1. To build an application system:
   1. based on Oracle to store all business data,
   2. using Spring Framework,
   3. accessible with internet browsers,
   4. utilizing Javascript, JQuery, Thymeleaf, and Bootstrap for client side presentation, styling, and interaction,
2. The system will be accessed only by Employees of the car rental company.
3. Each Employee signs in with an assigned UserName and password. Each Employee can inquire own personal details as well as change own password.
4. An Employee with ADMIN Role will be initialized in the database and the access given to the system owner. Only Employees assigned ADMIN Role can create, modify Employee records, reset passwords, grant and revoke Employee Roles. An Employee can be assigned zero, one, or more Roles.
5. Each business operation requires specific Roles. Only Employees granted those Roles can perform the business operation.
6. Creation and deletion of Roles, as well as association of Roles to specific business operations is an application program maintenance task. Association of Roles to specific Employees is however a business operation that requires ADMIN Role.
7. 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.
8. 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 Roles to Employees.
   3. MANAGER :
      1. Create Car into READY 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 fee 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.
         1. When Car hire starts before 14:00, there is an early start fee of 25% of daily rate.
         2. If expected Car return is after 12:00, there is a late return fee of 25% of daily rate.
      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/Customer due to concurrent access.
      7. Return of car. A car can be returned:
         1. On-time:
         2. Ahead of time: There will be no refund.
         3. Late: When a Car is returned after expected date/time, the extra period is charged separately as if it is a new hire from original return date/time.

In all cases, the Hire records will be created/updated and an invoice generated on web page. As a result, one Invoice may be associated with one or more Hire records.

* + 1. 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.

1. From the Hire records, a fleet utilization efficiency statistics will be generated and presented graphically.
2. Creation and deletion of car Statuses, as well as association of car Status to business operations is an application program maintenance task. Association of car Statuses to specific Car is however a business operation that requires relevant Roles.
3. Testability and the use of system clock:
   1. The application should refer to the clock whenever necessary, and especially for starting and ending time for each hiring.
   2. To make test more efficient, the application should be able to run in test mode, where a user maintained offset (in positive or negative number of days and hours) 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. Due to the nature of the business, the user should be allowed to adjust the start time and return time up to <zz> minutes ahead or behind the clock.
4. Keep these future enhancements in view.
   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.
   7. Customer self service, registration and car forward booking.

Fee Schedule:

Hiring Fee computation:

1. Each car is assigned a base daily rate by MANAGER.
2. Phase 1: 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. Same day early dispatch and late return will each attract quarter day fee.
3. Week-end factor: there is a percentage mark-up for weekend rentals, weekend period refers to Friday 14:00 to Monday 12:00.
4. 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.
5. The fee module should be developed such that it can be easily changed.