to decision-makers.
Purpose of the Travel Demand Model.
I can tell my policy board the model is a two-step process. I can tell them about mode limitations.

Model limitations.
What model can do for us and limitations of models.

7. What can we do to improve this lesson?

What the TDM can do or not do?
More examples of potential TDM uses.
Add more limitations.
Brief overview of the types of software that can be used to do TDM
The lesson was very good. I'm sure Karen will tweak it some more.
Model benefits and for different audiences.
Add more content about "big picture" output - what model can reveal about system and implications.

Please provide additional input about this lesson overall.

Overall, good introduction with some information needed to be added. TDM traffic counts program is needed. Understand the schedule to make adjustments.

The lesson could use more slides about specific uses that are appropriate to use a TDM for.

Liked the emphasis on the limitations (no illusions), yet still underline the importance of this tool as a start for travel modeling; easy to implement and can be upgraded/improved. "Length of lesson was ok." (Q5)

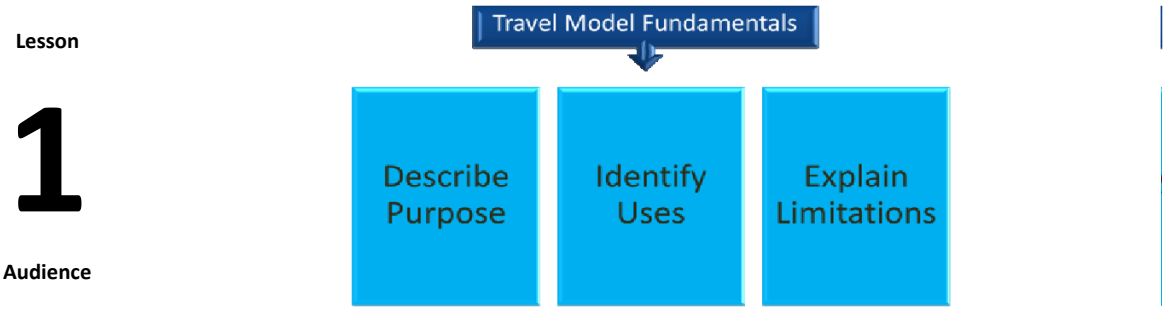
I think this would greatly enlighten the PB members, but would need to carefully craft level of detail and informatio presented. Length of time for lesson: "Appropriate." (Q5)

The information is appropriate for all of the above except the Policy Board because our policy board is more concerned with outputs/information obtained from a TDM. I like the way the information is broken down because it is easier to understand. Length of lesson: "good." (Q5)

This is a concept, process driven course. However, maybe some more examples of real world cases would help communicate the message better. Examples of limitations: transit, hike & bike, special events, holiday travel. "Time spent was appropriate." (Q5)

Discussion about PB issues, how to use model and limitations was very useful. Using presentation materials as framework/starting point for presentations is good and these materials are very good. Lesson time (Q5): "appropriate."

Participant Evaluation Results from the Pilot Course, September 2012



8. Please circle your response below regarding the appropriateness of the material for MPO directors and other parties.

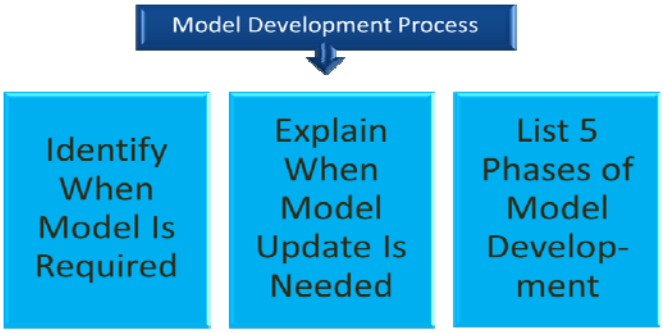
Response	#	Comments
MPO Director/Modeling Manager		
Yes	9	To understand the TDM process; Simple, not too technical; helps one understand the process better; great for process manager.
No	0	n/a
MPO Policy Board Member		
Yes	4	Maybe, but I think a policy board would latch onto limitations; Simple, not too technical; but only the concepts, not the technical aspects.
No	5	No; Maybe too technical; too high-level; should be more basic and less technical; too technical for time they have (elected officials); depends on the member, but probably not.
MPO Modeler		
Yes	5	How staff uses information; but may be a lot of info they know already; yes, all of it.
No	3	Perhaps too basic; too high-level; not technical enough.
No response	1	
TxDOT Regional/District Staff		
Yes	8	To monitor progress in study uses; basic, but direct; okay for staff; but geared toward the specific audience; depends on position.
No	0	
No response	1	
TxDOT TPP Planner or Modeler		
Yes	6	To understand technical aspects; Again, may be a lot of infor they are familiar with; only as introduction; all of it; if expanded to explain different audiences.
No	1	Too high-level.
No response	2	

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

2

Overall



Avg. Score	Statement
4.9	9. The learning objectives above are appropriate for this lesson and stage of the course.
4.6	10. This lesson's content meets the lesson learning objectives (above).
4.2	11. This lesson's handbook material meets the lesson learning objectives.
4.2	12. This lesson's activities meet the lesson learning objectives.
(out of 5)	
1.7	13a. The length of time spent on this lesson was___ hours
1.6	13b. And should be___ hours

Open Questions

Input

14. What information in the lesson will benefit you the most?

Importance of model imports and timelines.
The discussion of the project selection process: making the MTP.
Definition of the different types of models.
Survey information.
The process for developing a model and how it is related to the development of the MTP.

The fact there are 3 models: current, one in development, one in the planning/data gathering stages.
New model development schedule critical path development.
Model refresh/model reapplication process.
Timeline for developing model and relation to MTP timeline, understanding what triggers a mode re-fresh or re-apply.

15. What can we do to improve this lesson?

Re-think timelines for model development and MTP due date.
Should the "develop model input" step start before year 3 for a longer period of time? It couldn't hurt to get MPO directors into the mindset that it is a long time commitment.
Define terminology such as "refresh" , "revalidation", "reapplication", etc. I found the terms/concepts a bit confusing initially (but that could just be me).
Refresh/validation not "update."
More explanation of when to update a model.
More real world examples. How would you achieve this?
Add best practices regarding determining interim year forecasts.
Change critical path graphic to separate model and MTP development processes, but still show relationship between them.

Please provide additional input about this lesson overall.

How often should study areas have a model for MTP development. Good diagram regarding model schedule.
I'm not speaking for myself, as a modeler, but for the MPO directors, the slides showing base year/forecast year seem a little busy. And possibly overwhelming for the layman. The used 4Runner example is very strong.

Maybe more emphasis on the processes required w/ HH Surveys and counts. Refresh = validation!

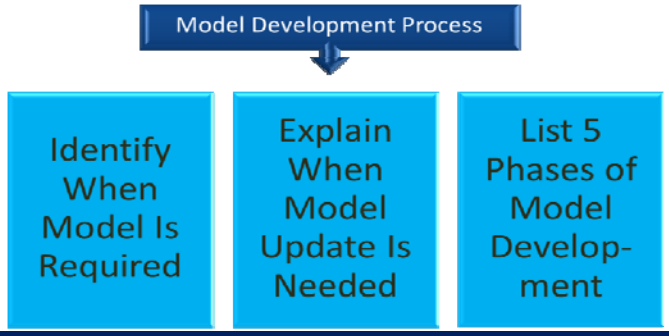
This chapter does a good job of demonstrating the model process for the above-listed participants. I think it is detailed enough for all to understand.
Length of time (Q13): "appropriate."
Addresses timeline/scheduling and process/required activities that are necessary for a director to develop. UPWP, staffing needs and programming.

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

2

Audience



16. Please circle your response below regarding the appropriateness of the material for MPO directors and other parties.

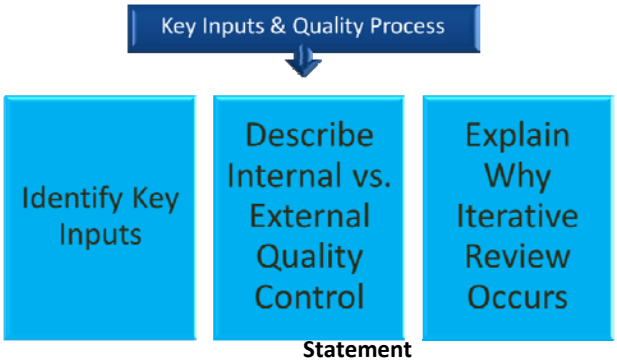
Response	#	Comments
MPO Director/Modeling Manager		
Yes	9	Yes; To manage process; these definitions need to be clear to all involved; need to know process to get to end product; need to know fundamentals and processes.
No	0	
MPO Policy Board Member		
Yes	3	These definitions need to be clear to all involved; if abbreviated.
No	4	Too technical; too much technical process.
Maybe	1	Yes and No: depends on the member, but probably not.
No response	1	
MPO Modeler		
Yes	6	To deliver a model for MPO; applies directly to the job; need to know fundamentals and processes.
No	2	Modeler's should know this; too high-level
No response	1	
TxDOT Regional/District Staff		
Yes	7	Understand tools available to MPO; these definitions need to be clear to all involved; if they work with modelers; limited because of tech; need to know fundamentals and processes.
No	0	
No response	2	
TxDOT TPP Planner or Modeler		
Yes	6	Manage model development; these definitions need to be clear to all involved; applies to job; need to know fundamentals and processes.
No	1	They should know this.
No response	2	

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

3

Overall



Avg. Score	Statement
4.8	17. The learning objectives above are appropriate for this lesson and stage of the course.
4.8	18. This lesson's content meets the lesson learning objectives (above).
4.4	19. This lesson's handbook material meets the lesson learning objectives.
4.5	20. This lesson's activities meet the lesson learning objectives.

(out of 5)

4.3	21a. The length of time spent on this lesson was___ hours
3.3	21b. And should be___ hours

Open Questions

Input

22. What information in the lesson will benefit you the most?

Understanding the elements pf TDM development.
For MPO directors, the focus on internal review will be very beneficial.
Quality control issues.
Example QA process.
The process of how data is used in the model.

Increased my understanding of model imputs, key concepts, TAZ development, demographics, MPO responsibilities for model development, QA/QC in consultant contracts.

Including model maintenance/data development into UPWP between updates and inclusion of QA/QC in RFQ/RFP and scope.

23. What can we do to improve this lesson?

Maybe some examples of coding or network development.
Probably too much detailed modeling info for MPO directors.
Shorter session (too long). Some details could be bypassed (too technical).
More explanation about TAZ's.
Check lists for MPO staff. Talk more about scope of work.
Provide copies of starred resources and update Appendix B to include QA/QC verbage.

Please provide additional input about this lesson overall.

This chapter is very important in TDM development.
The opening material about finding common sense demographic problems using some small sections of a sample map was very strong. Getting the directors to see some exmaples of how catching errors and renewing isn't super technical is very important for getting more eyes on the data. I would include another simple example of error checking network (i.e., F Type). The details about input dtat and model performance checks may have been too dragged out and in-depth. I got the sense that it was a bit too heavy for the Directors.

Include "scope of work" for TDM calibration and validation (base year); at least for a basic 24-hour, 3-step model.
Length of time (Q21): "appropriate."

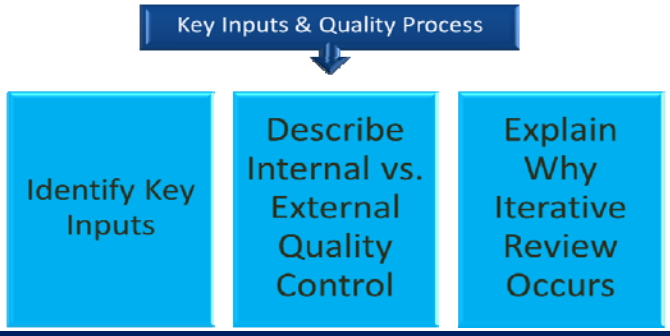
This lesson gives good information that is understandable for the above (ed. Q24) parties. "Length of time was good." (Q21)
The more people that understand the process, the better the model will be. Length of time (Q21): "appropriate."
The later it gets in the day, the more lively the presentation needs to be. Avoid pauses and slow, methodical speech patterns - maybe I just need more sleep. Yeah, I think that's it. (9/18/12 @ 16:30.)

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

3

Audience



24. Please circle your response below regarding the appropriateness of the material for MPO directors and other parties.

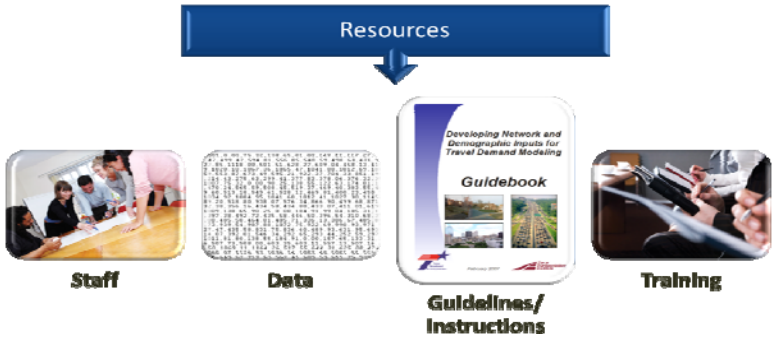
Response	#	Comments
MPO Director/Modeling Manager		
Yes	6	To manage process/QC; Q/A is important for all and cannot be over-emphasized.
No	0	
Maybe	1	
No response	2	
MPO Policy Board Member		
Yes	2	Q/A is important for all and cannot be over-emphasized.
No	4	Too technical (x2).
No response	2	
MPO Modeler		
Yes	7	To review TDM development; Q/A is important for all and cannot be over-emphasized; very important.
No	0	
No response	2	
TxDOT Regional/District Staff		
Yes	5	Monitor process/development of TDM; Q/A is important for all and cannot be over-emphasized; but only with modeler/developer.
No	1	
No response	3	
TxDOT TPP Planner or Modeler		
Yes	6	Review status; may be a bit redundant for a modeler; Q/A is important for all and cannot be over-emphasized.
No	0	
No response	3	

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

4

Overall



Avg. Score	Statement
4.8	25. The learning objectives above are appropriate for this lesson and stage of the course.
4.7	26. This lesson's content meets the lesson learning objectives (above).
4.7	27. This lesson's handbook material meets the lesson learning objectives.
4.4	28. This lesson's activities meet the lesson learning objectives.
(out of 5)	
1.5	29a. The length of time spent on this lesson was___ hours
1.5	29b. And should be___ hours

Open Questions

Input

30. What information in the lesson will benefit you the most?

Identifying resources for TDM development. Decision-making on the part of the manager.
List of useful resources for data and guidebooks.
Data sources.
The information and data that you need is out there and available.
What to look for regarding TDM training and staff. I learned the value of TDM.
Matching staff skill sets to modeling tasks. Where to go for help on all of the learning objectives.

Staffing discussion.
Workforce planning, sources for training.

31. What can we do to improve this lesson?

Some improvement on the slides. Separate some sections as suggested by instructor.
Maybe some more thought on "reapply, refresh, new model." It seemed to confuse the MPO Directors, so it would really confuse a policy committee.
Insure that there are links to the most up-to-date resources.
Great section.
Clarify staff resources a little better. It was good, but still a little fuzzy.
Include specific examples from MPOs on topics.

Please provide additional input about this lesson overall.

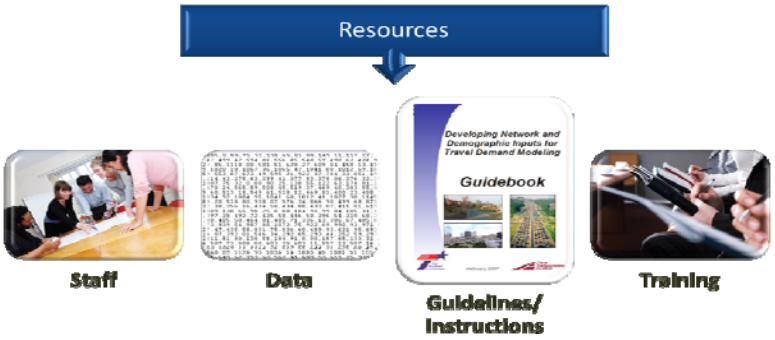
Good chapter on data sources for TDM development.
This is the best section so far in terms of pacing and loads of information available to the MPOs for model development.
Length of time (Q29): "appropriate."
This was a great lesson. The dialogue about staff and training was extremely helpful for me since we are in the process of hiring a technical person.
Good, comprehensive breakdown of resources available to MPOs. Length of time (Q29): "good."

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

4

Audience



32. Please circle your response below regarding the appropriateness of the material for MPO directors and other parties.

Response	#	Comments
MPO Director/Modeling Manager		
Yes	8	Obtain knowledge.
No	0	
No response	1	
MPO Policy Board Member		
Yes	2	I think a PB member could understand this.
No	5	Maybe too technical; they wouldn't care; not enough interested.
No response	2	
MPO Modeler		
Yes	7	Development of TDM; this section is appropriate for most anyone, especially the links to resources; helps the modeler know where to go for help.
No	1	A modeler should know this.
No response	1	
TxDOT Regional/District Staff		
Yes	5	Monitor progress; this section is appropriate for most anyone, especially the links to resources; familiarize them with resources.
No	2	
No response	2	
TxDOT TPP Planner or Modeler		
Yes	6	Monitor progress; this section is appropriate for most anyone, especially the links to resources; familiarize them with resources; district level.
No	1	They should know this.
No response	2	

Participant Evaluation Results from the Pilot Course, September 2012

Lesson

5

Overall

Avg. Score	Statement
4.8	33. The learning objectives above are appropriate for this lesson and stage of the course.
4.3	34. This lesson's content meets the lesson learning objectives (above).
4.3	35. This lesson's handbook material meets the lesson learning objectives.
4.5	36. This lesson's activities meet the lesson learning objectives.
(out of 5)	
2.0	37a. The length of time spent on this lesson was___ hours
2.2	37b. And should be___ hours

Open Questions

Input

38. What information in the lesson will benefit you the most?

Setting up a schedule for the TDM. Also, to develop a strategy to manage staff resources.

Basic activity scheduling.
Options available for staffing or using outside resources to help in the model development process.
Knowing how to match skill sets with model tasks. Scheduling tasks should be easier.

All of it. Worksheets and templates are a great idea!
The decision-making/scheduling tools.

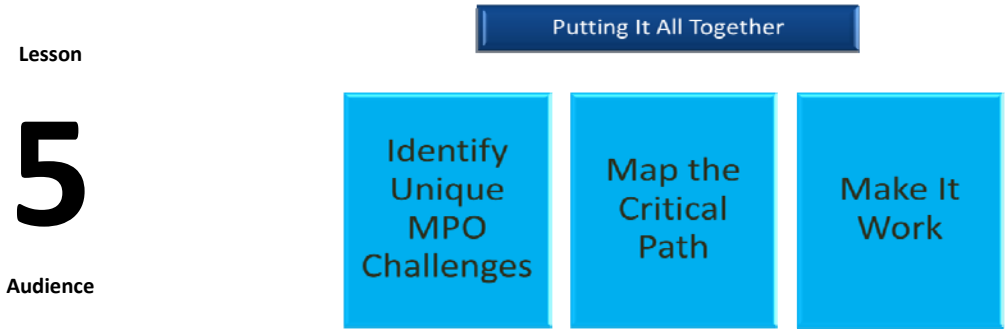
39. What can we do to improve this lesson?

Maybe minimize or reduce number of tables.
Needs more time.
More time to cover this chapter.

Please provide additional input about this lesson overall.

Very important chapter. May need to reduce the number of tables.
This lesson was helpful and gave the overall picture of the course. Length of lesson (Q37): "good."
The scheduling and work force tools were worth the time of the pilot course. The crib. Length of lesson(Q37): "About right."

Participant Evaluation Results from the Pilot Course, September 2012



40. Please circle your response below regarding the appropriateness of the material for MPO directors and other parties.

Response	#	Comments
MPO Director/Modeling Manager		
Yes	5	To manage staff.
No	0	
No response	4	
MPO Policy Board Member		
Yes	1	Good way to explain overall challenges.
No	4	Too technical; too much detail - perhaps something shorter, briefer; lack of interest.
No response	4	
MPO Modeler		
Yes	5	Understand tasks; get a sense of critical path; match skills to tasks. Develop schedule.
No	0	
No response	4	
TxDOT Regional/District Staff		
Yes	4	Get a sense of critical path; show them timelines to get model done.
No	1	
No response	4	
TxDOT TPP Planner or Modeler		
Yes	4	Develop a schedule; same as above, plus show need from TxDOT for input, data, and resources.
No	1	
No response	4	

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