# Background

carDate© is a single outlet car rental company catering to ad hoc transport needs of the local residents.

It caters to the leisure spin market when the need is impetuous. Therefore there is no forward booking facilities. The shop opens from 09:00 to 21:00. A customer cannot hire a car outside open hours. Car returns are handled only during office hours, and customers are changed base on the actual time the car is accepted by the staff when the office opens.

The fare model mimics hotel operations. Hires are charged by the day from 14:00 to 12:00 next day. Car collection from 09:00 to 14:00, if available, will be charged extra 25% to 50% of daily rate. Cars returned late between 12:00 to and 21:00 will be charged extra 25% to 50% of daily rate.

The owner intends to open more outlets so that cars can be hired and returned at different outlets. When the fleet expands, the application system may be opened to Customers to access over the internet for self-registration and forward booking.

# Proposed solution

1. A simple Hire tracking system will be built. The system will be accessed only by Employees of the car rental company.
2. Each Employee signs in with an assigned user name and password.
3. Upon sign-in, an Employee can inquire own personal details as well as change own password.
4. An Employee with ADMIN Privilege will be initialized in the database and the access given to the system owner.
5. Only Employees assigned ADMIN Privilege can create, modify Employee records, reset passwords, grant and revoke Employee Privileges. An Employee can be assigned zero, one, or more Privileges.
6. Employee personal details can only be changed by users with ADMIN Privilege. A user with ADMIN Privilege can change personal details of all users except himself.
7. Each business function requires specific Privilege to access. Only Employees granted relevant Privileges can perform the business operations.
8. Access to record deletion is granted only to Employees with ADMIN or MANAGER Roles. Employee deletion is only allowed for ADMIN. The physical deletion however will always be subject to referential integrity constraints in the database.
9. Business Operations by Roles:
   1. ALL: for all users.
      1. Log-in
      2. View non-sensitive own Employee details.
      3. Change own password.
   2. ADMIN: for administrators
      1. Maintain system configuration parameters, such as:
         1. Car return grace period in number of minutes.
      2. Create, modify, suspend Employees. Suspended Employees are barred from log-in.
      3. Reset Employee passwords, Unsuspended Employees.
      4. Grant/Revoke Privileges to Employees.
   3. MANAGER :
      1. Create Car into FREE status.
      2. Maintain daily base rate for Cars, and other Car details.
      3. Upload of multiple pictures for each car. Pictures can be added, deleted, and reordered. Pictures can be shown to aid choosing.
      4. Maintain fare schedule.
      5. Monitor Cars utilization. Especially those not generating income for last <x> days, or utilization below <y>% for the last <z> days.
      6. Set Car status to RETIRED. Retired Cars cannot be hired.
      7. Suspend/Unsuspend Customers.
   4. USER: for front desk who serve customers
      1. Create, Modify Customers. Suspend Customers.
      2. When Customers are created by USER, they are created with status Suspended. Such Customer has to be Unsuspended by MANAGER before allowed to hire Vehicles.
      3. Search for available Cars base on Customer specifications (filters). Because there is no forward booking, candidate cars are always retrieved from current READY status cars.
      4. All Hire starts from now. Customer will provide an expected return date/time. Hire fee is computed for each candidate car.
      5. Conclusion and creation of a Hire. Car status is updated to HIRED upon conclusion of the rental.
      6. There has to be mechanism to prevent double booking of the same Car due to concurrent access.
      7. Return of car. The Car status will be updated, Hire record updated with actual return date time, and an invoice generated on screen.
      8. Each Hire record must register the date time and staff id who serves the customer, for the renting out as well as the returning, and any late returns.
10. For the manager, there is a screen operations statistics presented graphically.
    1. Average daily utilization (hours rented / 24) of the last <n> days, by Car and overall.
    2. Income generated in the last <n> days, by Car and overall.
    3. Percentage of early, on-time, late return of Cars in the last <n> days.
11. Use of Clock. In tracking the starting and ending date time of a Hire, the application should make use of the system clock, while allowing the user to override up a certain difference of not more than 30 minutes (can be changed in system configuration).
12. Testability and the use of system clock:
    1. To make test more efficient, the application should be able to run in test mode.
    2. Under test mode, the tester can adjust a date/time offset, (in positive or negative number of days and hours). This offset is applied to the clock before returning to the application. This allows the clock to be manipulated manually by the tester in a manner to fast track the time.
    3. This offset can only be used to adjust the time forward, not back.

# Fare Schedule

Hiring Fare computation:

1. Each car is assigned a base daily rate by MANAGER.
2. Cars are hired on a daily basis similar to hotels. There is a specific start time of 14:00 and end time of 12:00.
3. Same day early dispatch and late return will each attract quarter day to half day rate.
4. Week-end factor: there is a percentage mark-up for weekend rentals, weekend period refers to Friday 14:00 to Monday 12:00.
5. When a Car is returned early, there is no refund.
6. Penalty factor: For cars returned late, the period from original return date/time to actual return date/time will be subject to separated billing with a percentage based penalty markup.
7. The fee module should be developed such that it can be easily changed.

# Out of Scope

The following are out of scope:

1. The solution is to be deployed in company intra-net, and not meant for internet. It is to be used by company staff.
2. User authentication is performed using Spring Framework base on user name and passwords stored in Oracle database. There is no Oauth2 authentication.
3. All the Privileges, all business functions, are developed and their association set up upon software delivery. They are not user maintainable. Any changes will require application program maintenance.
4. All the Car Statuses, all the manner it changes for Cars, are embedded in the software upon delivery. They are not user maintainable. Any changes will require application program maintenance.
5. Customers have no direct access to the application. They are served by the company staff. Customer cannot make booking on their own.
6. This is not a Human Resources system. It does not handle staff attendance, performance appraisal, nor payroll.
7. This is not an accounts receivable system. It does not handle invoicing nor payments.

# Technology

The system should be developed on these technology:

1. Use Oracle database to start all busines data.
2. The application is to be built using Spring Framework.
3. The users access the application with regular internet browsers.
4. CSS and Bootstrap can be used for web page styling.
5. Thymeleaf can be used for presentation of business data on web pages.
6. Javascript and JQuery can be used to enrich user interaction.

# Future Enhancement

While building the solution, developer should keep these future enhancements in view, to avoid designs that may hinder the introduction of the following enhancements.

1. Hiring extension: a customer can call in to extend the current Hire before expiry. Early extensions are charged at normal rate.
2. Late extension: a customer can call in to extend the current Hire after expiry. In that case, the period from original expiry to current time will be charged at LATE penalty rate. The period from current time to new expiry will be charged normal rate.
3. Change to more responsive and faire fee schedules.
4. Allow ADMIN to maintain association of Business Operations to Roles, so that tasks can be assigned to different Roles instead of as defined in original user requirements.
5. Creation of new branches, cars can be rented and returned at different branches.
6. Creation of new Role MECHANIC, who looks after the fleet. Tracking of cars sent for service and repair.
7. Customer self-service for registration and forward booking.