

Rental Chassis Cost Optimization Through Milestone-Based Tracking and Cost Allocation in Transportation Management A Public-Source Framework for Rental, Leasing, Utilization Visibility, and Cost Control

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Abstract: Rental chassis are widely used in intermodal and landside transportation to provide flexible equipment capacity without requiring organizations to own the full chassis fleet. However, rental strategy is not solely a daily-rate decision. The economic outcome depends on demand stability, productive utilization, billing rules, maintenance responsibility, equipment availability, repositioning, and administrative effort. This review presents a milestone-based framework for managing rental chassis costs by connecting demand planning, sourcing, equipment allocation, transportation execution, usage visibility, return, billing validation, and portfolio optimization. The framework is designed for digital transportation management environments, including enterprise transportation management systems such as SAP Transportation Management (SAP TM), while remaining independent of any single implementation. The review combines a lifecycle process model with a total-cost framework and published 2026 screening benchmarks. An industry guide cited in this paper reports pool-rental rates of approximately \$15–30 per day and long-term lease rates of approximately \$8–12 per day, while indicating that rental may be appropriate below roughly 150–200 utilization days per year. Using the same 200-day basis for both rates, a unit-rate illustration produces a difference of \$1,400–\$3,600 per chassis; this is not a full annual lease-versus-rental comparison and is not a measured organizational saving. The paper therefore emphasizes a realized-value approach based on validated baseline cost, actual post-implementation cost, cost per productive day, utilization, paid idle days, availability, maintenance downtime, and invoice exception rate. The framework shows how milestone and utilization visibility can support more disciplined rental decisions while requiring financial value to be validated against actual contracts, operational data, and market quotations.

Keywords: Rental chassis; intermodal transportation; transportation management; SAP Transportation Management; cost allocation; chassis utilization; milestone tracking; freight settlement; total cost of ownership; logistics optimization.

INTRODUCTION

An intermodal chassis is wheeled equipment used to carry a container by road. Transportation organizations can obtain chassis through daily rental or pool arrangements, fixed-term leasing, managed fleets, or ownership. The appropriate model depends on the operating environment rather than on the quoted daily price alone. Public provider information distinguishes flexible daily rental and pool capacity from term leasing and managed-fleet arrangements, while ownership transfers capital and lifecycle responsibilities to the operating organization [Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; TRAC Intermodal, 2026; FlexiVan Leasing, Inc. 2026; FlexiVan Leasing, Inc. 2026; FlexiVan Leasing, Inc. 2026].

Rental chassis create a particular cost-management challenge because many charges are time dependent. A chassis can generate a daily charge while it is being used productively, while waiting for a move, or while awaiting return or reassignment. Consequently, a transportation organization needs visibility into both the equipment lifecycle and the financial consequence of each day of possession or responsibility.

Rental chassis strategy should be evaluated as a total-cost and utilization decision rather than a quoted-rate comparison alone. A 2026 industry guide reports pool-rental rates of approximately \$15–30 per day and long-term lease rates of approximately \$8–12 per day, while cautioning that the appropriate sourcing model depends on utilization, commitment, and operating conditions [Qazi, A. 2026]. These figures are used in this paper only as screening benchmarks rather than audited market averages.

The objective of this paper is to present a practical framework that connects demand planning, sourcing, transportation execution, equipment visibility, return management, invoice validation, and continuous cost optimization. The framework is suitable for implementation within a transportation management environment and can support milestone-driven cost allocation without relying on company-specific confidential data.

Problem Statement and Research Objectives

A rental chassis process can become difficult to control when commercial sourcing decisions, transportation execution, equipment tracking, and financial settlement are handled as separate

activities. Without a consistent view of equipment identity, productive deployment, idle time, return status, and contract-specific billing rules, organizations may have difficulty identifying avoidable paid days or explaining invoice differences.

The research problem addressed in this paper is: How can a transportation management framework connect chassis lifecycle milestones and utilization information with rental-cost analysis so that organizations can make better sourcing, allocation, return, and billing decisions?

The study has five objectives:

- Develop a lifecycle framework for rental chassis from demand assessment through portfolio optimization.
- Define operational controls for equipment identification, inspection, utilization visibility, return, and billing validation.
- Establish a total-cost model that includes rental or lease charges and relevant operational cost drivers.
- Demonstrate the financial effect of published benchmark ranges through clearly identified illustrative calculations.
- Define measurable KPIs for validating realized savings using actual baseline and post-implementation data.

MATERIALS AND METHODS

Review Method and Source Selection

This paper uses a narrative, practice-oriented review of publicly available regulatory, industry-provider, and enterprise-software documentation. It is not a systematic literature review and does not use confidential company data. Sources reviewed include current FMCSA guidance, the Electronic

Code of Federal Regulations, public information from Direct ChassisLink (DCLI), TRAC Intermodal, and FlexiVan, an industry cost guide from O Trucking, and SAP Help Portal documentation for transportation execution and freight settlement [Federal Motor Carrier Safety Administration, 2022; Electronic Code of Federal Regulations, 2026; Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; TRAC Intermodal, 2026; FlexiVan Leasing, Inc. 2026; FlexiVan Leasing, Inc. 2026; FlexiVan Leasing, Inc. 2026; Qazi, A. 2026; SAP SE. 2026; SAP SE. 2026]. Web sources were reviewed through September 20, 2026.

The framework synthesizes these sources into a transportation lifecycle model. Regulatory sources establish the safety and maintenance context; provider sources describe rental, leasing, managed-fleet, maintenance, and visibility options; the O Trucking guide supplies screening-rate ranges used only for illustrative calculations; and SAP documentation supports the relationship between freight-order execution data, charge calculation, and freight settlement. Provider claims and benchmark ranges should be validated against current quotations, executed contracts, actual utilization, and local availability before procurement or financial decisions are made.

Rental Chassis Lifecycle Framework

The proposed lifecycle consists of nine connected stages: demand assessment; sourcing-model selection; contract and allocation; inspection and dispatch; transportation execution; usage monitoring; return or reassignment; charge validation; and portfolio optimization.

Table 1. Rental chassis lifecycle and cost-optimization process framework.

Stage	Lifecycle step	Control / activity
1	Assess demand	Forecast base, peak, specialty, and geographic requirements
2	Select model	Choose pool, daily rental, term lease, managed fleet, ownership, or hybrid
3	Contract & allocate	Confirm equipment type, term, service scope, location, and responsibilities
4	Inspect & dispatch	Complete required inspection and release suitable equipment
5	Execute move	Use assigned chassis for container pickup, transport, and delivery
6	Monitor usage	Track location, utilization, dwell, maintenance, and exceptions
7	Return / reassign	Return to approved location or reassign under the applicable agreement
8	Validate charges	Check billable days, accessories, maintenance responsibility, and invoice data
9	Optimize portfolio	Compare cost per productive day and adjust the sourcing mix

Digital Transportation Management and Milestones

A transportation management system can provide a structured location for transportation execution data, equipment identifiers, milestones, and

settlement-related information. SAP documentation states that freight orders can contain locations, dates and times, product information, and resources used for transportation planning and execution, and that transportation

charges can be calculated from freight documents [SAP SE. 2026]. SAP also documents the freight settlement document as the basis for representing freight-document cost to Materials Management for follow-on invoice-verification processes [SAP SE. 2026]. The proposed rental-chassis framework does not prescribe a particular SAP configuration; rather, it defines the information relationship that a digital transportation platform should support.

For a rental chassis, useful lifecycle events can include chassis assignment, pickup, delivery, empty return, release, and reassignment. The operational objective is to determine when equipment is available for productive transportation activity, when it becomes idle, and when responsibility for rental charges should end under the applicable agreement.

The framework therefore separates two connected dimensions. The operational dimension answers: where is the chassis, what transportation activity is it supporting, and when was it released? The financial dimension answers: how many days are billable under the agreement, what rate applies, what additional charges apply, and how should the cost be allocated?

Cost Model

The core rental equation is:

$$\text{Rental Cost} = \text{Billable Days} \times \text{Contracted Rate} + \text{Accessorial Fees}$$

For leasing, the total cost should include lease payments, lessee maintenance where applicable, service options, repositioning, and administration. Public provider information shows that

maintenance responsibility and service scope vary by lease type and provider [Direct ChassisLink, Inc. 2026; Direct ChassisLink, Inc. 2026; TRAC Intermodal, 2026; FlexiVan Leasing, Inc, 2026; FlexiVan Leasing, Inc, 2026; FlexiVan Leasing, Inc. 2026]. For ownership, the model should include annualized acquisition cost together with maintenance, compliance, insurance, storage, repositioning, downtime, and residual-value considerations; the specific values should be based on the organization's actual operating and financial data [Qazi, A. 2026].

Cost per Productive Day = Total Period Cost ÷ Productive Deployment Days

This metric is useful because a low nominal daily rate does not necessarily produce a lower total cost if equipment is committed but idle. The applicable contract also controls the billing convention. For example, DCLI publicly states that chassis usage is invoiced by calendar day rather than by each 24-hour period [Direct ChassisLink, Inc, 2026].

RESULTS

Published Benchmark Results

The 2026 O Trucking industry guide reports pool-rental rates of approximately \$15–30 per day and long-term lease rates of approximately \$8–12 per day. It also suggests that rental may fit utilization below roughly 150–200 days per year, while ownership may become more attractive above roughly 200 consistent usage days [Qazi, A. 2026]. These are screening assumptions from a single industry source, not audited market averages or universal thresholds.

Table 2. Equal-day unit-rate illustration at 200 days using published screening ranges. The table is not a full annual lease-versus-rental cost comparison and does not represent measured or guaranteed savings.

Scenario	Rental @ 200 days	Lease @ 200 days	Unit-rate difference	Difference vs. rental
Low-rate (\$15 vs. \$8/day)	\$3,000	\$1,600	\$1,400	46.7%
Midpoint (\$22.50 vs. \$10/day)	\$4,500	\$2,000	\$2,500	55.6%
High-rate (\$30 vs. \$12/day)	\$6,000	\$2,400	\$3,600	60.0%

Cost-Saving Value

Using the same 200-day basis for both published daily rates, the unit-rate illustration produces a difference of \$1,400–\$3,600 per chassis, and the midpoint example produces a \$2,500 difference. These values should not be interpreted as annual realized savings. A long-term lease can involve payment commitments beyond productive-use days, and actual economics can also change because of accessorials, maintenance responsibility, repositioning, downtime, equipment

quality, service levels, and availability. A valid sourcing decision therefore requires contract-specific total-cost modeling rather than simple multiplication of published daily rates.

The framework therefore treats cost saving as a realized-value calculation rather than a rate comparison. A practical annual savings equation is:

Realized Savings = Validated Baseline Total Cost – Actual Post-Implementation Total Cost

For rental-day reduction specifically, the measurable value can be expressed as:

$$\text{Avoided Rental Cost} = \text{Number of Chassis} \times \text{Avoided Billable Days} \times \text{Contracted Daily Rate}$$

This equation directly connects milestone and return visibility to financial impact. If better

visibility reduces paid idle or unnecessary rental days, the avoided days can be multiplied by the contract-specific rate. The same framework can be extended to administrative savings by multiplying validated hours removed from manual reconciliation by an appropriate fully loaded labor rate.

Operational Results and Value Levers

Table 3. Operational value levers synthesized from the public-source framework.

Value lever	Operational mechanism	Measurement
Right-size capacity	Separate predictable base demand from peak and uncertain demand	Productive days / available or committed days
Improve visibility	Track location, activity, dwell, idle time, and exceptions	Idle days and dwell duration
Improve return control	Use release/return events and approved locations	Paid idle days after operational release
Transfer maintenance responsibility	Select service model aligned with operating capability	Maintenance cost and downtime
Improve billing quality	Validate billable days, accessorials, and contract terms	Invoice exception rate
Maintain compliance	Inspection, repair, maintenance, and recordkeeping controls	Out-of-service and compliance events

DISCUSSION

The results support a segmented approach to chassis sourcing. Daily rental or pool capacity provides flexibility when demand is variable, seasonal, or geographically uncertain. Term leasing can provide predictable dedicated capacity when demand is stable enough to keep equipment productive. Full-service arrangements may shift normal wear-and-tear maintenance responsibility to the provider, while net-lease arrangements can provide greater maintenance control to organizations with suitable capabilities [Direct ChassisLink, Inc. 2026; TRAC Intermodal, 2026]. Ownership may be evaluated when utilization is consistently high and the organization can absorb capital, maintenance, compliance, storage, and lifecycle risks.

The central management implication is that sourcing decisions should be based on total cost per productive day rather than the quoted daily rate alone. A lower rate can still create higher realized cost if the organization carries unused capacity, incurs repositioning expense, experiences downtime, or pays for equipment after the productive transportation activity has ended.

Milestone-based visibility can improve this decision process by making the equipment lifecycle measurable. For example, a return or release milestone can establish a defensible

operational point for investigating continued rental charges. Similarly, assignment and delivery events can help distinguish productive deployment from waiting or dwell. The resulting data can support both operational corrective action and invoice validation.

The financial value of visibility should be demonstrated through actual reductions in paid idle days, increased productive utilization, lower downtime, fewer invoice exceptions, or reduced administrative effort. Technology deployment alone should not be treated as proof of savings.

The framework also supports portfolio optimization. Instead of treating rental, lease, and ownership as mutually exclusive choices, an organization can evaluate a hybrid portfolio in which predictable base demand is covered by a stable capacity model and variable peaks are supported through flexible rental or pool capacity. The appropriate mix should be recalculated as demand patterns, locations, equipment specifications, service requirements, and contract economics change.

Evaluation and Measurement

A repeatable evaluation process is required to convert the framework into measurable business value. The recommended sequence is to profile demand, collect comparable quotations, normalize total costs, model utilization, assess operational

risk, select the portfolio, and track realized value

against a validated baseline.

Table 4. Recommended KPIs for evaluating rental chassis cost optimization.

KPI	Definition	Purpose
Cost per productive day	Total cost / productive deployment days	Compare sourcing models
Utilization	Productive days / committed days	Detect excess capacity
Paid idle days	Billable days without productive deployment	Identify avoidable spend
Availability	Suitable requests fulfilled / requests	Measure service level
Maintenance downtime	Days unavailable for inspection or repair	Measure maintenance burden
Invoice exception rate	Disputed lines / total lines	Measure billing quality
Realized savings	Validated baseline cost – actual cost	Report verified value

Recommended Validation Dataset

For an organization applying this framework, the next step is to capture a controlled baseline before claiming savings. At minimum, the dataset should include chassis identifier, provider, agreement type, rate, assignment date, operational milestones, return or release date, billable days, productive days, idle days, accessorial charges, maintenance charges, invoice exceptions, and total cost.

A before-and-after analysis can then compare the same population or comparable operating periods. Where possible, the analysis should control for shipment volume, geographic mix, seasonality, equipment type, and contract changes. This prevents a reduction in total cost from being attributed to the framework when the actual cause was a change in demand or commercial pricing.

Limitations

- The published rate ranges used in the illustrative calculations come from a single industry guide rather than a peer-reviewed empirical market dataset and may not represent a specific geography, provider, equipment type, or contract.
- Provider webpages describe their own offerings and should be validated against formal quotations and executed agreements.
- Illustrative savings exclude accessorial fees, maintenance, service levels, downtime, taxes, availability effects, repositioning, and contractual commitments.
- The framework is public-source and does not claim to represent a specific company's confidential process, production savings, or financial results.
- Milestone-based calculations depend on accurate operational events and equipment identifiers. Missing or incorrect events can affect chargeability analysis.
- The study does not establish a universal threshold at which rental, leasing, or ownership is economically optimal; the

decision should be based on normalized total cost and actual utilization.

CONCLUSION

Rental chassis management is fundamentally a utilization and total-cost problem. A daily rate by itself does not determine economic value because paid idle time, maintenance responsibility, repositioning, downtime, availability, and administrative effort can materially change the outcome.

This paper presented a lifecycle framework that connects demand assessment, sourcing, allocation, inspection, transportation execution, usage visibility, return, billing validation, and portfolio optimization. The framework is suitable for digital transportation management environments and provides a structured way to connect operational milestones with cost analysis.

The published 2026 screening ranges used in this review illustrate the magnitude of unit-rate differences between rental and long-term lease scenarios, but the calculations are deliberately presented as equal-day illustrations rather than organizational savings or full annual lease economics. The stronger measurement approach is to calculate realized savings from validated baseline and post-implementation total costs, particularly through avoided paid rental days, improved productive utilization, reduced downtime, fewer invoice exceptions, and lower administrative effort.

Future work can extend the framework through predictive return-date estimation, automated exception detection, equipment-level analytics, geolocation-based utilization monitoring, and optimization models that dynamically balance owned, leased, and rented chassis capacity.

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