



Transportation Management System (TMS) with Integrated HRD – Comprehensive Analysis

1. ERD and DFD for a Full-Featured TMS with HRD Integration

Entity Relationship Diagram (ERD) Outline: A fully integrated TMS with Human Resource Development (HRD) features encompasses a wide range of entities across logistics operations and personnel management. Key entities and their relationships include:

- **Shipment / Order:** Represents a customer booking or load, with attributes like origin, destination, weight, delivery window, etc. Each shipment is placed by a **Customer** and can have many **Tracking Events** (status updates) ¹. Shipments are assigned to a **Driver** and a **Vehicle** (one driver/vehicle can handle many shipments over time).
- **Customer:** The client or shipper who books shipments. A customer can place multiple shipments (one-to-many). In an integrated system, customers have a profile and may access a **Customer Portal** for bookings and real-time tracking ².
- **Driver (Employee):** An employee responsible for transporting shipments. A driver (often a subclass of a generic **Employee** entity) has credentials, availability schedule, and is associated with one or more assigned shipments (many shipments per driver) ³. Drivers are linked to **Vehicles** they operate and generate **Driver Logs** (hours, statuses) and **Incident Reports** (e.g. accidents) that tie into HR records.
- **Vehicle / Fleet Equipment:** Each vehicle (truck, van, etc.) is an entity with details like type, capacity, registration, etc. Vehicles have many **Maintenance Records** and can be scheduled for shipments. A vehicle is often assigned to a driver and shipment (many shipments per vehicle over time).
- **Route / Trip:** A planned route or trip that groups one or more shipments for a driver. A trip entity links a driver, vehicle, and the set of shipments or stops. Routes have attributes like optimized sequence of stops, total distance, and estimated times (often calculated via a route optimization module ⁴).
- **Maintenance Record:** Logs of fleet maintenance activities. Each record links to a specific vehicle and may also reference a **Mechanic** (employee) who performed the work. Vehicles have many maintenance records (one per service event). Maintenance records might also tie to **Incident Reports** if repairs are due to accidents ⁵.
- **Employee:** Master entity for all personnel (drivers, dispatchers, mechanics, etc.) in the HR module. Each employee record stores personal info, role, certifications, etc. (e.g. commercial license for drivers). It links to sub-entities: **Training Records** (courses completed, certifications), **Performance Records** (reviews, infractions), and **Payroll Records** ⁶ ⁷. An employee can have multiple training and performance records over time.
- **Training Program:** HRD entity for onboarding/training. It contains training modules or sessions. There is a many-to-many relationship between Employees and Training (an employee can attend many trainings; each training session involves many employees).

- **Payroll / Timesheet:** Represents salary, wages, and work hours. Each payroll record is linked to an Employee and a time period. It may aggregate data from driver logs (for drivers) or work hours for other staff, and links with the finance module for payment processing ⁸ ⁵.
- **Account (Invoice/Billing):** Financial records for customer billing and payments. Each shipment or order may generate an **Invoice** (one-to-one or one-to-many if multiple shipments per invoice) linked to the Customer and managed by the Accountant role. Likewise, payroll data for employees interfaces with accounting.

Data Flow Diagram (DFD) Outline: The system's data flows connect external users (customers, drivers, etc.) with internal processes and databases. Major workflows include:

1. **Customer Booking & Shipment Management:** A customer uses the portal to create a new shipment order, entering details (locations, cargo, etc.) ². The system (Order Management process) stores this in the Shipment/Order database and notifies a **Dispatcher**. The dispatcher reviews the order, possibly adjusts details or adds a carrier, and confirms it. The order data flows into planning processes and generates confirmation back to the customer (booking confirmation and later, tracking number). This workflow involves data moving from Customer -> TMS (new Order) -> Dispatcher -> TMS (updated shipment status) -> Customer (confirmation and later tracking updates).
2. **Driver & Vehicle Scheduling:** The dispatcher (or automated planning module) schedules a driver and vehicle for one or more shipments. The scheduling process pulls available driver and vehicle data from the Employee and Vehicle records (ensuring the driver has required certifications and the vehicle is suitable/available). Once assigned, the system creates a **Trip/Route plan** linking driver, vehicle, and shipments ⁹. Data flows from the dispatcher's input into the system, updating the dispatch schedule and sending assignment notifications to the Driver's mobile app. The driver receives the manifest (list of stops, route) and acknowledges. This process also triggers route optimization: the system may call an optimization service or module to calculate the best route and update the trip data.
3. **Route Optimization & Execution:** When planning a route, the TMS evaluates routes and optimizes loads and sequences ⁴. The **Route Optimization** process takes shipment details and mapping data (often via an external GIS API) to compute an optimal route and schedule ¹⁰. The optimized route is stored (Route entity updated) and delivered to the dispatcher and driver. During execution, the **Tracking** process receives real-time GPS or driver check-ins. As the driver moves, **Tracking Events** (departed pickup, en route, delivered, etc.) are generated either automatically via telematics or manually via the driver app ¹¹. These events flow into the system, updating the Shipment status and triggering notifications to customers and dispatchers (e.g. "delivery completed" or exception alerts) ¹.
4. **Customer Track & Trace:** The system provides customers visibility into shipment status. The **Track-and-Trace** process pulls data from Tracking Events and exposes it on the Customer Portal in real-time ². Customers (external entity) request status or subscribe to notifications; the system outputs current location, ETA, or any delay alerts to them. Data flows from the internal tracking database to the customer's view, typically filtered to show only that customer's shipments. For example, Freight2020's customer portal allows customers to see live updates of movements and events for their bookings, and even download relevant documents like PODs or invoices ².

5. Fleet Maintenance Workflow: This involves **Drivers**, **Mechanics**, and the **Fleet Manager/Dispatcher**. Drivers may report vehicle issues via the mobile app (e.g. a breakdown or maintenance need), which creates a Maintenance Record and alerts the Mechanic ¹². Separately, scheduled maintenance triggers are generated based on vehicle usage or time (e.g. service due date). The **Maintenance Management** process receives these inputs and schedules a maintenance task. Data flows include a work order sent to the Mechanic, who updates the Maintenance Record (parts used, work done) and marks the vehicle's status (e.g. "out of service" during repair). This status update flows back to Dispatch – ensuring the dispatcher doesn't assign a down vehicle. Once maintenance is complete, the vehicle is marked available. The integration of HRD comes into play if a maintenance issue was caused by driver error or accident – an **Incident Report** is logged linking the driver (employee) and the vehicle. For instance, an accident record would flow into both the driver's HR profile (for safety/compliance tracking) and the vehicle's maintenance history ⁵.

6. Employee Onboarding, Training & Payroll: The HR Manager or Admin initiates an **Onboarding process** for new employees. Data like personal details, licenses, certifications are input and stored in the Employee entity ⁶. The system might enforce compliance checks – e.g., ensuring a driver's license and certifications are recorded and set with expiry dates. These data feed other processes; for example, license expiry dates will trigger reminder alerts (via an Auto-Notification subsystem) to the HR Manager or driver before expiration ¹³. **Training management** involves scheduling training sessions (data flow: HR Manager enters training event -> notification to relevant employees -> employees confirm attendance -> upon completion, Training Records are updated). During operations, drivers' hours and work logs flow into the **Payroll** process: the system aggregates hours, calculates wages or overtime, and the HR Manager or Accountant reviews payroll drafts ⁸. Finally, **Payroll processing** outputs salary payments and updates financial records. Sensitive HR data (like performance notes, salaries) is restricted to authorized roles; for example, only the HR Manager and business owner (Admin) might access detailed performance and pay info ¹⁴. This controlled access is enforced as data flows to user interfaces based on role permissions.

Figure: Typical TMS process flow connecting order management, planning, execution, and analysis. Modern TMS platforms manage shipments from initial order capture through route planning, carrier/driver assignment, real-time tracking, documentation & compliance, billing, and performance analytics ⁹ ¹¹. Each step generates data that feeds into the next, illustrating how an integrated system shares information across modules and stakeholders. (Note: HR processes like hiring/training run in parallel, feeding employee data into operations, and are integrated with incidents and payroll in the overall system ⁵.)

2. User Roles and Responsibilities

A robust TMS with HRD integration supports multiple types of users, each with specific responsibilities and access privileges. Common user roles include the following ¹⁵:

- **Admin (System Administrator / Owner):** Top-level user with full system access and configuration rights. Admins manage global settings, user accounts/permissions, and have oversight of all modules (operations, fleet, HR, finance, etc.). For example, an Admin can configure carrier contracts, set up integrations, and view all reports and analytics ¹⁶ ¹⁷. This role often represents company owners or IT managers responsible for ensuring the TMS supports all business processes.
- **Dispatcher (Operations Manager):** The dispatcher coordinates shipments and fleet operations. They handle day-to-day logistics: input and update orders, plan and optimize routes, assign drivers

to vehicles, and monitor shipment progress ¹⁸. Dispatchers typically access load details, scheduling tools, and real-time tracking dashboards, but may have limited access to financial or HR data (e.g. they might not see billing rates or HR records) ¹⁹. Their goal is to ensure on-time pickups/deliveries and efficient resource use.

- **Driver:** The driver uses the system (usually via a mobile app) to carry out deliveries. Drivers receive their assigned shipments or routes, navigate to locations, update statuses (pickup/delivery confirmations), and handle digital proof-of-delivery. They can often upload documents (photos of POD, etc.), report incidents or maintenance issues, and communicate with dispatch ²⁰ ³. Drivers typically only have access to the Driver App portion of the system – they see their own runs and cannot view broader operational data ²¹. They may also use the app for HR-related tasks like logging hours or viewing their own training and safety records.
- **Customer:** External users who book and track shipments. A customer (shipper) can log into a self-service **Customer Portal** to request new shipments, view quotes or rates, and track the status of current shipments ². They can also access their shipment history, invoices, and delivery documents. Customers only have access to their own data; they cannot see other clients' shipments. By enabling customers to self-serve (e.g. make bookings and check delivery updates), the TMS improves service transparency ².
- **HR Manager:** Internal user focused on Human Resource Development and personnel management. The HR Manager maintains employee records from hiring to termination ²². Responsibilities include onboarding new staff (entering personal info, licenses, certifications), scheduling and tracking training or driver certification renewals, monitoring compliance (e.g. ensuring all drivers have valid licenses, up-to-date medical exams), and managing payroll preparation ⁶ ⁸. This role can access sensitive information like salaries and performance reviews – data which the system restricts to HR and executives only ¹⁴. The HR Manager works closely with the system's HR module, ensuring that any HR-related alerts (expiring licenses, upcoming training, incident reports) are addressed promptly.
- **Mechanic (Fleet Technician):** A user role dedicated to fleet maintenance. Mechanics use the system's maintenance module to view work orders, update service records, and manage vehicle availability. They can log repairs, schedule routine maintenance, and mark vehicles as out-of-service or roadworthy. In some TMS platforms, a "Mechanic" role is limited to fleet-related data – for example, DrayMate TMS added a mechanic role that "**allows users with this role to manage the containers in the yard, trucks and chassis only**" (i.e. they don't access shipment or finance info) ²³. Mechanics might also see driver-reported issues and update their status once resolved. Their input ensures the dispatch team has accurate information on which vehicles are available or under maintenance at any time.
- **Accountant (Finance/Billing Manager):** The accountant oversees financial transactions within the TMS. This includes managing customer billing (invoices, payments) and coordinating payroll or driver settlements. Accountants access the finance module to generate or approve invoices, record payments, and run financial reports ²⁴. They often have full access to billing and cost data but limited access to operational screens. For instance, an accounting role can manage invoices and view financial reports, while not being able to modify dispatch settings or see detailed load planning screens ¹⁹. In an integrated HR scenario, the accountant may also handle payroll outputs – ensuring that payroll data from HR (hours, wages) is correctly recorded in the financial system and that payments to employees (or contractors) are processed.

To clarify the scope of each role, the table below summarizes the major system features each role can access or manage:

Role	Operations (Shipments & Dispatch)	Tracking & Visibility	Fleet Maintenance	HR (Employee & Training)	Finance (Billing & Payroll)
Admin	Full access to all operations (create/edit orders, assign resources) ¹⁷ .	Full visibility of all shipments (global tracking dashboards).	Full access (fleet status, maintenance records).	Full access (all employee records, HR reports).	Full access (invoices, costs, payroll data).
Dispatcher	Manage shipments and trips (planning, driver/ vehicle assignment) ¹⁸ .	Monitor all active shipments, view live status maps ²⁵ .	View vehicle availability and status; report issues from drivers.	View driver info relevant to scheduling (availability, certifications).	Limited (perhaps view costs or COD status; not manage invoices).
Driver	Execute assigned deliveries (view task list, but cannot alter global plans).	Update status for their loads; view own route map and ETA.	Report vehicle issues via app ¹² (no direct access to maintenance module).	Access own profile (training completed, certifications); receive HR notifications (license renewal).	View own pay stubs or settlement info; no access to overall finance.
Customer	Create bookings for their shipments (via portal) ²⁶ .	Track status of their shipments in real-time ²⁶ .	N/A (no fleet access).	N/A (not an internal employee).	View their billing invoices and payment history ²⁶ .
HR Manager	N/A (does not manage shipments).	N/A (not involved in shipment tracking).	View driver incident reports or safety records related to vehicles ⁵ .	Full HR module access (all employees' data, compliance, training) ⁶ .	Manages payroll preparation; coordinates with accounting on salary payments ⁸ .

Role	Operations (Shipments & Dispatch)	Tracking & Visibility	Fleet Maintenance	HR (Employee & Training)	Finance (Billing & Payroll)
Mechanic	N/A (not involved in dispatch).	Possibly see vehicle telematics (to locate trucks for repair).	Full access to maintenance module (service logs, work orders) <small>23</small> .	Record driver-induced incidents (for HR to review); no broader HR access.	View maintenance costs or parts inventory; not involved in billing.
Accountant	N/A (no shipment planning).	N/A (not directly tracking shipments).	Review fleet cost reports (fuel, maintenance costs) for accounting.	Limited – may process payroll totals but not edit HR data.	Full access to billing (invoices, payments, financial reports) <small>24</small> ; oversees payroll disbursement.

(Table: Summary of which major modules/features each role primarily uses. “Full access” means the role can create, edit, and view that data; “View” indicates read-only or limited visibility; N/A means the role typically has no need for that module.)

3. Front-End Components by User Role

Modern TMS solutions are built with modular, component-based UIs (often using frameworks like React or Vue)
27. This allows the interface to adapt to each user role, showing relevant dashboards, forms, and tools. Below, we list the key front-end components for each role, aligned with their functional needs. Common UI elements include interactive **dashboards** with KPIs, data-rich **tables** and **forms** for data entry, **modals** for quick edits, **status indicators** and maps for tracking, **notification panels** for alerts, **calendars** for scheduling, and **analytics charts** for performance review. We also note how leading TMS vendors incorporate these elements into their user experience:

Admin Interface Components

- **Admin Dashboard:** A comprehensive dashboard displaying high-level metrics across the entire transportation operation and workforce. It might show KPIs like on-time delivery rate, fleet utilization, total shipments, and safety stats, all in one place
28. The admin dashboard is often configurable – e.g., Manhattan TMS allows configuring dashboards to include only the metrics each team or executive needs
29. This dashboard provides filters and drill-downs so the Admin can get an overview and then inspect details of any aspect (operations, financials, HR) as needed.
- **User & Role Management Panels:** Admins have access to screens for managing system users and permissions. This includes forms and tables to create new user accounts, assign roles, and define access levels. For instance, an Admin can add a new dispatcher or mechanic and assign the appropriate role in the interface (often via a form in a modal dialog). They can also configure role-based access to data – e.g., restrict salary visibility to HR managers
14.

- **System Configuration Module:** A collection of pages or settings modals where Admins configure global parameters – for example, defining service regions, setting up integrations (e.g. with mapping APIs or ELD devices), managing master data like customer lists, carrier contracts, or tariff rates. These often use form components with validations (for setting rules) and possibly file upload components (e.g., to import integration keys or templates).
- **Reports & Analytics:** Admin users can access all system reports – operational reports, financial summaries, HR reports, etc. This part of the UI includes report selection dropdowns, date range pickers, and generates charts or tables for analysis. For example, the Admin can view an analytics page with charts for cost per mile, on-time performance, revenue vs expense, employee turnover, etc. ²⁹. Advanced TMS dashboards (like those described by Databrain) turn raw data into visualizations for strategic planning ³⁰ ³¹. Admins often can customize or export these reports.
- **Notifications Center:** A panel or icon (often a bell icon) aggregating system-wide alerts – such as warnings about delayed shipments, upcoming license expirations, or system health checks. Admins see critical alerts across all modules. For example, the system might alert the Admin of a severe incident (accident) or an integration error. Many TMS provide automated email/SMS notifications as well, but the UI panel gives an at-a-glance view of pending issues (e.g., “5 shipments delayed”, “2 maintenance tasks overdue”, “3 compliance alerts”) ¹³.
- **Security/Audit Logs:** In some systems, Admins have a view of audit logs or user activity streams (for compliance). This might be a table showing who logged in, changes made to orders, etc., to monitor the system’s use.

(Admin interfaces are often web-based dashboards accessible on a desktop browser for full control. Given their broad access, Admins essentially see a superset of components available to other roles, plus the user-management and configuration tools unique to their role.)

Dispatcher (Operations) Interface Components

- **Dispatch Dashboard:** A real-time operations dashboard focused on live shipments and resource status. This often includes a **map view** plotting vehicles/trucks and shipments in transit, along with a list or table of active loads and their statuses. Leading systems provide rich dispatch boards – e.g., DrayMate’s dispatch screen shows real-time truck GPS locations on a map and allows searching for the nearest truck to a location ²⁵. Key components here are a map widget (with truck icons, traffic overlays, etc.), and side panels or pop-ups showing load details when a truck or route is selected.
- **Orders/Loads Management Table:** A table or grid listing all shipments/orders that are pending assignment, in transit, or completed. The dispatcher can filter and sort by criteria (e.g., by pickup date, customer, status). Each row typically has color-coded status indicators (e.g., green for delivered, red for delayed) for quick visual scanning. Clicking a load opens a detailed view (often a modal or detail page) with all info (addresses, items, etc.) and actions (assign driver, edit, cancel).
- **Assignment & Scheduling Tools:** Dispatchers use interactive scheduling components to assign drivers and vehicles. This could be a **drag-and-drop calendar or Gantt chart** that shows drivers/vehicles on one axis and time on the other. For example, a scheduling calendar might list drivers down the side and time slots across; the dispatcher can drag a shipment into a driver’s row to assign it. Forms or modals assist with assignment – selecting a driver, a truck, and maybe a route; once assigned, the UI might display the assignment on the calendar or mark the order as dispatched. Some TMS have an automated tendering component (if using external carriers) – the UI would then allow the dispatcher to approve or override carrier suggestions ³², but in a carrier-managed scenario, it’s more about internal assignment.

- **Route Optimization & Planning UI:** If the TMS offers manual route planning in the UI, the dispatcher may have a **Route Planning wizard or map interface**. This component allows the dispatcher to input multiple stops or orders and then either manually arrange them or run an optimization. The UI would show a suggested route on a map and details like total distance and ETA. Dispatchers can adjust the sequence (e.g., by dragging stops) and confirm the plan. Modern TMS incorporate AI suggestions here – e.g., highlighting if a different driver or route would save cost or time ³³ (the UI might show a recommendation banner or alternative route option).
- **Real-Time Alerts Panel:** Within the dispatcher's view, there's usually a live feed or alert list for operational exceptions. For instance, if a driver is running late or deviates from route, the system triggers an alert ³⁴. The dispatcher's dashboard might display these alerts prominently (blinking icon or highlighted row) so they can act – e.g., calling the driver or notifying the customer. Similarly, an alert will show if a vehicle breaks down or if a shipment is at risk of missing a delivery window. This component ensures the dispatcher can prioritize issues and respond quickly.
- **Communication and Notifications:** Dispatchers often have built-in communication tools in the UI, such as the ability to send messages to drivers (which appear in the driver's app) or automated SMS/email to customers. This might appear as a **chat window** or a “**send update**” form in the load detail view. For example, a dispatcher might use a “Notify Customer” button on a delayed shipment to trigger an update email. Some systems integrate with telematics/ELD messaging, so the dispatcher can send canned messages to the driver's device directly from the interface.
- **Operational Reports:** While deeper analytics are often for managers, dispatchers have access to day-to-day reports or dashboards focusing on operations. Components like a **daily performance chart** (e.g., deliveries per hour, or map of completed routes) and **driver performance tables** (on-time rate, idling time, etc.) might be part of their dashboard. These help dispatchers review the recent performance and plan accordingly. Rose Rocket's TMS, for example, allows operations users to see analytics relevant to their assigned work (while hiding irrelevant financial info) ³⁵ ³⁶.

(Overall, the dispatcher's UI is centered around managing and monitoring the flow of shipments. Modern dispatch UIs emphasize real-time data – maps with live GPS, instant notifications – and interactive scheduling. This ensures the dispatcher can react and adjust plans swiftly to keep freight moving efficiently.)

Driver Interface Components

- **Mobile App Job List:** Drivers interact via a mobile-friendly interface (often a native app). The core component is a **job list or itinerary** showing the driver's assigned trips and stops. This appears as a list of deliveries/pickups with key info (customer name, address, time window, etc.). The driver can tap a job to see full details. For example, in the Freight2020 Driver Mobility app, drivers see their job allocations and locations in real time ¹². Each job entry may have status icons (e.g., not started, in progress, completed) and may be color-coded by urgency or status.
- **Route Map & Navigation:** When a driver selects a job or route, the app provides a map view with turn-by-turn directions. Many TMS apps integrate with mapping services (Google Maps, HERE, etc.) for navigation. A **map component** shows the current location, route path, and destination, possibly with multiple stops pinned if it's a multi-stop route. Some systems embed the map; others deep-link to the driver's preferred navigation app. The map also helps in sending back location data for tracking.
- **Check-in/Status Update Buttons:** The driver app includes simple UI controls for updating status. For instance, buttons like “Start Trip”, “Arrived at Pickup”, “Picked Up”, “Delivered” allow drivers to trigger status events. These may be presented contextually (e.g., only “Arrived” is enabled when near

the destination, possibly using geofence). Once a driver taps “Delivered”, the app might prompt for additional input like capturing signature or photos.

- **Proof of Delivery (POD) Capture:** A component to handle delivery confirmation – often a **signature pad** (where the receiver signs on the screen) and/or a **camera interface** to take a photo of the delivered goods or signed paperwork. The app then uploads this as a POD document. The UI would show a confirmation (e.g., an image thumbnail or a “POD saved” message) once captured. This feature replaces paper and integrates the result into the shipment record immediately.
- **Forms for Notes and Incident Reporting:** Drivers can fill out quick forms in the app for exceptions or incidents. For example, if there’s a delay or an accident, the app might have an **Incident Report form** where the driver selects a category (breakdown, accident, etc.), enters a description, and can attach photos. Freight2020’s driver app enables instant documentation of accidents or maintenance issues on the road ¹². Similarly, a **Vehicle Inspection Checklist** form may be available (to do pre-trip or post-trip inspections and submit results to the system).
- **Hours of Service (HOS) and Availability:** If integrated with compliance, the driver’s interface could display their driving hours or shift timer (often pulled from an ELD device). A **HOS status indicator** shows how many hours they have left to drive today or if they must take a break, etc. The UI might have a clock/timer graphic or simply text like “Driving Hours Remaining: 2h 30m”. Drivers might also use the app to declare availability (e.g., marking themselves on-duty/off-duty) via toggle buttons, which feeds HR/payroll and compliance tracking.
- **Notifications:** A simplified notification list or push notifications are used in the driver app to inform drivers of new assignments or updates. For instance, when a dispatcher assigns a new load, the driver gets a push notification “New Load Assigned: #12345, Pickup at 2 PM”. Delays or changes might also trigger notifications (e.g., “Route updated by dispatcher”). This ensures drivers don’t miss critical changes while on the road.
- **Personal Profile & HR Info:** Since HRD is integrated, the driver app can also serve some HR functions for the driver. For example, a **profile section** might let the driver view their certifications and upcoming expirations (with warnings if, say, their hazmat certificate is expiring next month). They might see a record of completed training modules or have links to online training content. Additionally, a **pay summary** component could be available: after completing a trip or at week’s end, the driver can see their earnings or reimbursements (as an overview or a link to a separate HR/payroll portal). Some systems allow drivers to download their payslips or settlement statements from the app (often in PDF).
- **Support/Contact Links:** The app provides a quick way to contact dispatch or support (e.g., a “Call Dispatcher” button or in-app chat). There may also be an FAQ or help section for app usage or company policies.

(Driver-facing components prioritize clarity and ease-of-use, often using large buttons and minimal text for safety. Everything is contextual – only the next needed action is shown – to guide drivers through their workflow. The integration with HR means the app isn’t just for deliveries, but also a touchpoint for the driver’s relationship with the company, from compliance checks to receiving their compensation details.)

Customer Interface Components (Customer Portal)

- **Booking Request Form:** The customer portal provides an interface for customers to enter new shipment requests. This typically is a multi-step form (wizard) where the customer inputs pickup and delivery locations (with address autocomplete), shipment details (weights, dimensions, commodity, etc.), selects service options (mode, speed), and perhaps gets a rate quote. The form might include a **date picker** for scheduling, dropdowns for service types, and an **order summary** at the end.

Modern portals often save frequent addresses or allow uploading a CSV for multiple orders. Upon submission, the UI confirms the booking and shows an order confirmation number.

- **Track & Trace Dashboard:** A central dashboard where the customer can see all their in-progress shipments at a glance. This often includes a **table of active shipments** with status, and possibly a map for shipments currently in transit. Each shipment entry will display key status info (e.g. "In Transit – ETA Dec 5, 3 PM" or "Delivered – Nov 30, 1 PM") often with an icon or color code. Customers can click on a shipment to get a detailed **Status Timeline** – a chronological list of events (picked up, at hub, out for delivery, delivered) with timestamps ²⁶. This detail view might also show the current GPS location of the truck if available, or at least the last known location.
- **Notifications & Alerts:** Customers can opt into notifications. The portal might have a settings page where they choose to receive email/SMS updates for events like pickup, delivery, or exceptions. In the UI, important alerts might also be shown (e.g., a late shipment could be highlighted in red in their dashboard). Some portals provide a **self-service issue resolution** component – for example, if a delay occurs, the portal might show a message like "Delayed – Weather issue" and offer a contact button if further action is needed.
- **Invoices and Payment:** Integrated TMS portals let customers view and download their invoices. A **Billing or Invoices section** lists all past shipments or periodic invoices with status (paid/unpaid). The customer can click an invoice to see details and download a PDF copy ²⁶. If online payment is enabled, the portal might have a **payment gateway component** allowing credit card or EFT payments for outstanding invoices (this might redirect to a secure payment form). Even without online pay, showing the account history (all bills and payments) helps transparency ²⁶.
- **Account Management:** Customers have a profile page to manage their information – e.g., saved addresses, contacts, and preferences. Components here include forms to update contact info, manage API tokens (if the customer integrates via API), or add sub-users (some systems allow a customer admin to create sub-accounts for colleagues).
- **Reports/Analytics for Customers:** Some advanced portals give customers analytics about their own shipments – for example, a **shipment history report** charting their volume over time, on-time performance, cost per lane, etc. This would involve data visualization components (charts, graphs) tailored to the customer's own data. While not every TMS portal includes this, leading 3PL portals often provide at least downloadable reports. The UI might have a **reports tab** where the customer can generate a report (e.g., "shipments last month") and download it in Excel.
- **Support Integration:** A help or support component, such as an embedded chat for customer service or a ticket form, is often part of the portal. Customers can use this to reach out for any issues not solved by the tracking info.

(The customer portal is typically web-based (responsive for desktop and mobile) and branded with the company's look and feel ². Its design focuses on simplicity and clarity, ensuring customers with no training can easily book shipments and get updates. Leading vendors tout these portals as key differentiators – for instance, Freight2020's portal is described as providing a seamless end-to-end experience for bookings and track-and-trace, appearing as part of the company's own website ².)

HR Manager Interface Components

- **HR Dashboard:** Upon logging in, an HR manager sees a dashboard of workforce metrics and alerts. This could include **widgets** like "# of Drivers On Duty Now", "Training Compliance Rate", "Pending Certifications Renewals", etc. A key element is a **task/alert list** highlighting urgent HR tasks: e.g., "2 licenses expiring next month", "1 new incident report to review", "3 employees due for performance

review". The dashboard may also show HR KPIs (turnover rate, training hours this quarter, etc.) in chart form for overall insight.

- **Employee Management Module:** A set of pages for managing employee information. A **Employee List Table** shows all employees (or filtered by role/department), with search and filters (by role, status active/inactive, etc.). The HR manager can click an employee to open their profile – often a detailed view with tabs or sections for different info (Personal Info, Credentials, Training, Payroll, etc.). In edit mode, forms allow updating details or uploading documents (like a driver's license scan or training certificate PDF). Given integration, some fields might be auto-updated from other modules (e.g., total miles driven could appear on a driver's profile).
- **Onboarding/Recruitment Tools:** If included, the HR manager might have a **Recruitment form** to enter new applicants or a way to track applications. Freight2020's HR module, for example, allows capturing job applications and pre-employment checks ⁶. The UI could provide a form to input an applicant's data, attach a resume, and then convert an accepted applicant into an employee record seamlessly.
- **Training & Certification Scheduler:** A calendar or scheduler interface specifically for training sessions and certification renewals. The HR manager can create a **Training Event** (via a form specifying date, type of training, required attendees, etc.). The calendar view shows upcoming training sessions; clicking one shows details and who's enrolled. The system might highlight if certain employees are overdue for mandatory training (e.g., a defensive driving course) – possibly with red highlight on their profile or an alert. There could also be a **Certification Management** component: a table of certification types, which employees have them and their expiry dates, with filters to find expiring soon. The HR manager uses this to plan training or renewal processes. Notifications are tied in – e.g., auto-email to a driver to renew a license 30 days before expiry ¹³, which the HR manager can configure in the UI.
- **Incident and Compliance Management:** HR managers need to review driver incidents (accidents, violations) and ensure compliance. A **Compliance Console** in the UI might list all recorded incidents and their status (open, under review, closed). Each incident record can be opened to view details (automatically captured from the driver's report or dispatcher input) and then allow the HR manager to add notes or mark any follow-up (e.g., "Driver counseled on 12/01, incident closed"). The compliance view may also track things like drug test schedules or medical exam due dates in some industries. Essentially, this part of the UI helps HR ensure all regulatory and company policy requirements are met (e.g., all drivers took their yearly safety course, all have valid medical certificates, etc.). Auto-alerts in the system assist here – e.g., an alert for upcoming driver medical exam due ¹³ – and the HR dashboard aggregates these compliance alerts.
- **Payroll and Timesheets Interface:** Depending on how HR and accounting split responsibilities, the HR manager may prepare payroll data. The UI could have a **Timesheet Approval** screen listing all employees and their logged hours or trips for the pay period. The HR manager reviews and edits entries (e.g., adding sick days or correcting a driver's hours) via editable tables or forms. Once finalized, they trigger payroll calculation. The **Payroll Summary** component then shows each employee's gross pay, deductions, etc., for confirmation. If the TMS has an integrated payroll module, the HR manager can then finalize and perhaps even issue payslips directly. Freight2020's integration between HR and payroll means HR data (hours, awards, deductions) shares to Payroll instantly ⁸, so the UI might reflect changes in real-time. The HR manager can also generate pay reports or export data for accounting if needed.
- **HR Reports & Analytics:** The HR manager can access reports focused on the workforce. Examples: a **Training Hours Report** per driver, **Employee Turnover report**, **Absence report**, or **Safety incident rate**. These might be accessible via a reports menu and output to PDF/Excel or show charts on screen. Some systems allow analyzing correlations (e.g., incident rate vs. training hours). The UI uses

typical components like bar charts, pie charts (for workforce composition), and tables for lists of employees meeting certain criteria. Given modern HR needs, the UI might also support building simple custom queries (e.g., list all employees hired in the last year, etc.).

- **Access Control & Confidential Data:** As HR deals with confidential info, the interface ensures only HR managers/admins can see certain fields (like salaries, SSN, etc.). There might be UI hints, such as a locked icon next to sensitive fields that only appear for authorized roles ¹⁴. The HR manager's view will include these, whereas, say, a dispatcher viewing a driver's profile would not see salary info.

(In summary, the HR Manager's UI in a TMS blends traditional HRIS (Human Resource Information System) features with logistics-specific data. It is form-heavy (for data input) but also includes calendars and alert panels to manage the dynamic aspects of workforce compliance. Leading TMS vendors stress the benefit of having HR integrated – for example, Freight2020's HR module shares data with compliance and payroll in real time, reducing duplicate data entry and ensuring everyone works with the same updated information ³⁷ ⁸.)

Mechanic (Fleet Maintenance) Interface Components

- **Maintenance Dashboard:** A focused dashboard for fleet status. It might show the number of vehicles **In Service** vs **Under Maintenance**, upcoming scheduled services, and recent breakdown incidents. Visual components could include a **fleet status pie chart** (e.g., 90% vehicles available, 10% in maintenance) and a **list of alerts** (like "Truck #12 – engine service due in 5 days" or "Trailer #7 – tire issue reported by driver"). This gives the mechanic (or fleet manager) a quick view of workload and priorities.
- **Work Order Management:** A central table or Kanban-style board of maintenance tasks. Each work order entry lists the vehicle, issue, priority, and status (e.g., "Open – Awaiting Parts", "In Progress", "Completed"). Mechanics can click an order to open a **Work Order Detail** modal/form, where they record work done, parts used, time spent, etc. For example, if a driver reports a maintenance issue via the app, an entry is automatically created (with details from the driver's report) and appears here for the mechanic to address ¹². The UI allows updating the status and adding notes. A **Create New Work Order** form also lets mechanics or managers input issues discovered outside of driver reports (e.g., periodic inspection found an issue).
- **Vehicle Inventory & History:** Mechanics have pages for each vehicle's profile and history. A **Vehicle List** table shows all fleet vehicles with key info (make, model, status, next service date). Clicking a vehicle opens its profile, which includes attributes (VIN, capacity, etc.), current status, and a **Maintenance History log** (a table of all past maintenance records for that vehicle). This component is crucial for diagnostics and warranty tracking. It might allow filtering the history by type of service or date. Also, a **documents section** could list any uploaded files (like maintenance checklists or compliance documents for that vehicle).
- **Preventive Maintenance Schedule (Calendar):** A calendar view showing scheduled maintenance events (e.g., "PM Service for Truck 12 on Dec 10"). The mechanic or fleet manager can plan recurring maintenance here. The UI might allow scheduling by mileage or time (for example, set a rule that every 10,000 miles or 6 months triggers an oil change). Once scheduled, those events show up on the calendar and will generate reminders. This calendar likely integrates with notifications so that, say, a week before a scheduled service, an alert is shown or emailed.
- **Parts and Inventory Management:** If the TMS includes inventory of spare parts, the mechanic role would have components to manage parts stock. This might be a **Parts Inventory table** listing parts, quantities on hand, and reorder thresholds. The mechanic can update usage of parts on each work order (e.g., on the work order form, selecting parts used which then decrement inventory). The UI

could provide alerts when certain parts are low. (Not all TMS cover this, but some fleet management integrations do.)

- **Telematics Integration View:** In some systems, mechanics can access telematics data from vehicles (like fault codes, engine hours). A **Telematics Dashboard** might display active diagnostic trouble codes (DTCs) from trucks or data like fuel efficiency, which helps in proactive maintenance. This could appear as a list of vehicles with any warning signals or an interface to run remote diagnostics. For example, if a truck's onboard computer sends an alert, it might pop up here so the mechanic can prepare before the truck arrives.
- **Mechanic Performance/Reports:** Internally, there may be reports for maintenance metrics, like average downtime per repair, maintenance cost per mile, etc. A mechanic or fleet manager can generate these to analyze efficiency. These would use charts or tables similar to other report sections. For instance, a **Maintenance Cost Report** might show each vehicle's total maintenance cost vs. mileage in a given period.
- **Limited Operations Interface:** Unlike dispatchers, mechanics typically do not manage shipments. Their UI might still allow viewing where a vehicle is currently (to coordinate maintenance). For instance, if a truck needs urgent repair, the mechanic could check the **Tracking** module for that vehicle's location or schedule (this might be read-only access to the dispatch schedule for that unit). DrayMate's introduction of a mechanic role specifically limits them to managing trucks, containers, chassis – implying their UI doesn't show customer orders or billing, focusing instead on equipment management ²³. So, the mechanic's interface might hide menus like "Shipments" or "Accounting", showing only "Fleet" and related modules.

(By tailoring the UI to maintenance tasks, the TMS ensures mechanics can focus on fleet reliability. The use of calendars and work order boards aligns with maintenance workflows, while integration with driver inputs and telematics helps catch issues proactively. The overall goal is a smooth flow of information: e.g., a driver's defect report appears instantly in the mechanic's queue, and once the mechanic fixes it and updates the system, the dispatcher is automatically informed that the vehicle is back in service.)

Accountant (Finance) Interface Components

- **Finance Dashboard:** A high-level dashboard showing financial health indicators: total freight cost, total billing, outstanding receivables, etc. It may include charts like monthly transportation spend vs budget, or profitability per route or customer. Accountants use this to monitor the financial performance of transportation operations. For instance, a chart might show the trend of freight cost per mile over the last 6 months. Another widget might be "Aging Receivables" listing how much money is overdue from customers. This dashboard helps prioritize actions (like follow up on late payments) and is often read-only graphs and summaries.
- **Invoice Management Table:** A core component listing all customer invoices. Each entry shows invoice number, customer, amount, status (unpaid/paid/overdue). The accountant can filter by customer or date, and sort by due date or amount. Clicking an invoice opens an **Invoice Detail** view (with line items, associated shipments, etc.). The interface allows actions such as marking an invoice as paid, editing an invoice (if adjustments are needed), or sending it to the customer (maybe triggering an email with PDF). There could also be a "**Generate Invoice**" function – if the TMS allows creating invoices based on shipments, the accountant can select completed shipments and bundle them into an invoice via a form/dialog.
- **Billing Settings and Rates:** A section for configuring billing rules – e.g., setting fuel surcharge percentages, accessorial fees, or customer-specific rate tables. This might be a combination of forms and tables. For example, a **Rates table** where the accountant (or pricing manager) enters lane rates

or a tariff. If integrated, this could also involve importing/exporting rate files. The UI ensures these financial settings are correctly captured, which then the system uses to calculate costs and charges on shipments. (If this is not in the accountant's purview, it might be under Admin or a Pricing role, but in smaller operations the accountant might handle it.)

- **Cost Management & Settlement:** For carriers that pay drivers or owner-operators per load, the accountant has a **Settlements** component. This would list trips or loads alongside the amount to pay the driver (or an outside carrier). Super Dispatch's example distinguishes that accounting roles handle invoices and payments, whereas dispatch doesn't ¹⁹ – so this part might be exclusively visible to accounting. The UI might allow generating a **Driver Settlement Statement** – essentially a pay stub for trip-based pay – and mark it as paid. DrayMate's updates included automating driver settlements and generating PDF statements ³⁸, meaning the accountant's UI likely has a button to "Calculate Settlements" and then a way to view/print the resulting statements for each driver.
- **Payment Processing Integration:** If the TMS integrates with payment systems, the accountant may have a **Payments module** to process or reconcile payments. For instance, there could be a "**Record Payment**" form to log a received check or an **online payment gateway** interface to charge a customer's credit card. Some systems integrate with accounting software (QuickBooks, etc.), so this UI might show a sync status or allow exporting financial data to the external system. For payroll, if integrated, the accountant might also oversee the final pay run – possibly an interface to approve the payroll that HR prepared, and then a confirmation that funds were disbursed (or an export to a banking system).
- **Financial Reports:** Accountants can run detailed financial reports. Components here include selection menus for report type (e.g., Profit & Loss on transportation activities, Accounts Receivable Aging, Cost by Customer, etc.) and parameters (date range, customer filter). The output could be shown as tables and charts, or simply be downloadable. For example, a **Cost Analysis report** might list each shipment with its cost components and revenue, highlighting profit margin. Another might summarize maintenance costs vs. budget (blending fleet info). These reports help accountants and management understand where money is made or lost in transportation. Given the HR integration, reports could also combine data – e.g., **Payroll vs. Productivity** analysis per driver (linking pay and delivered shipments).
- **Audit Trail & Permissions:** The accountant's interface might allow viewing an **audit log** of financial transactions (who approved what invoice, etc.) for compliance. Also, since finance roles might be subdivided (e.g., junior clerk vs manager), there could be permission settings visible (though usually configured by Admin). In context, an accountant using the system will primarily see menus for "Accounting" or "Billing" rather than operational ones, streamlining their workflow.

(In practice, many TMS integrate with external accounting systems; however, an integrated design gives accountants immediate visibility. The UI is designed to ensure accuracy (with checks like invoice reconciliation tools) and to segregate financial data from operational data for other users. For example, dispatchers may not even see the Billing menu, preventing unauthorized access to financial info ¹⁹. By structuring the components this way, leading TMS platforms keep financial controls tight while still sharing essential data (like costs, rates) across modules to avoid double entry.)

References to Leading TMS Vendor Practices

Throughout the above descriptions, we've noted how top TMS solutions implement these components to enhance user experience. Leading enterprise TMS like Oracle OTM or SAP TM typically offer role-based UIs with extensive configuration, but can be overly complex for some users ³⁹. Modern, user-focused TMS vendors (e.g., Rose Rocket, Super Dispatch, Freight2020, Manhattan TMS) emphasize clean, role-tailored

design: - Rose Rocket simplifies with four main roles (Admin, Manager, Operations, Customer Service) and limits what each sees, which reduces information overload for, say, an operations dispatcher ³⁵. - Super Dispatch provides a streamlined Carrier TMS where dispatchers, accountants, and drivers each have distinct interfaces or apps, ensuring drivers only use the mobile app and not the complex TMS screens ²¹. - **Manhattan TMS** (enterprise level) showcases configurable dashboards and robust analytics that can be tailored per role – for example, only surfacing the KPIs relevant to a dispatcher versus an executive ²⁸. They also integrate real-time GPS and notification features so that exceptions trigger alerts to the appropriate user immediately ³⁴. - **Freight2020 (CMS Transport)** provides a fully integrated suite including HR, demonstrating the benefit of cross-module data sharing: when an accident is logged, it updates both the vehicle's maintenance schedule and the driver's HR record, linking the two in the interface for management review ⁵. Their customer portal is an example of a well-integrated component, letting customers seamlessly place bookings and track shipments as if it were part of the company's own website ². - **DrayMate TMS** (for drayage operations) illustrates continual refinement of UI: adding a dedicated mechanic role with restricted views for yard equipment ²³, and enhancing dispatch screens with live maps and drop-down quick entries based on user feedback ⁴⁰ ⁴¹. - Across the board, **modern UX/UI approaches** like responsive design, modular components, and real-time web technologies (WebSockets for live updates, etc.) are being adopted. This means that whether a user is an accountant at a desktop or a driver on a smartphone, the TMS presents an optimized interface. For example, many TMS now use **React or Vue.js components** for dynamic grids, charts, and forms, which create a snappy, app-like experience in the browser ²⁷.

In conclusion, a Transportation Management System with integrated HRD features is a complex but highly cohesive platform. Its ERD spans shipments, fleet assets, and human resources, and its DFD illustrates information flowing seamlessly between booking, dispatch, tracking, maintenance, and HR processes. By defining clear user roles and crafting UIs tailored to each, the system ensures that every user – from drivers and dispatchers to mechanics, HR, and customers – interacts with intuitive components geared to their needs. This role-centric, modular design (as championed by leading TMS vendors) not only improves usability but also boosts efficiency, as each stakeholder has the right information at the right time, all within one integrated system ³⁷ ²⁸.

¹ ⁴ ⁹ ³² ³³ ³⁹ How to Build TMS Software That Fits Your Logistics

<https://stfalcon.com/en/blog/post/how-to-build-a-tms>

² ²⁶ Online Customer Portal - Transport Software - Freight2020 TMS

<https://transportsystems.com.au/interactivity/online-customer-portal/index.html>

³ ¹⁵ ¹⁸ ²⁷ Choosing a Tech Stack for Transportation Management System

<https://wezom.com/blog/choosing-a-tech-stack-for-your-transportation-management-system>

⁵ ⁶ ⁷ ⁸ ¹² ¹³ ¹⁴ ²⁰ ²² ³⁷ Human Resources Software - Freight2020 TMS

<https://transportsystems.com.au/freight2020/human-capital-management/human-resources-software/index.html>

¹⁰ ²⁸ ²⁹ ³⁴ Essential Features of a Modern Transportation Management System | Manhattan

<https://www.manh.com/our-insights/resources/articles/key-modules-and-features-transportation-management-system>

¹¹ The Essential Components of an Effective TMS | Tai Software

<https://tai-software.com/the-essential-components-of-an-effective-tms/>

16 35 36 **User Roles & Permissions**

<https://help.roserocket.com/user-roles-and-permissions>

17 19 21 24 **Understanding User Role in Carrier TMS – Super Dispatch**

<https://support.superdispatch.com/hc/en-us/articles/45863721064979-Understanding-User-Role-in-Carrier-TMS>

23 25 38 40 41 **Intermodal TMS - New features and enhancements**

<https://draymate.com/new-features-intermodal-dispatch-software>

30 31 **Transport Management System Dashboard: Templates, Examples & Use Cases**

<https://www.usedatabrain.com/blog/transport-management-dashboard>