Car Repair database

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TCSS 445: Database Systems Design

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1. **Brief description**:
   Database is a shop management software, it contains records of service for all customers in a shop. It holds contact information, vehicle information, descriptions of repairs, parts, & suppliers. It tracks appointment times, mechanic times, and parts and labor times for billing.
   Shops perform the following tasks:
   - Intake customers: (name, address, phone#, spouse/AuthContact, email, plate#, year, model, submodel, VIN, color)
   - Estimate Repair (labor description, time, parts, mechanic, total)
   - Bill for work: (description of work, time, parts, mechanic notes, amend customer record)
   - Order parts: (vender name, address, phone, account number, order total, transrecord (part name, partID, price, date, order#)
   - Receive parts (update shop inventory, markup parts, update blocked repairs)
   - Track repair (mechanic assigned, work estimate, eta for work blocks (mech availability, parts on order, etc)
   - Shop scheduling (Assigned jobs, estimated hours, actual hours, breaks, clock in/out, customer appointment checkin/out)
   - Contact Customers (service updates, maintenance reminder, appointment confirmations, etc)

2. **Data entity and its attribute:**
   Customer gathered information:
   a. Customer (Name, address, phone, email, [authorize contact], [vehicles], customer#) Ex: (Adam Adams, 123 Fake st…. , (253) 111-1111, AAdams@fakemail.m , Betty Adams (spouse), [Vehicles], 1)

   b. Authorize_contacts (name, relationship, phone number) Ex: (Betty Adams, wife of [Customer.name = Adam Adams], (253) 111-2222

   c. Vehicle (plate#, year, make, model, VIN, color, submodel, past service w/date) Ex: (C00LCT1, 1974, Chevrolet, El Camino, 1D80H4B586827, Black, SS, History/Date)

   d. Appointments (Date, time, est duration, customer name, vehicle, service, employee assigned) Ex: (04/12/2023, 800 hrs, 1hr, [Customer.Name = (Adam Adams)], [Customer.Vehicle = (El Camino)], [Service = (Oil Change)], [employee = (John Doe)]

Shop point of sale info

e. Employees (Name, address, phone, email, job title, hire date, employee number, TimeClock) Ex: (John Doe, 321 Fake st… , (253) 222-2222, jDoe@fakemail.m, Mechanic, Jan 1, 2020, 2, [TimeClock])

f. TimeClock (Employee, Time In, TimeOut, Calendar) Ex: (John Doe, 800hrs, 1600hrs, 4/12/2023)

g. Estimate/Invoices - Customer (Estimate/Invoice#, customer name, description of work, inventory of parts & labor, date, total amount)
Ex: (1, [Customer.Name = Adam Adams], “Oil change of 1974 El Camino”, [Parts.Part# = FTN-10], [Service.Time = 1.0 hr] 4/12/2023, $60.00)

h. Payments (Payment#, invoice#, payment type, payment date, amount) Ex: (0001aaa, 1, MasterCard, 4/12/2023)

Parts information

i. Part Supplier (name, address, phone number, email, [Parts] catalog) Ex: Napa Auto Parts, 123 Fife dr…, 253 333-3333, nParts@email.m, (external database of parts)

j. Purchase Invoice ([Part Supplier], invoice num, total, [Parts]) Ex: ([Supplier.name = Napa Auto parts], 000123, $25.00, [Parts])

k. Parts (Part #, Description, cost, price, #inStock, history) Ex: (FTN-10, “Oil filter for 1974 El Camino”, $4.23, $12.76, 5, List of [Purchase Invoice]

l. Return Parts ([Part Supplier], Part#, [Purchasing Invoice], description)

Service

m. Service Ticket ([Invoice]#, date, current status, [customer], [vehicle], [parts], [work], [employee] assigned, Est completion)

n. Work (Description, estimated time, [parts] needed)

o. Current Status (Estimate, customer approval, parts ordered, parts received, work started, work finished, invoiced)

p. Parts Ordered (Part number, supplier name, date ordered, quantity, cost)

q. Warranty work ([Invoice], [customer], [vehicle], description, [parts]

Date/Time

r. Special promotions (Promotion ID, description, start date, end date)
s. Customer Scheduling ([Customer], [vehicle], [Calendar], [work] description)
t. Calendar (date, time, entity)

3. **Scenarios:**
    a. Book an appointment for customers on a given day (do not overfill appointment),
    b. Store sends a reminder email about upcoming appointments,
    c. During special promotions, price of some car parts are discounted
    d. Check inventory of car parts
    e. Order car parts from a supplier
    f. Return car parts to a supplier
    g. Bill a customer for a service
    h. Record a service given to a car
    i. Track assigned mechanics
    j. Track Job status

4. **Analytical Q:**
    a. What is the average age of a vehicle visiting the shop?
    b. What is the most frequent repair performed in Winter/Spring/Summer/Autumn?
    c. What are common vehicle parts that are out of inventory in Winter/Spring/Summer/Autumn?
    d. What was the average store's profit increase when there was a special promotion?
    e. Among the cars that made an appointment at the store, which car returned for the same appointment within a year? (I want to identify if there is any problem with car parts)
    f. Which vehicle makes and models are the most profitable for the repair shop in Winter/Spring/Summer/Autumn?
    g. What is the average number of service appointments per month for each vehicle make and model?
    h. Which family owns more than 3 vehicles?
    i. What was the most profitable month for repairs?

5. **Business logic:**

    a. Send reminder email after 6 months post visit,
    b. A customer may have one vehicle, or several. Vehicles may change ownership.
    c. Do not install customer supplied parts.
    d. Parts must have at least a 20% markup.
    e. Send updates to customer by preferred contact (phone, email, text)
    f. All inspections are minimum 1 hour, and this time is applied to any repair work that is found to be needed.

g. Supplies must be checked out from inventory before use. A small amount of supplies is added to each ticket to cover shop costs. The amount of the charge is based on the supplies used in the last 7 days.
h. Before work begins, an initial estimate and inspection needs to be done. This inspection and diagnostic is a 1 hour charge, but it is superseded by any repair work done. (Ex. Customer gets inspection only, 1 hour billed, customer gets brake job, inspection time is replaced by brake time, 1 hour billed.)
i. Sometimes an estimate may be inaccurate, and need to be revised. (Ex mechanic found additional issues, customer has option for premium part, etc) In this case, the revised estimate must be approved by the customer before work can continue if the amount would exceed $100 over the initial estimate.
j. Ticket order flow
    i. Intake customer: Customer books appointment/ walk-in. Customer gives feedback to shop (ex: I want an oil change, My brakes are making noise, etc) Shop collects customer information and vehicle information and adds it to database
    ii. Generate Estimate: Mechanic inspects vehicle and reads vehicle drop off info. Inspection report is generated by the mechanic and returned to the database (Ex: found missing radiator cap while inspecting vehicle). The parts in inventory are assessed and prices and availability for any that need to be ordered is determined (Ex: rad cap is rare, and will cost $30 and take 3-5 days to get from Germany.) Once all parts and services needed for the vehicle are determined, and the wait time to get them, the estimate can be presented to the customer.
    iii. Customer Deny/Accept: Get what work is authorized done, or bill for minimum inspection. / Order parts as needed and assign mechanics to work once parts are ready.
    iv. Provide Service: Mechanic works on job. If trouble, possible revision of estimate may be needed here. Otherwise, the mechanic will inform the shop when work is started, a break is taken, or the work is complete.
    v. Final billing: Mechanic relays any final notes on the job to the database, then the invoice for work can be generated. Typically mechanics work commission with a goal of beating the estimated work time provided for the job. Once the repair is finished and the invoice is generated, the customer is contacted to pick up their vehicle.