



Decision Making

*for Outsourcing and
Privatization of Vehicle
and Equipment Fleet
Maintenance*

March 2012

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PREFACE

The outsourcing and/or privatization vehicle and equipment fleet maintenance has been a concern of many agencies and, over the years, has resulted in a variety of applications and outcomes of these endeavors.

As a result, NCHRP Project 13-03 and Project 13-03A were funded to develop a recommended set of guidelines for making decisions on outsourcing and privatization of vehicle and equipment fleet maintenance. The basic results of the studies have been reviewed and the recommended process has been approved by AASHTO for consideration as a guide for use by the member departments.

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SUMMARY

Decision Making for Outsourcing and Privatization of Vehicle and Equipment Fleet Maintenance

Outsourcing is a key component of the state department of transportation's (DOT's) strategy for delivering services. *NCHRP Synthesis of Highway Practice 313: State DOT Outsourcing and Private-Sector Utilization* documented that either the legislative or executive branches of state government can mandate outsourcing directly, although more commonly they act to limit or reduce the number of state employees, resulting in a de facto mandate to outsource. Not surprisingly, the most common reasons cited for outsourcing were lack of sufficient staff or improper combination of skills. These reasons were followed by cost cutting and/or improved service quality.

The decision to outsource is not an easy one, and how the outsourcing decisions are made is of great interest to state DOTs. While several best-practice outsourcing models are available in the private sector, caution should be exercised while translating those models directly for use in the public sector. The profit and business development considerations in the private sector should be balanced against the legal, economic, public service, and political mandates of government. Also, a variety of factors should be considered in the decision process, such as the criticality of the outsourcing candidates to the organization's mission and goals, availability of third-party vendors, cost, and service quality. Outsourcing public-sector fleet and equipment maintenance offers certain unique challenges that require such decisions to address additional and more complicated considerations.

This report presents a practical, logical, and transparent framework for conducting systematic analysis and making decisions on outsourcing and privatization of vehicle and equipment fleet maintenance. The framework was designed to be flexible and scalable to address a full range of outsourcing decision alternatives, from outsourcing a single type of service for single vehicles on case-by-case and day-to-day bases at specific locations to outsourcing some or all maintenance services at some or all locations, for some or all fleet segments in the enterprise.

A commonly adaptable typology of equipment and maintenance types was defined to ensure that the framework is widely acceptable and adaptable across diverse fleet assets and maintenance services. A core three-dimensional decision variable was also defined to serve as a common basis to evaluate virtually all possible outsourcing alternatives. Commonly used performance indicators or metrics in the fleet management industry are suggested herein to assist in consistent evaluation of insourced and outsourced service performance.

The core process model is presented as a step-by-step (structured) logic process that focuses on the unique needs of the state DOT's fleet maintenance and business environment. There are five processes in the model (see Figure 1).

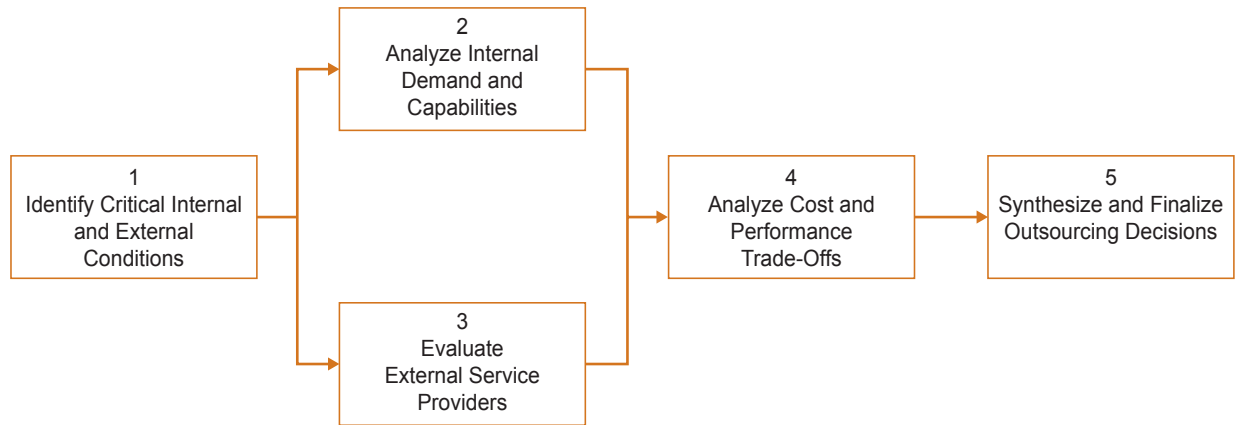


Figure 1. High-level outsourcing decision process

The process steps and their sequences represent key checkpoints and logical information and decision flows in arriving at the final outsourcing and insourcing decisions. The actual execution of the process model is highly flexible, depending on the context of the outsourcing decisions such as the scopes of the outsourcing decisions and how often the outsourcing decisions need to be reviewed and updated. This report also presents two case study examples that demonstrate the practical application of the decision framework.

The report details each step in the high-level logic model via processes and discussions of the rationale and suggested typologies that can be applied or tailored to the user.

The decision logic model detailed in this report is intended to help ensure a thorough and considered decision-making approach. Fleet management agencies may at any time have already thoroughly addressed or leap-frogged certain steps in the logic and may want to adapt the decision process to existing knowledge or policy. The logic model is not intended to be overly prescriptive; rather, it is meant to assist in comprehensive and balanced evaluation of outsourcing decisions.

I.0 INTRODUCTION

I.1 Study Context

Privatization has been a subject of interest for the public and private sectors since the concept gained wider acceptance in the 1970s. Outsourcing is considered a form of privatization in which the service delivery is contracted to an external private vendor, while the sponsor retains oversight and control over delivery. Public- and private-sector organizations have embraced outsourcing because of benefits, such as lower costs and better quality. The market for outsourced services has increased over time, with firms offering services ranging from specialty to comprehensive. The private sector has grown tremendously from outsourcing because it offers better-quality services at a lower cost than performing the job in-house. This enables private firms to focus on their core products, which helps them to gain competitive advantage and venture into new directions that improve their market position over their competitors. However, the public sector has had mixed success with outsourcing. Although the scope of government outsourcing has expanded from simple to more stylized services, the challenges public managers face to maintain effective and efficient service delivery have increased, sometimes resulting in substandard levels of service quality (1). Others have had success gaining the intended benefits of outsourcing.

The overall growth in state highway programs and the lack of growth in department of transportation (DOT) staff have resulted in the need for state DOTs to rely more on the private sector to deliver services (2). *NCHRP Synthesis of Highway Practice 313: State DOT Outsourcing and Private-Sector Utilization* (2) found that state DOTs outsource highway-related activities in the areas of administration, construction, design, maintenance, operations, planning, and right-of-way. The study found that the majority of DOTs reported outsourcing activities that grew or remained the same over a five-year period and projected an increase in outsourcing levels in the near future. The most common reasons cited for outsourcing were lack of sufficient staff and the right combination of skills. DOTs infrequently cited cost-effectiveness as the reason for outsourcing.

In the public-sector realm, not all activities are appropriate or even eligible for outsourcing. Outsourcing cannot be the cure-all for all cost- and performance-related issues (3). It is usually inappropriate or unacceptable to outsource certain services that are inherently governmental, such as law enforcement, policy making, and public safety. In such cases, the risk of contractor failure outweighs the benefits of outsourcing. In the early 1990s, the City of Indianapolis clearly distinguished the potential outsourcing candidates between policy-making and policy-implementing functions. The city decided that only the latter should be eligible for private-sector bidding (4).

In the area of fleet maintenance, many public agencies already outsource the fleet and equipment maintenance work. Resource limitations, staff shortage, and lack of specific skills are the most commonly cited reasons for outsourcing. Many municipalities, such as the cities of Indianapolis, Charlotte, and Winston-Salem, have resorted to managed competition, whereas the City of Pittsburgh has turned to privatization for improvements. Many state DOTs, such as

those of Massachusetts, Virginia, Texas, and Missouri, have outsourced certain maintenance functions and have had varying levels of success.

The decision to outsource is not an easy one. The organization has to answer a variety of questions about the criticality of the outsourcing candidates to the organization's mission and goals, availability of third-party vendors, cost, and service quality, to name a few. A variety of successful case studies, practices, and decision models are available and applied in the private sector to evaluate outsourcing decisions. However, caution should be exercised in translating these models for use in the public sector. When considering outsourcing strategies, the profit and business development motives of most private-sector organizations need to be balanced against the legal, economic, public service, and political mandates of government.

Currently, there is no widely accepted general process for evaluating and deciding on the various options for outsourcing fleet maintenance. This project aims to bridge this gap to develop a logical framework for making outsourcing decisions with due consideration to the key factors that drive them. Public agencies involved in maintenance of nonrevenue vehicle and equipment fleets will be the primary users of this decision framework.

I.2 Study Scope and Objectives

The most common reasons cited for outsourcing and/or privatization by state DOTs are cost-cutting, improved service quality, lack of resources, and lack of specific skills or expertise. The resources freed up through outsourcing and/or privatization may be diverted to other critical activities within the DOT. In a competitive environment, the profit motive and the opportunity to secure future contracts are sufficient motivation for the private-sector vendors to maximize performance, improve efficiency, and deliver quality service in a cost-effective manner. Vehicle and equipment maintenance are among the services that are typically not considered core or mission-critical, and are ideal candidates for further evaluation.

Because of growing demands and resource limitations on vehicle and equipment fleet maintenance, state DOTs often consider the outsourcing and/or privatization of these services. However, these decisions largely depend on fleet size, vehicle mix, and equipment type, and are influenced by cost-effectiveness, timeliness, and external market conditions. Also, state DOTs can implement outsourcing and privatization in a variety of forms with different levels of agency involvement, such as outsourcing statewide or regional activities and selected outsourcing of specific activities, and with different levels of responsibility for quality control and assurance. Currently, there is no widely accepted process for evaluating the alternatives for outsourcing vehicle and equipment fleet maintenance.

NCHRP Project 13-03A was intended to develop a logical and systematic decision-making framework and process to address the various plausible scenarios in which fleet maintenance outsourcing and privatization decisions should be considered. The resulting decision framework and process addresses the following:

- Various levels, scopes, and scenarios of outsourcing and privatization,
- Performance and quality assurance issues,
- Level of agency involvement and/or delegation,
- Various fleet compositions and existing resources,
- Local and regional operating imperatives,

- Procurement policy and rules extant, and
- Local and regional service markets.

I.3 Purpose and Organization of This Report

The purpose of this report is to present the outsourcing decision-making framework for state DOT fleet outsourcing. The report is organized into the following chapters:

- **Chapter 1: Introduction**—Describes the study context, project scope, and report organization.
- **Chapter 2: Background**—Provides background on typical characteristics of state DOT fleet and equipment, challenges of outsourcing state DOT fleet-maintenance operations, and definitions of key terms.
- **Chapter 3: Scope of Outsourcing Decision Framework**—Identifies and lists specific requirements regarding the outsourcing decision-making process.
- **Chapter 4: Fleet Outsourcing Decision Framework**—Introduces the three-dimensional outsourcing decision framework that considers equipment class, maintenance service type, and organizational unit, and how it can be applied to capture a full range of fleet outsourcing alternatives. Defines a decision process model for key process phases, process activities, decision points, and relevant evaluation criteria, along with a logical sequence in arriving at various outsourcing decisions.
- **Chapter 5: Case Studies**—Illustrates the practical application of the fleet outsourcing decision framework using case studies.
- **Chapter 6: Conclusion**—Summarizes the report.
- **References**—Presents the references for the report.
- **Appendix A: Summary of Outsourcing Model and Process Steps**—Presents all of the subprocesses in one chart, and lists the inputs and outputs for each step.
- **Appendix B: Forms and Templates**—Presents the forms and templates to support the outsourcing analysis.

2.0 BACKGROUND

2.1 Characteristics of State DOT Vehicle and Equipment Fleets

The state DOT fleets and equipment are unique in that they offer certain operational challenges that are not common to over-the-road fleet operators, delivery fleets, relatively homogenous transportation fleets (e.g., police, taxis, van services), or motor pools. In addition, the heterogeneous fleet mix and usage, dispersed storage, and availability are some aspects in which DOT fleets and equipment differ from the conventional fleet operations.

Fleet mix: State DOTs typically operate a wide variety of fleet vehicles and equipment, ranging from light-, medium-, and heavy-duty vehicles to specialized equipment, small-engine equipment, and seasonal vehicle attachments. These categories can account for most—if not all—of the units operated and maintained by state DOTs.

Usage: Vehicle and equipment usage varies daily and seasonally for individual units in each fleet class. The vehicles can be inactive for significant periods from day to day and may tend to accumulate low mileage. Nevertheless, they must be available when needed to support work crews and emergencies.

Storage location: The fleets and equipment may be based in various operating centers deployed throughout various urban, suburban, and rural regions, with seasonal considerations playing a major role in the fleet mix stored in any particular location.

Availability: The local availability needs for vehicles and equipment are also variable due to scheduled and unscheduled work requirements. For example, the availability of trucks, spreaders, and plows during emergencies can directly affect how quickly agencies can respond to clear snow or debris to ensure safe movement of goods and traffic. Regular road maintenance activity is often variable due to weather factors and unanticipated events.

Table 2-1 displays some example characteristics found in local (or district) DOT fleets. It also identifies the common maintenance activities that are outsourced and the adequacy of private-sector vendors.

Table 2-1. DOT Vehicle and Equipment Fleets—Example Characteristics

Example Fleet Units	Fleet/Equipment Class	Typical Uses—Frequency	Typical Measure of Utilization	Availability Risk	Common Insourcing or Outsourcing Practices	Local Service Market Issues
Sedans	Light duty	Transport, platform—anytime	Miles/year, days used	Low	IN: preventive maintenance (PM), light repair OUT: warranty	Usually adequate
Pickups, SUVs	Light or medium duty	Transport, platform—anytime	Miles/year, days used	Low	IN: PM, light repair OUT: heavy repair, warranty	Usually adequate
Dump trucks	Heavy duty	Hauling, snow—intermittent	days used	High at times	IN: PM, light repair OUT: heavy repair, warranty	Sometimes limited
Mowers	Small engine	Work machinery—scheduled	Operating hours	Usually low (seasonal)	IN: PM, repair OUT: warranty	Usually adequate
Loaders—backhoes	Specialized	Work machinery, snow—anytime	Operating hours	High at times	IN: PM OUT: repair, warranty	Sometimes limited
Graders	Specialized	Work machinery, snow—anytime	Annual calls for use	High at times	IN: PM OUT: repair, warranty	Sometimes limited
Distributors—rollers	Specialized	Work machinery—scheduled	Annual calls for use	High at times	IN: PM OUT: repair warranty	Sometimes limited
Specialty equipment, spreaders, plows	Seasonal attachments	Work machinery—scheduled	Annual calls for use	High at times	Mixed	Sometimes limited

2.2 Challenges for Outsourcing Fleet Maintenance Operations

Fleet management is not typically considered a core line of business for state DOTs; however, the fleet is a resource that must be available as needed and must perform reliably for DOTs to accomplish their operational missions. For enterprises located in or near business centers, with established services available in the market, outsourcing decisions for non-core activities or processes may not be simple, but they do involve straightforward considerations. The potential for fleet management cost savings and better utilization of available resources plays a major role and is particularly enticing to the public and policymakers. However, DOTs must carefully consider in the overall decision-making process a variety of challenges connected with the non-reversibility of some outsourcing decisions, workforce factors, relinquishing of ownership and control, and procurement constraints.

Reversibility of outsourcing decisions: The long-term effects of outsourcing decisions need thorough study because future reversals of major outsourcing decisions may involve significant new capital investments and unwanted budget impacts. Furthermore, although an outsourcing strategy can have predictable short-term effects, supporting assumptions must be carefully examined for long-term conditions and risks.

Market for services: The availability of experienced and well-qualified vendors in the local markets to adequately provide fleet maintenance and support services is an important variable that affects potential local outsourcing strategies and risks. If implemented, the services may require special procurement approaches to manage the limited competition found in some areas. A familiar worst-case situation in outlying areas is when only two sources exist for a particular service. One source is selected on price and then builds capability and competitive strength in the local market through increased scale, and other sources become noncompetitive and may not stay in business. After the agency is committed to outsourcing, only one dominant provider may remain, and buyer leverage on cost or quality is lost.

Scale: The volume of demand for specific maintenance activities at specific operating centers plays a key role in decision making. If the demand for maintenance activities is low, then outsourcing is a viable alternative, possibly an imperative. For example, the demand for certain services in smaller-scale operations may not be sufficient to economically justify a full mix of needed capabilities or certain specialized resources in-house. However, with larger-scale service demand, efficient in-house maintenance activities may be supported.

Workforce considerations: Outsourcing fleet and equipment maintenance activities could contribute to an underutilized staff capability. Within the constraints of union and civil service rules, it may be possible to reassign displaced staff to perform other activities less suited to outsourcing. Also, because some local operational staffing levels may be sized for peak needs (e.g., emergencies or seasonal peaks) rather than steady-state needs, staff time availability may be used for other productive routine work. In such cases, some fleet maintenance work could be considered very low cost because available off-peak or off-season staff time might otherwise be idle or underused.

Performance expectations: State DOT vehicle and equipment fleet management realities sometimes challenge conventional fleet-management wisdom. Performance measurement is an example of this. Mileage utilization and cost per mile are often primary measures of performance for over-the-road fleet operators, delivery fleets, and relatively homogenous transportation fleets that generate revenue through travel. A small reserve of vehicles usually ensures efficiency and sufficient availability.

On the other hand, although DOT fleets do provide intermittent transportation, the DOTs use light-duty vehicles more often as platforms for work projects, supervision, or staging of tools and material. A consequence of this operational duty is often fairly low mileage, and therefore utilization may appear low by conventional measures. During an emergency, there may be a need to mobilize all available fleets and equipment of a certain type. For DOT fleet operators, concerns over reliability, vehicle and equipment availability, and the pattern of needed use are important considerations while measuring performance.

Ownership and control: Loss of control over resources (personnel, fleet, and equipment), work practices, and quality is a common objection or perception about outsourcing. This concern is lessened for vehicles and equipment that are interchangeable and for which full required availability can be reliably scheduled. For more-specialized vehicles and equipment that may be in high demand at short notice, outsourced off-site maintenance can increase the risk to core operations. Cost or performance benefits from outsourcing (if they are small) may not be worth this risk. At a minimum, the costs and benefits of mitigating any risk exposure for the core business need to be considered when making outsourcing decisions. For example, outsourced, off-site maintenance might require either larger numbers of fleet reserve units or special performance specifications to address emergencies.

Cost development: Developing reasonable and valid true cost factors for activities on both sides of the outsourcing tradeoff is a common challenge for typical outsourcing decisions. Most agency financial management systems do not have sufficient activity-based financial and performance data to make this a simple and easily supportable process. Thus, there is often a need not only to recognize factors that may not be obvious, but also to develop and apply approximate cost and performance estimates. For example, in addition to the simple invoiced cost of outsourced services, there is procurement expense, cost of administering and paying for services, and inspections/quality management to consider on the outsourced side. For in-house work, the full, loaded cost of employee labor (today, some public-sector organizations have established load factors to apply for this purpose), tools and equipment needed, and parts/supply management should be considered.

Procurement policy constraints: Outsourcing options in the public sector may be limited by the constraints of specific procurement regulations and the particular policies that apply in a given organization. For example, if procurement regulations or policy mandate strict lowest-bid approaches for maintenance service procurement, it may be difficult for agencies to limit risk by managing the market. For instance, it would be prudent to ensure the continuity of multiple market sources by awarding work to more than one vendor or using other performance-based procurement approaches.

Depending on the extent of the outsourcing alternatives (ranging from single activity to turnkey), fleet maintenance outsourcing options may call for multiple contracting possibilities or combinations such as:

- Multiple-award contracts for same services at different prices,
- Indefinite-quantity ordering agreements,
- Performance-based incentive contracts,
- Award-fee contracts, and
- Time-and-materials contracts.

Historically, transportation agencies have used service contracting approaches that are highly prescriptive and often include detailed method specifications. However, in recent years, state DOT experience has increased with performance-based strategies that focus on the quality of results. Public–private partnership initiatives have evolved that employ a number of business models relevant to this study, including franchising, competitive joint ventures, and concessions. These approaches may offer creative outsourcing options to consider for fleet management.

2.3 Applicable Forms of Fleet Maintenance Outsourcing

There are various terms used interchangeably when addressing the outsourcing or privatization issues, such as asset transfer, managed competition, turnkey contracting, and public–private partnership. Although these terms have overlapping meanings, they have distinct implications with respect to critical aspects of outsourcing decisions (e.g., asset ownership, extent of government and contractor responsibility for performance). For example, the distinction between “privatization” and “contracting out” has been a source of some confusion. Privatization is often interpreted as the transfer of responsibility for public assets to the private sector. However, under some situations, it also refers to contracting the private sector to improve the performance of an activity that would remain, in some sense, public. This report adopts the following definitions provided in the Governmental Accountability Office (GAO) report, *Privatization: Lessons Learned by State and Local Governments* (5).

Asset transfer: “Another form of privatization occurs when a government transfers ownership of assets, commercial type enterprises, or responsibilities to the private sector. In general, the government will have no role in the financial support, management, or oversight of a transferred asset.”

Franchise–external service: “In the franchise–external service approach, the government grants a concession or privilege to a private-sector entity to conduct business in a particular market or geographical area (similar to concessions, lodging, and other services provided in certain national parks). The government may regulate the service level or price, but users of the service pay the provider directly.”

Managed competition: “Under managed competition, a public-sector agency competes with private-sector firms to provide public-sector functions or services under a controlled or managed process. This process clearly defines the steps to be taken by government employees in preparing their own approach to performing an activity. The government may award the contract to the bidding agency or to a private bidder.”

Outsourcing: “Under outsourcing, a government entity remains fully responsible for the provision of affected services and maintains control over management decisions while another entity operates the function or performs the service. This approach includes contracting out, the granting of franchises to private firms, and the use of volunteers to deliver public services.”

Privatization: “Privatization is commonly defined as any process aimed at shifting functions and responsibilities, in whole or in part, from the government to the private sector. Privatization can take various forms.”

Public–private partnership: “Under a public–private partnership, sometimes referred to as a joint venture, a contractual arrangement is formed between public- and private-sector partners, and can include a variety of activities involving the private sector in the development, financing, ownership, and operation of a public facility or service. It typically includes infrastructure projects and/or facilities. In such a partnership, public and private resources are pooled and their responsibilities divided so that each partner’s efforts complement one another. Typically, each partner shares in income resulting from the partnership in direct proportion to the partner’s investment. Such a venture, while a contractual arrangement, differs from typical service contracting in that the private-sector partner usually makes a substantial cash, at-risk, equity investment in the project, and the public sector gains access to new revenue or service delivery capacity without having to pay the private-sector partner.”

Table 2-2 illustrates applicable privatization options for state DOT fleets and equipment. This report focuses on exploring the logical thinking behind decisions on maintenance outsourcing with consideration of the risks and expectations for the various privatization approaches that might be used and not on how to implement these various forms of outsourcing and privatization.

Table 2-2. Forms of State DOT Fleet Maintenance Privatization

Forms	Fleet Ownership	Role and Responsibility			Consideration in Study
		Maintenance Service Performed By	DOT Management and Policy Responsibility	Financial Responsibility	
Asset transfer	Private sector	Private sector	Limited, case by case	Private	Strategic alternative
Outsourcing	State DOT	Private sector	Full control—state DOT	State DOT	Primary alternative
Insourcing	State DOT	State DOT	State DOT	State DOT	Primary alternative
Managed competition	State DOT	Public or private depends on competition outcomes	Full control—state DOT	State DOT	Strategic alternative
Public–private partnership	Joint	Private sector	Joint	Joint	Strategic alternative

3.0 SCOPE OF THE OUTSOURCING DECISION FRAMEWORK

Although the concept of outsourcing is not new, the outsourcing decision-process models vary significantly from industry to industry and from organization to organization. The decision-making framework developed under this project takes into consideration both the best practice models of outsourcing and the many complicated issues unique to state DOT fleet operations. This section identifies a set of requirements that attempt to define the purpose, scope, and functionalities of this fleet outsourcing decision-making process. These requirements fall into the following categories:

- Purpose and goal,
- Scope,
- Key considerations, and
- Implementation.

These requirements are not intended to be prescriptive to the details of the decision-making framework. Their purpose is to provide a high-level understanding of what this outsourcing decision-making process aims to accomplish.

3.1 Purpose and Goal

The overall purpose of this outsourcing logic model is to enable a systematic process for evaluation of state DOT fleet and equipment outsourcing and privatization decisions. On a practical level, the logic model should help agencies achieve acceptable levels of service and cost savings by evaluating and making decisions on different outsourcing and privatization alternatives.

3.2 Outsourcing Decision Framework Requirements

The following requirements provide a strategic perspective of this framework, along with its essential characteristics:

- The framework must be able to address the range of outsourcing options possible—from completely outsourcing the fleet maintenance function, to outsourcing a single repair location, to outsourcing specific activities—fleet-wide or at a single location.
- The framework should be built at a high level, by capturing the general characteristics of fleet profile and maintenance, breadth of repair, and replacement options, so that it will be widely applicable and acceptable to most agencies.

- The framework should allow practitioners to incorporate strategic, analytical, and operational decision criteria.
- The framework should take local, regional, or statewide operating imperatives into consideration.
- The framework should recognize, define, and describe process differences between internally and externally driven outsourcing initiatives.

The flexibility and scalability of this outsourcing decision-making framework is one of the critical requirements. The framework should be able to address a full range of outsourcing decision alternatives, from outsourcing a single type of repair for a single vehicle on case-by-case and day-to-day basis at a particular location to privatizing a single maintenance function at a particular location to the entire fleet. These potential outsourcing alternatives clearly reflect the unique and complicated aspects of fleet and equipment outsourcing decision making under a typical state DOT business operational environment. The following requirements attempt to capture specific views on how to make this decision-making framework flexible and scalable. The subsequent section revisits and analyzes this category of requirements using an abstract mathematical form.

1. The framework should be flexible and scalable to address the full range of decision making, such as:
 - Outsourcing of decisions on day-to-day and case-by-case basis at state DOT shops, particularly a single type of repair for a single particular vehicle situation,
 - Outsourcing of decisions on a particular vehicle or equipment class and/or particular types of maintenance and repair activities,
 - Outsourcing of a single maintenance function,
 - Outsourcing of a single repair location,
 - Outsourcing of specific statewide or regional activities,
 - Fleet-wide and regional combinations of some or all of the activities or fleet segments, and
 - Privatization of entire fleet maintenance operations.
2. The framework should take into consideration a variety of outsourcing and privatization forms with different levels of agency involvement and responsibilities (i.e., for quality control and assurance).
3. The framework should address selected outsourcing and privatization and be flexible enough to handle different risk and performance expectations (e.g., in managed competition, selected outsourcing, and privatization situations).

3.3 Key Factors to Be Considered

Like any decision-making model, this outsourcing model must take into consideration and incorporate various factors to evaluate how agency management weighs in on the final outsourcing decisions. Some of these factors, such as cost and performance, are common to most outsourcing models, and others are unique to state DOT fleet and equipment maintenance (e.g., fleet composition, regional and statewide considerations). The following requirements attempt to identify and capture these factors for consideration in the outsourcing model:

1. The framework should be adaptable to various fleet compositions and sizes (i.e., mix of vehicles and types of equipment).
2. The framework should take into consideration various maintenance activities performed on the fleet (e.g., minor repair, preventive maintenance [PM], overhaul, heavy repair).
3. The framework should take into consideration how decisions for outsourcing and/or privatization are influenced by factors such as:
 - Workload of in-house shops,
 - Operations requirements that drive shop priorities (e.g., emergencies, backlog),
 - Full costs of maintenance activities (e.g., direct and indirect costs),
 - Performance and quality measures (e.g., preventive maintenance compliance, response times, down times, reliability factors, breakdown rates, repeat repairs),
 - Management requirements, and
 - Internal and external capabilities available.
4. The framework should take into consideration fleet and non-fleet activities normally performed by DOT fleet maintenance personnel as part of the comparative cost analysis.
5. The framework should take into consideration local and regional service markets and be able to evaluate the capabilities of available service providers.
6. The framework should incorporate agency-specific procurement policy and rules.
7. The framework should take into consideration the long-term implications and risks associated with outsourcing.

3.4 Implementation of the Framework

Realizing the importance of developing a decision-making framework that is practical and implementable by state DOTs, the following features were required to ensure that the model is readily implementable:

- The decision-making framework must be presented as a step-by-step process flow with description of each decision point, logical sequences, evaluation criteria, and necessary data computations.
- The framework must include sample templates in electronic formats to analyze and present the results of each step in clear and concise fashion to assist in the decision-making process.
- The framework should include guidance to compute and compare in-house costs and outsourced costs for considered alternatives, including direct, indirect, and other costs.
- The framework should be built based on the data that are readily available—or can be reasonably estimated—without requiring significant data collection efforts.

4.0 FLEET OUTSOURCING DECISION FRAMEWORK

The scope and requirements of the outsourcing decision framework described in Chapter 3 highlighted the features the logic model will provide. However, among these requirements, two in particular pose significant challenges to the application of the logic model:

1. The framework should be widely acceptable and applicable to state DOT fleet and equipment maintenance.
2. The framework needs to be flexible and scalable to address a full range of outsourcing decision alternatives.

The decision process framework aims to ensure usefulness, flexibility, and scalability. This project established generic, working definitions for the decision framework—the equipment class and maintenance type—to reflect typical agency fleet maintenance activities. Additionally, the project defined a core three-dimensional decision variable to use as a common denominator to evaluate the variety of outsourcing alternatives. This chapter describes these definitions and concepts in detail.

4.1 Equipment Class

Most state DOTs maintain substantial fleets of equipment and vehicles. They represent significant investments and are a vital set of assets to support maintenance and management road networks. For example, the Oregon Department of Transportation (ODOT) Fleet Services Section manages ODOT's fleet, which includes over 5,000 pieces of active equipment worth approximately \$340 million to \$390 million (6), the Montana Department of Transportation has over 4,000 pieces of equipment that are located in over 150 facilities statewide (7), and the Virginia Department of Transportation has around 33,000 units (8) maintained in roughly 37 facilities statewide (9).

The logic model can support outsourcing decisions for a single type of repair for a particular vehicle or piece of equipment, as well as the outsourcing decisions with respect to a particular class of equipment or a particular type of maintenance and repair activity. A state DOT fleet typically consists of many types of equipment and vehicles, such as small and large trucks, cars, and heavy machinery (e.g., graders, bulldozers, many types of tractors). Meanwhile, maintenance actions also vary significantly from vehicle to vehicle. To ensure that the outsourcing decision-making process will be broadly applicable and adaptable, the project developed a typology for equipment class and maintenance type.

Table 4-1 shows six equipment classes to be applied in the process model. Gross vehicle weight and physical characteristics of the fleet and equipment were considered in the development of these equipment classes. This classification system is similar to the one proposed by the National Association of Fleet Administrators (NAFA) in the *Fleet Maintenance Operations Guide* (10). According to NAFA, the gross vehicle weight-based classification system

provides common attributes to compare vehicles from widely different fleets and fleet applications. Also, operating and maintenance costs have a correlation to gross vehicle weight, vehicle type, and function.

Table 4-1. Typical Equipment Classes

Equipment Class	Examples
Small engine	Chainsaws, grass trimmers, lawnmowers
Seasonal attachments	Plows, salt and sand spreaders
Light duty	Sedans, light pickup trucks, light trucks
Medium duty	Heavy pickups, medium dump trucks
Heavy duty	Heavy trucks
Specialized	Tractors, loaders, graders, backhoes, oil spreaders

The proposed class provides a mix of small, medium, and large vehicles as well as more specialized equipment. For example, the classification includes small-engine equipment (e.g., chainsaws, grass trimmers, lawnmowers). The small-engine equipment constitutes a large portion of the equipment to be maintained but represents less value to the overall fleet and requires fewer repairs. Snow and ice management attachments, such as plows, deicing equipment, snow blowers, and sand/chemical spreaders, are grouped in a separate class. The light-, medium-, and heavy-duty vehicles are classified based on their gross vehicle weight. Due to different designs and functions as well as considerations of the typical availability of service providers, the tractors and construction equipment are in separate categories, with the purpose of differentiating them from the heavy-duty class.

This project does not aim to define a national standard for equipment and vehicle classes. Table 4-1 provides an example of one reasonable classification based on grouping similar equipment or vehicles together. The decision framework is flexible enough to adopt a different classification system. Users of the logic model should be able to refine the equipment class definition or create their own classification schemes by considering the following:

- Availability of data from an agency's fleet management system;
- Targeted level of accuracy or detail for outsourcing decision analysis;
- Mechanical similarities among equipment;
- Availability of external service providers; and
- Consistency with industry peers, practices, and benchmarking systems.

4.2 Maintenance Types

The main objective of maintenance, repair, and overhaul activities is to provide reliably available vehicles and equipment to meet operations needs, when they are needed, at minimum cost, with fully reliable performance. For a typical state DOT fleet, five types of maintenance were considered for the model. The intent was to group similar maintenance activities together and develop a type structure that is a good representation of common fleet maintenance and repair activities to both state DOTs and external service providers. Like the vehicle classification system, these maintenance types can be defined or expanded to suit specific users. For the logic model, the following are the assumed maintenance types:

1. **Preventive maintenance** is a schedule of planned inspection, maintenance, and service actions aimed at the prevention of breakdowns and extension of service life. Preventive maintenance activities include inspection and replacement of minor parts and consumables such as wipers, bulbs, belts, brake pads, lubrication, fluids, and filters.
2. **Minor repair** involves the repair or replacement of specific parts and components that fail or wear out and that can be replaced in a relatively short time and may need some special tools and equipment. Examples are batteries, tires, electrical system components, brake system components, starters, and alternators.
3. **Major repair** usually includes component or system repair needing more special tools or equipment and typically requiring more time and training. Examples are replacement of large truck tires, suspension repair and alignment, brake system overhaul, hydraulics repairs, and electrical systems, as well as accident repair and heavy bodywork.
4. **Overhaul and rehabilitation** includes extensive renewals of power train, chassis, and body systems.
5. **On-road repair** includes mobile road-call response, with on-site repairs or vehicle recovery.

Users of outsourcing decision tools may develop different, specific definitions of maintenance types. The model recognizes that there are several levels of maintenance activity that may require logically differentiated trade-offs when considering factors such as costs, investments needed, management risks, and market options.

4.3 Outsourcing Decision Variables

As emphasized in its requirements, the outsourcing decision process must be able to account for a full degree of outsourcing alternatives, ranging from privatizing a single type of maintenance for a single particular vehicle or a single equipment class at a particular location to privatizing maintenance for the entire fleet. The challenge is systematically expressing them so that all possible alternatives will be considered.

This study defined a core decision variable for use as a common denominator to construct all possible outsourcing alternatives, as illustrated in Figure 4-1. This decision variable has three dimensions and considers three variable factors—a particular *equipment* or *equipment class*, *maintenance type*, and *organizational unit*.

For example, if a maintenance shop is evaluating the outsourcing of hydraulic repair of a dump truck for a day due to operational reasons, the mathematic expression D_{ijk} will be represented as $D_{\text{Dump truck, heavy repair, shop}}$.

$$D_{ijk} \rightarrow \begin{cases} 1\text{—Insourcing} \\ 2\text{—Outsourcing} \\ 3\text{—Trade-off analysis} \end{cases}$$

where,
i = Equipment Class
j = Maintenance Type
k = Organizational Unit

Figure 4-1. A three-dimensional outsourcing decision variable