A PROJECT REPORT ON

Seat Making Barcode Scanning System

At

Webicsoft India Pvt. Ltd

Submitted in partial fulfilment for Degree of

MASTER OF COMPUTER APPLICATION

By

Miss. Sneha Pramod Rawool

Under the guidance of

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(Department of MCA)

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Submitted to

FINOLEX ACADEMY OF MANAGEMENT AND TECHNOLOGY, RATNAGIRI

FINOLEX ACADEMY OF MANAGEMENT AND TECHNOLOGY, RATNAGIRI

This is to certify that the project report titled:

Seat Making Barcode Scanning System

Submitted By:

Miss. Sneha P. Rawool

In partial fulfillment of the award for degree of

MASTER OF COMPUTER APPLICATION

From Mumbai University

And is the bonafide record of the work done by me during the Semester IV of A.Y. 2024-2025

Internal Guide	HOD	Principal
(Prof. Ravindra V. Kerkar)	(Prof. Tejas V. Joshi)	(Dr. Kaushal K. Prasad)

CERTIFICATE OF APPROVAL

This is to certify that the project titled

Seat Making Barcode Scanning System

Is the bonafide record of project work done by

Miss. Sneha P. Rawool (_____)

This project is approved for the degree of

MASTER OF COMPUTER APPLICATION

Mumbai University

_____

(Examiner)

ACKNOWLEDGEMENT

I would like to express my gratitude and sincere regards to the following people to whom I am grateful for their support and help without which I would not have been able to do this project entitled **"Seat Making Barcode Scanning System".**

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Last but not least, I am thankful to all the Teaching and Non-Teaching staff and Lab Assistant **Mr. Sukumar Birje Sir** of the college, whose names have not been mentioned here but have directly or indirectly, helped me in the completion of this project.

Sincerely,
Miss. Sneha P. Rawool

CERTIFICATE OF INTERNSHIP

WEBICSOFT INDIA PVT LTD

CER/WC/23062/23062025

CERTIFICATE OF INTERNSHIP

This is presented to

SNEHA RAWOOL

Miss. Sneha Pramod Rawool

We state on record that Sneha Rawool has successfully completed an internship project in the role of .Net Developer Trainee at Webicsoft India Pvt. Ltd. from 13th January 2025 to 13th May 2025 (4 month).

We wish her all the best for his future career.

Webicsoft India Pvt. Ltd.

Ceo & Founder

Sarita Avate

INDEX

Topic No.	Topic Name	Page No.
1.	Abstract	1
2.	Introduction	2
3.	System Planning and Analysis	7
4.	Software Requirement and Specification	15
5.	Estimation and Planning	16
6.	System Design (UML Diagrams)	18
7.	Data Dictionary	26
8.	User Persona, Wireframe or Prototypes	33
9.	Screens	38
10.	Testing Details (Test cases and other reports)	54
11.	Limitation and Enhancements	59
12.	Bibliography	60

1. Abstract

This project is based on ASP.Net MVC technology and backend SQL Server management studio 2022 also used in this project we are use in entity framework and MVC technology for the report use as well as we are used Html, CSS, Bootstrap and JavaScript in this project we make the seats vehicle seats of TATA motors automotive seating system that models like Tata Nexon, Tata Punch, Safari, Altroz, etc. model making seats and scanning bye hand held scanner.

The core functionality of the project includes the creation of vehicle seats, with a particular emphasis on ensuring the precision and quality of seat manufacturing. Handheld scanners are used for real-time scanning of seats during the manufacturing process, allowing operators to validate seat creation steps, track progress, and ensure compliance with production requirements. These scanners interface directly with the system, ensuring that each seat is properly documented and monitored throughout the assembly line.

The main goal of the project is to create high-quality vehicle seats and track their production step by step. By using these technologies, the system helps Tata Motors improve the efficiency and accuracy of their seat manufacturing process, ensuring high-quality seats for their vehicles.

2. Introduction

2.1 : Company Profile

About Webicsoft India Pvt. Ltd.

Webicsoft India Pvt Ltd was founded in 2022 to offer top-notch IT solutions. Webicsoft India Pvt Ltd is a pioneer in IT-based business communication management systems. We focus on developing creative and effective web and software applications that add value and deliver demonstrable savings for our clients. Webicsoft India Pvt Ltd has experienced impressive growth in a short amount of time and has become an expert in offering a broad range of client's end-to-end business IT solutions, including technical consulting, design, development, software re-engineering, maintenance, systems integration, package evaluation, testing, and implementation.

Specialties:

Software Development, Mobile Application Development, Supply Chain Management System, Online Market Place, Treding Technology, IT Support, Warehouse Management System, Website Development, and CRM Development.

2.2 : Introduction of the Project

"Seat Making Barcode Scanning System" represents a cutting-edge solution set to revolutionize the seat manufacturing process for Tata Motors. This innovative system, developed through the collaboration of technology experts and automotive industry professionals, is designed to modernize the way vehicle seats are tracked, validated, and managed throughout the production process. With a focus on precision and efficiency, the system streamlines operations for both production teams

and quality control departments, ensuring accurate and timely seat assembly Through its intuitive interface and powerful features, the Seat Making Barcode Scanning System stands as a key tool in enhancing productivity, reducing errors, and supporting the growth and success of Tata Motors' automotive seating operations.

Key Features:

1. **Step-wise Process Tracking:**
   - Tracks progress through each step of the seat-making process.
   - On scanning a barcode, the system shows detailed info about that step.

2. **Real-time Barcode Scanning Integration:**
   - Barcode scanner reads barcodes and fetches data from the database.
   - On successful scan, step info like Step Name, Status, Remark is displayed.

3. **Database Integration:**
   - Stores all manufacturing steps in CarMakingSteps table.
   - Barcode scan results and updates saved in Barcode Data table.
   - Uses ADO.NET (Database First) for data access.

4. **Status Updates and Data Saving:**
   - After viewing all step details, a “Save” button stores all updates.
   - Records final status (e.g., Completed, Pending, Error) and remarks.

5. Role-based Access:

- Supervisor, Manager, and Worker roles may have different access:
- Workers can only scan and update steps.
- Managers can view reports and check progress.

6. Security and Validation:

- Ensures only valid barcodes can be scanned.
- Prevents skipping or re-scanning already completed steps.

7. Scalability:

- Can be extended to other car components (e.g., dashboard, door panel).
- Barcode design and scanning logic is reusable across modules.

2.3: Purpose of the project

- **Support Quality Control:** Every car seat produced will be tracked, inspected, and logged to ensure that it meets quality standards. This ensures that defective units can be flagged early in the process and removed from the production line before they reach the shipping stage.

- **Enable Real-Time Tracking:** The system provides visibility into the entire production process from raw materials to finished products, enabling factory managers to monitor production flow and identify any bottlenecks or inefficiencies in real-time.

- **Streamline Packaging and Shipping:** The system will ensure that all car seats are packaged and shipped correctly by automatically generating shipping labels based on real-time data

2.4 : Scope of the project:

1. **Raw Barcode Scanning:**
   - The system will facilitate the scanning of barcodes upon steps to update the database.
   - The database will be continuously updated with real-time data on material usage and remaining task.

2. **Component Tracking and Production Workflow:**
   - Every individual car seat component will be tracked through various stages of production via barcode scans.
   - As components move through the production line, their progress will be logged in the system, providing real-time visibility into production flow.
   - Each stage of the manufacturing process (assembly, stitching, testing, etc.) will be tracked using a unique barcode for each car seat.

3. **Quality Control (QC):**
   - The system will include a quality control module that records the results of inspections for each car seat.
   - Barcode scanning will be used to associate inspection results (pass/fail) with the corresponding seat.
   - Defective units will be flagged and tracked to ensure they do not progress to the shipping stage.

4. **Packaging and Shipping:**
   - After production, the system will generate shipping labels based on scanned barcodes, ensuring that all packaging is correctly labeled and matched with the correct car seat.

- Shipment tracking will be done using barcode scans during the shipping process, ensuring accurate and timely deliveries.

5. **User Access and Role-Based Permissions:**
   - The system will support role-based access control (RBAC), ensuring that only authorized users can access specific features of the system.
   - Different roles such as Admin, Manager, Supervisor, Worker and Customer will have access to different functionalities based on their responsibilities.

6. **Real-Time Monitoring and Reporting:**
   - The system will provide a dashboard for monitoring production and inventory status in real time.
   - Reports on production output, material usage, and shipping details will be available for managers and administrators to review.

7. **Support for Various Barcode Types:**
   - The system will support both 1D (linear) and 2D (QR code) barcodes to ensure compatibility with a variety of barcode labels.
   - Barcodes will be printed on materials, components, finished products, and shipping labels.

The scope of the **Seat Making Barcode Scanning System** involves developing and implementing a software solution that integrates barcode scanning throughout various stages of car seat production. The system will be designed to handle raw material entry, inventory management, production tracking, quality control, packaging, and shipping, all while leveraging barcode technology for tracking and traceability.

3. System Planning and Analysis

System planning is a critical phase in any project as it helps define the overall structure, timeline, and resource allocation required for the project. In the case of the Car Seat Manufacturing System with Barcode Scanning, the planning phase focuses on identifying all necessary elements and setting the foundation for the project's execution.

3.1 Key Steps in the System Planning Phase:

1. **Project Initiation and Goal Definition**:
   - **Objective**: Clearly define the goals and purpose of the system. In this case, the goal is to improve manufacturing efficiency by using barcode technology to track and manage inventory, production, quality control, and shipping processes.
   - **Scope Determination**: Establish the boundaries of the system. For this project, the scope includes inventory management, production workflow, quality control, packaging, and shipping.
   - **Key Stakeholders**: Identify the stakeholders involved in the system's development, such as factory managers, IT staff, inventory managers, production line workers, quality control inspectors, and shipping personnel.

2. **Requirements Gathering and Analysis:**
   - **User Roles and Permissions:** Define different user roles and access levels. For instance, Admins have full control, Inventory Managers can manage stock, and Line Workers can update production status.
   - **Hardware and Software Specifications**: Identify the hardware (barcode scanners, label printers, tablets) and software platforms (web-based system, database) that the system will use.

3. Resource Planning:

- **Team Allocation:** Identify the required resources, such as developers, testers, project managers, and business analysts. This also includes allocating responsibilities among the team members.
- **Time and Budget Estimates:** Estimate the time and budget needed for each phase of the project (development, testing, deployment).
- **Risk Management:** Identify potential risks (e.g., delays in hardware delivery, integration challenges with existing systems) and establish mitigation plans.

4. System Architecture Planning:

- **Scalability:** Ensure that the system architecture is designed to handle future growth, including a higher number of users or larger volumes of data.
- **Security:** Plan for the system's security features, including role-based access control (RBAC), data encryption for sensitive information, and secure API integration with existing ERP systems.
- **Integration with Existing Systems:** Plan the integration with the existing ERP or other software systems used by the company. This includes APIs or data exchange mechanisms to synchronize data between the new system and current software.

3.2 System Analysis:

The System Analysis phase focuses on evaluating the requirements and translating them into a technical blueprint for the development team to implement. The analysis phase helps ensure that all functional, non-functional, and technical needs of the project are understood before moving forward with development.

3.2.1. Functional Analysis:

- **Barcode Scanning Module:**
  - Analysis: The system needs to be able to scan both 1D and 2D barcodes. It must support multiple barcode formats, including QR codes and traditional barcodes.
  - Use Case Example: A worker scans a component's barcode at the assembly station to update the production status.
- **Production Workflow Module:**
  - Analysis: As each stage of the car seat assembly is completed, workers will scan the seat’s barcode at each station. This will track the seat's progress through the production line.
  - Use Case Example: A worker scans a seat’s barcode at the stitching station, marking the seat as "stitching complete" in the system.
- **Quality Control (QC) Module:**
  - Analysis: Each seat must undergo quality control at the end of the production line. Inspectors will scan the seat's barcode and log the inspection results (Pass/Fail).
  - Use Case Example: An inspector scans a car seat's barcode and marks it as "Pass" or "Fail."

3.2.2. Non-Functional Requirements Analysis:

- **Performance:**
  - The system should be capable of handling at least 100 concurrent users. Response time for barcode scanning should be less than 1 second.
  - Load testing should be conducted to ensure the system performs well under peak loads.
- **Scalability:**
  - The system architecture should allow for scaling as the number of users or the volume of data increases. It should be capable of handling an increase in production or additional warehouse locations.
- **Security:**
  - Role-based access control (RBAC) will be implemented to ensure that only authorized users can access sensitive data and perform specific actions. For example, only admins can view financial data, while line workers can update production status.

3.3 Requirement Gathering:

3.3.1 Questionaries for understanding Project: -

Client Interview Questionnaire: Seat Making Barcode Scanning System

To gain contextual understanding and real-time insights into the current seat manufacturing workflow, semi-structured interviews were conducted with shop floor operators, production supervisors, and quality control managers within the automotive manufacturing unit.

Initial discussions revealed that the existing process relied heavily on manual logs and verbal communication between stations, which often led to delays, missed steps, and difficulty in tracing accountability during quality failures.

- **Section 1: General Understanding**
  1. Can you briefly describe what your company does in the automotive sector?
  2. Who are the main users of this system? (e.g., workers, supervisors, managers)
  3. Can you walk us through the seat-making process from start to finish?
  4. What should the system do if a step fails or is skipped?
  5. What are the core technologies used for Frontend, Backend?
  6. What major frameworks/libraries are being used in the project?
- **Section 2: Barcode Scanning**
  7. What kind of barcode will be used—1D, QR code, or 2D?
  8. Is a car model selection mandatory before generating a barcode?
  9. Should a new barcode be generated for each step of a model, or one barcode per seat that tracks all steps?
  10. Will each component or step have a separate barcode?

11. How should the system respond if an invalid barcode is scanned?

- **Section 3: Quality Control and Reporting**

12. Who is responsible for marking a step as passed or failed?
13. Would you like dashboards to show the saved steps used for making Seats?
14. Should the reports support filtering by date, model, shift, etc.?

- **Section 4: User Roles and Permissions**

15. How will password management (e.g., forgot password /reset) be handled?
16. What should each role be allowed to do in the system?
17. Should managers have access to modify or override data?

- **Section 5: Interface and Accessibility**

18. Should the system work on both desktop and mobile devices?
19. Do you want notifications or alerts?

3.3.2 Advantages Of proposed system:

- **Increased Process Efficiency:**
  - Automates step tracking through barcode scanning.
  - Eliminates manual recording, reducing time and errors.
- **Real-time Monitoring:**
  - Tracks each manufacturing step in real-time.
  - Allows supervisors to see which steps are completed, in-progress, or pending.
- **Easy Data Management:**
  - All scan data is stored in the SQL Server database.
  - Easily accessible for reports, audits, and analytics.
- **Cost Savings**
  - Reduces paperwork and manual labor.
  - Streamlines workflow, saving time and operational costs.

3.3.3 Feasibility Study

A feasibility study is conducted to determine the practicality of a proposed project. It evaluates technical, economic, operational aspects to ensure the project is worth pursuing.

1. Technical Feasibility

The Seat Making Barcode Scanning System is technically feasible as it uses well-established technologies:

- **Frontend:** ASP.NET MVC, Angular, HTML5, CSS3, Bootstrap
- **Backend:** SQL Server 2016, Entity Framework, ADO.NET
- **Barcode Hardware:** Handheld barcode scanners compatible with 1D/2D codes
- **Tools:** Visual Studio 2022, SSMS

All required technologies are available, mature, and supported, with team members trained in using them.

2. Economic Feasibility

Automation reduces labor costs and errors. Hardware investment is minimal. ROI is high. The system demonstrates **economic feasibility**:

- **Cost-saving through automation** of manual tracking, reducing labor hours and paper use.
- **Improved quality control** reduces rework costs.
- **Short payback period** due to operational efficiency.
- **Infrastructure reuse:** Barcode scanners and standard PCs/tablets minimize additional hardware investment.

3. Operational Feasibility

The system improves seat tracking, inspection, and shipping, aligning well with Tata Motors' workflow. The system is operationally feasible because:

- Workers and supervisors are already familiar with barcode-based systems.
- Real-time tracking reduces operational delays.
- Training sessions will be conducted to overcome the initial learning curve.

4. Legal Feasibility

No legal obstacles. Complies with standard software development and data handling practices.

- No legal barriers exist for implementing this system.
- Complies with IT policies and data handling standards.

4. Software Requirement and Specification

4.1 Software Requirement

Operating system	Windows 10 and above
Programming language	.Net MVC, Angular18
Web-technology	.Net MVC
Front End	HTML, CSS, JavaScript, Bootstrap
Back End	SQL management studio 2016, MVC
Web server	SQL Server
Frameworks	Entity Framework, ADO.NET
Integrated development	Visual Studio Enterprise 2022

4.2 Hardware Requirement

Processor	Intel(R) Pentium(R) Silver N6000 @ 1.10GHz 1.11 GHz
Ram	8GB
Hard Disk	256gb SSD
Input Device	Keyboard, mouse, hand held scanner (for the use of scanning the barcode)
System Type	64-bit operating system, x64-based processor

5. Estimation and Planning

Estimation and Planning are essential phases in software development. This section outlines how to estimate the resources, time, and planning needed to implement the **Seat making Barcode Scanning System.** It involves breaking down the tasks, estimating the duration, identifying potential risks, and planning the project timeline.

Here is a breakdown of the Estimation and Planning for the CSMS project:

1. **Project Scope Breakdown :-**

   The first step in estimation is breaking down the project into smaller, manageable parts. The major components of the CSMS include:

   - System Design & Architecture (Project planning)
   - Requirement Gathering
   - Database Design Module
   - Design and User Interface Development
   - Coding
   - Testing & Deployment

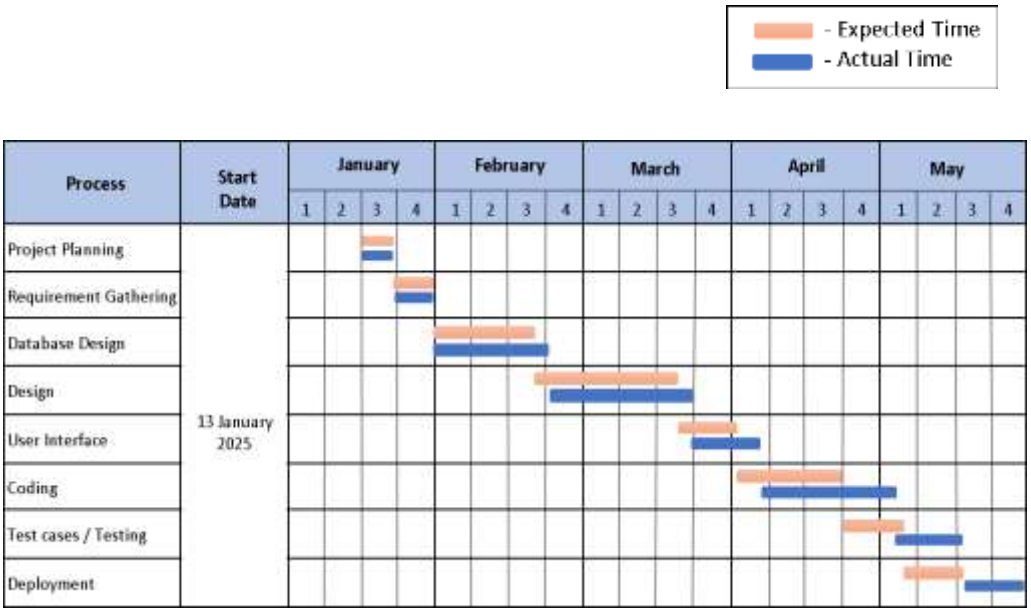
2. **Total Estimated Duration :-**

   Summing up the estimated durations for each module:

   - System Design & Architecture (Project planning): 1 weeks
   - Requirement Gathering: 1 weeks
   - Database Design Module: 3 weeks
   - Design and User Interface Development: 4 weeks
   - Coding: 4 weeks
   - Testing & Deployment: 3 weeks

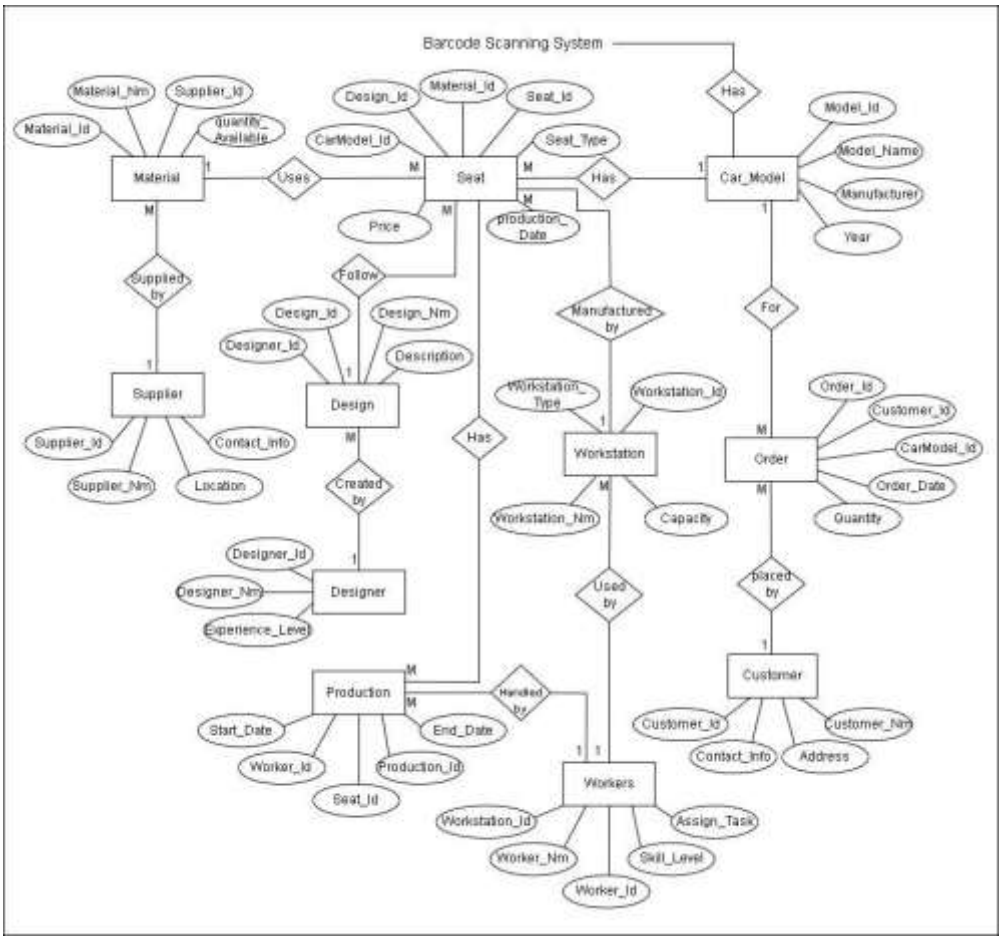
   Total Duration: 16 weeks (approximately 4 months)

Gantt Chart:


- Expected Time
- Actual Time
Process
Start Date
January
February
March
April
May
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
Project Planning
Requirement Gathering
Database Design
Design
User Interface
Coding
Test cases / Testing
Deployment
13 January 2025

6. System Design (UML Diagrams)

6.1 ER Diagram:



6.2 Use Case Diagram:

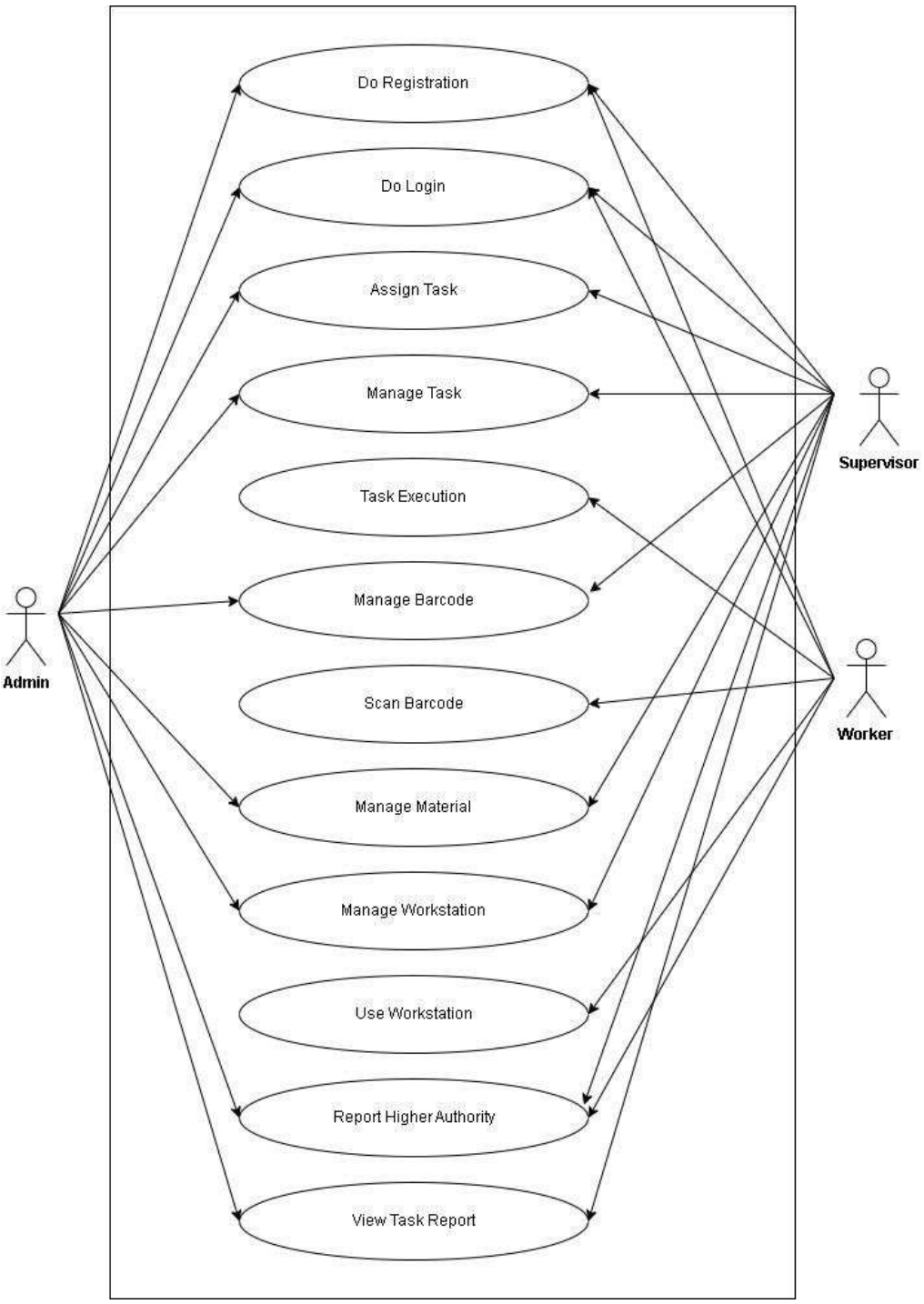


Fig. Use Case for Seat Making Barcode Scanning System

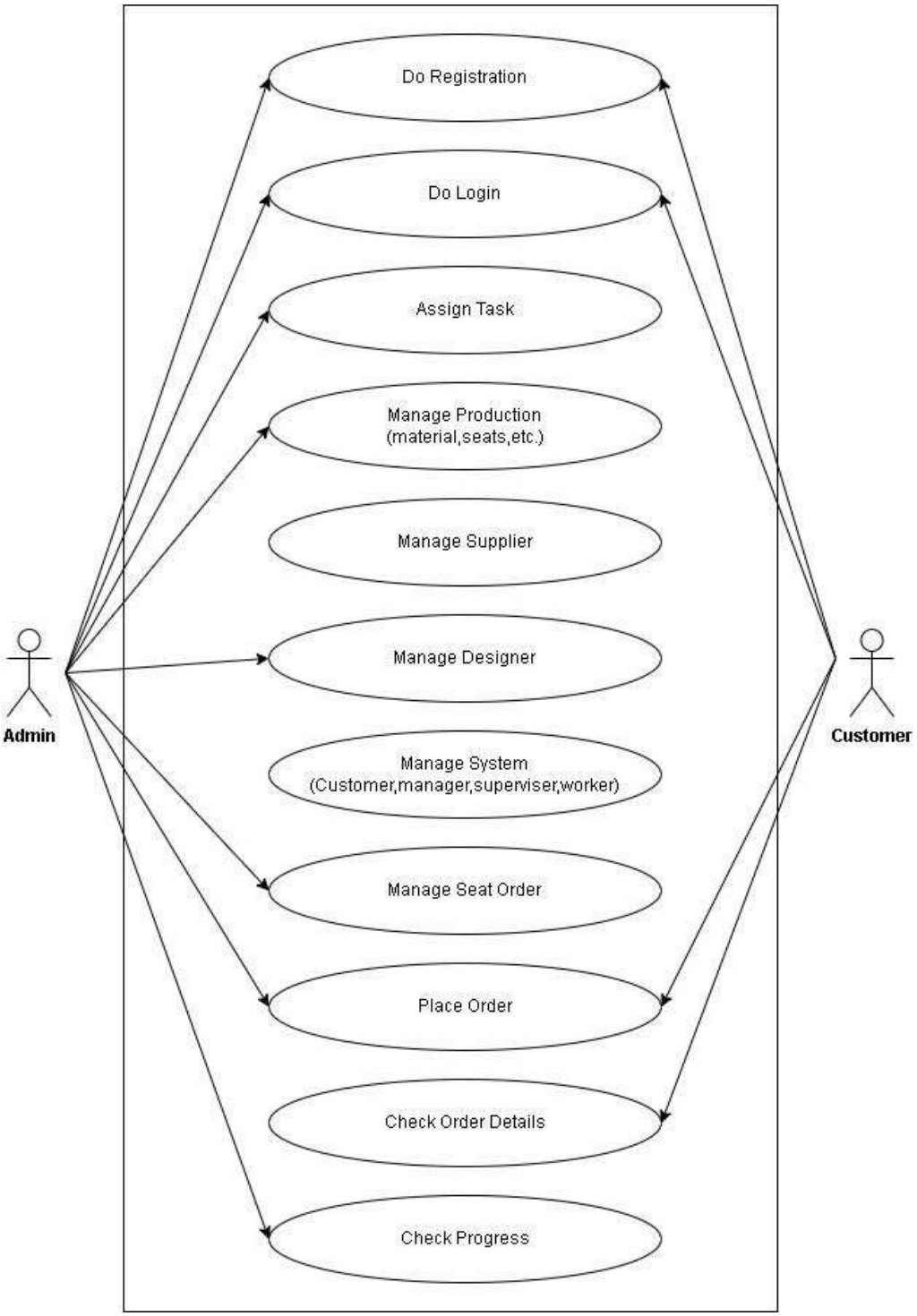
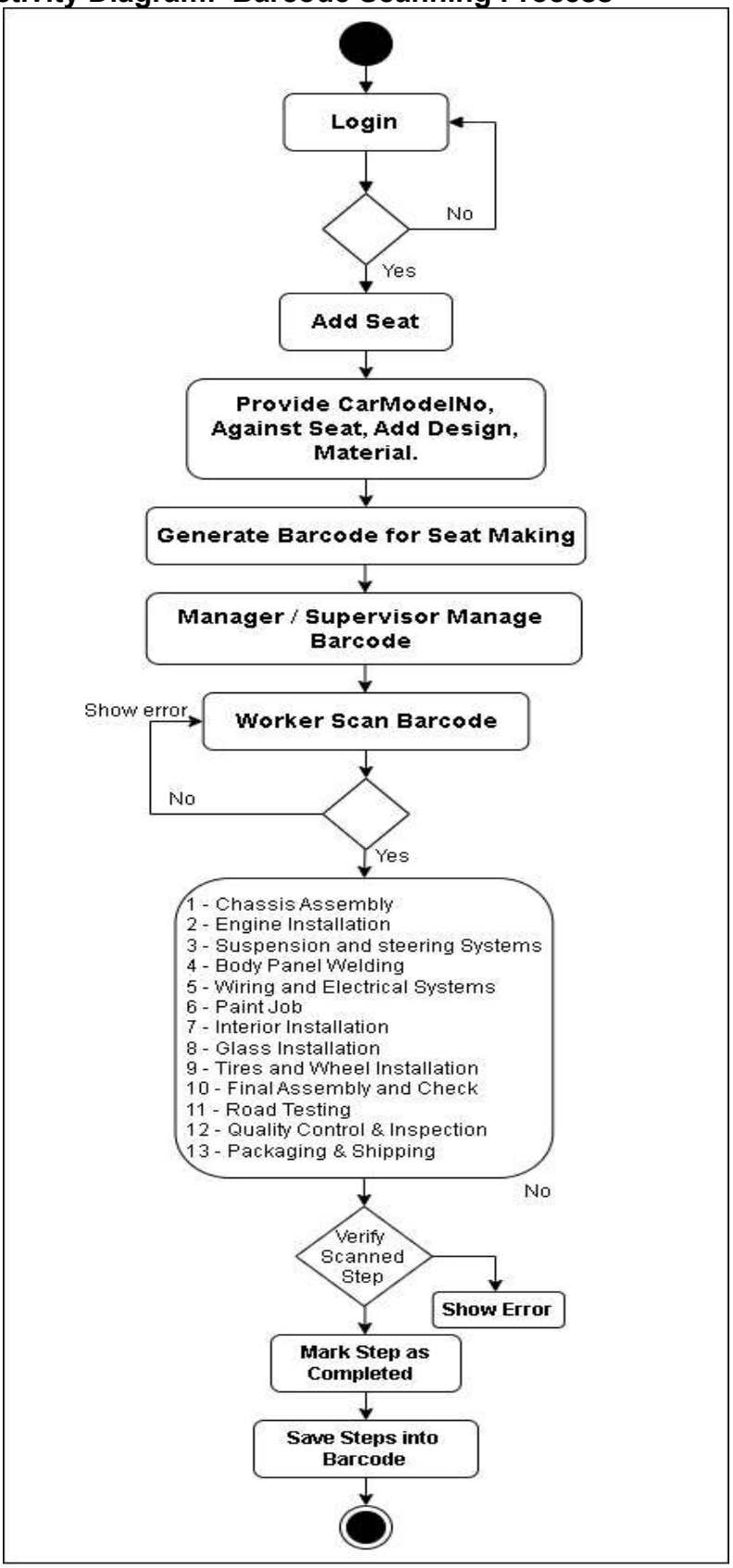
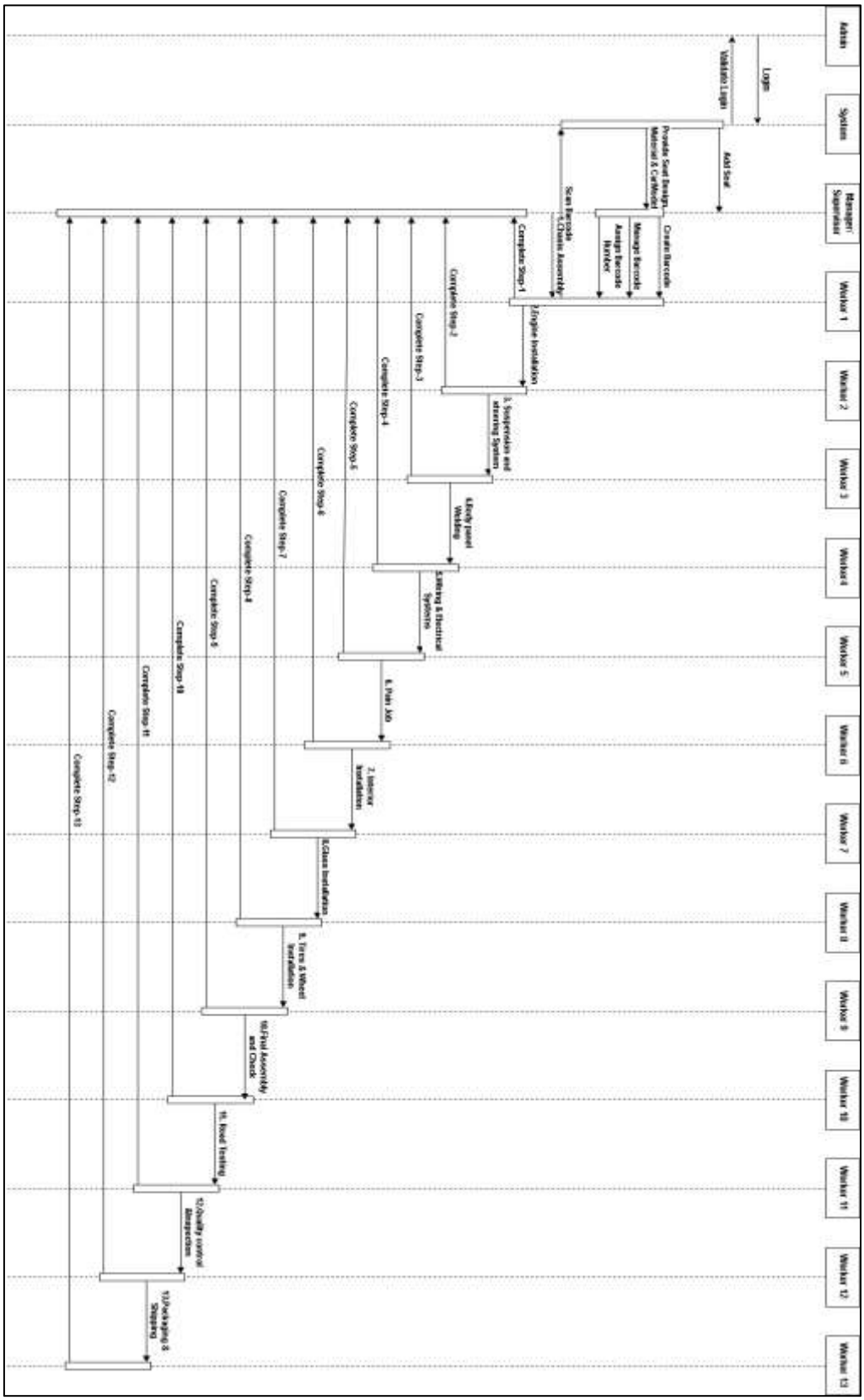


Fig. Use Case for Seat Making Barcode Scanning System

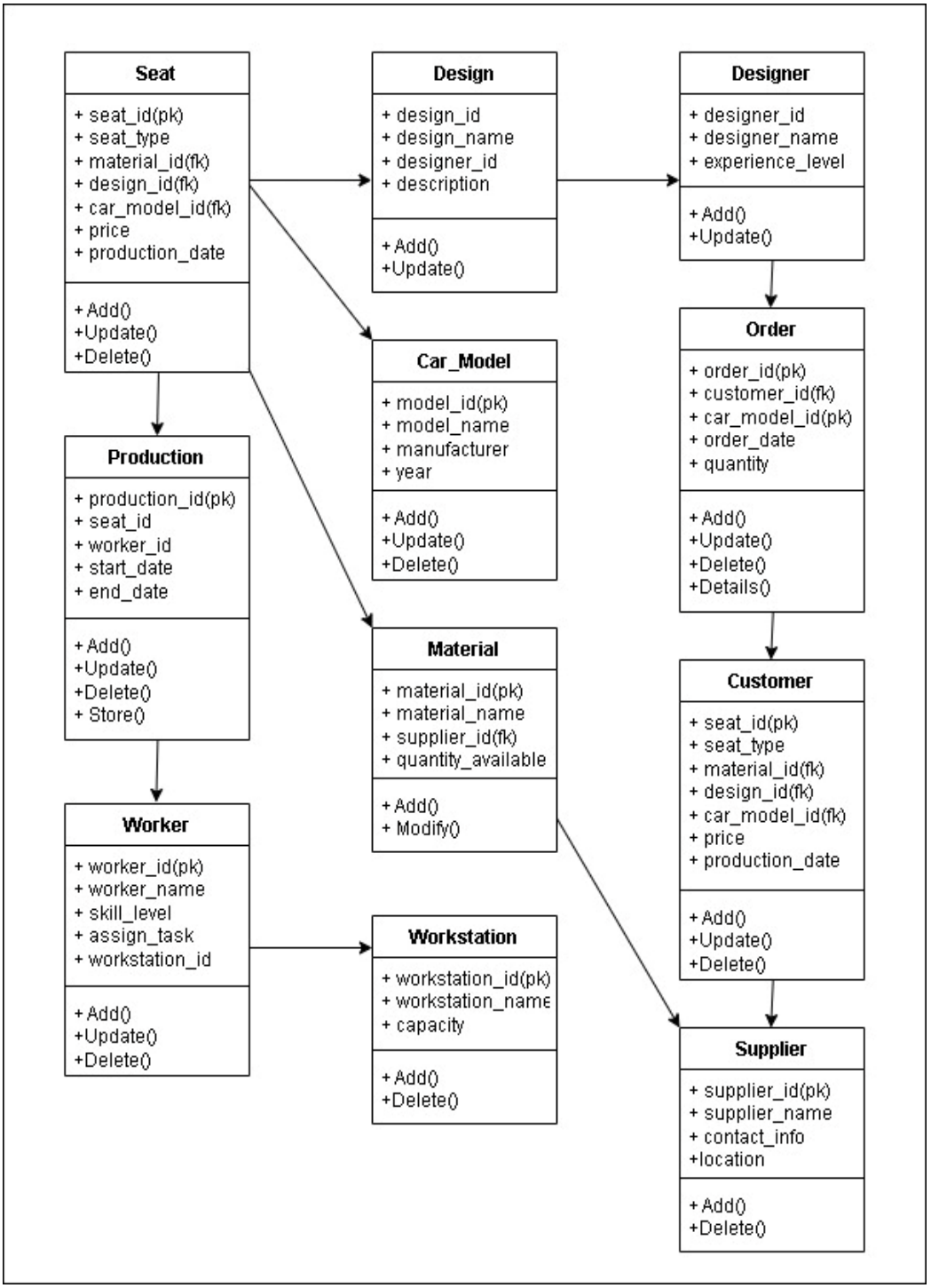
6.3 Activity Diagram: Barcode Scanning Process



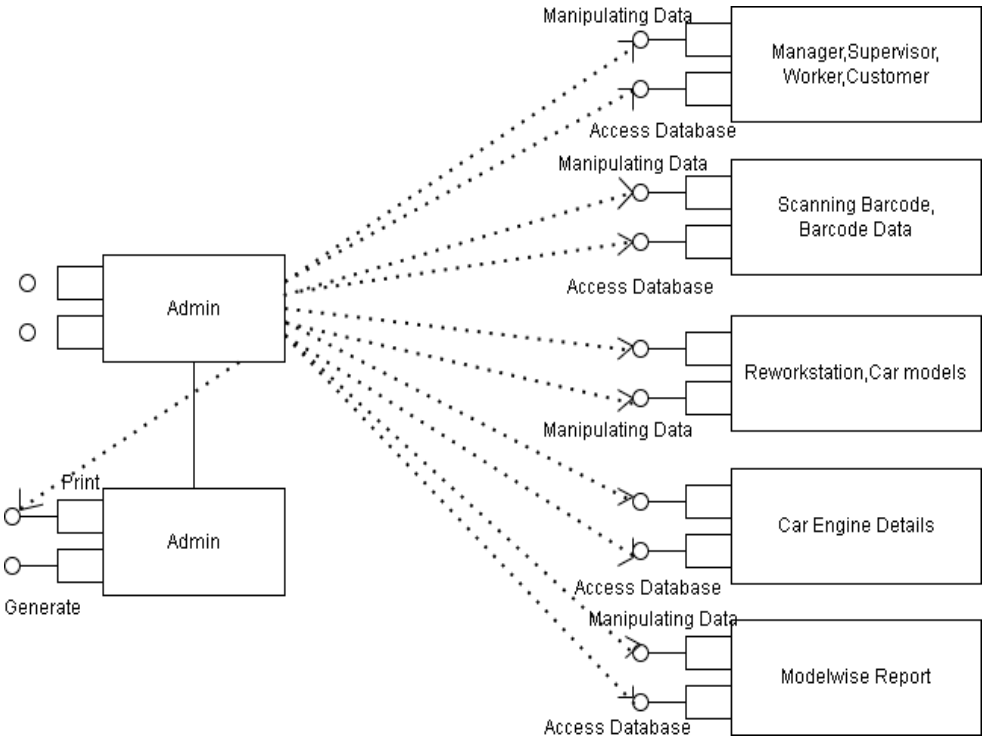
6.4 Sequence Diagram: Barcode Scanning Process



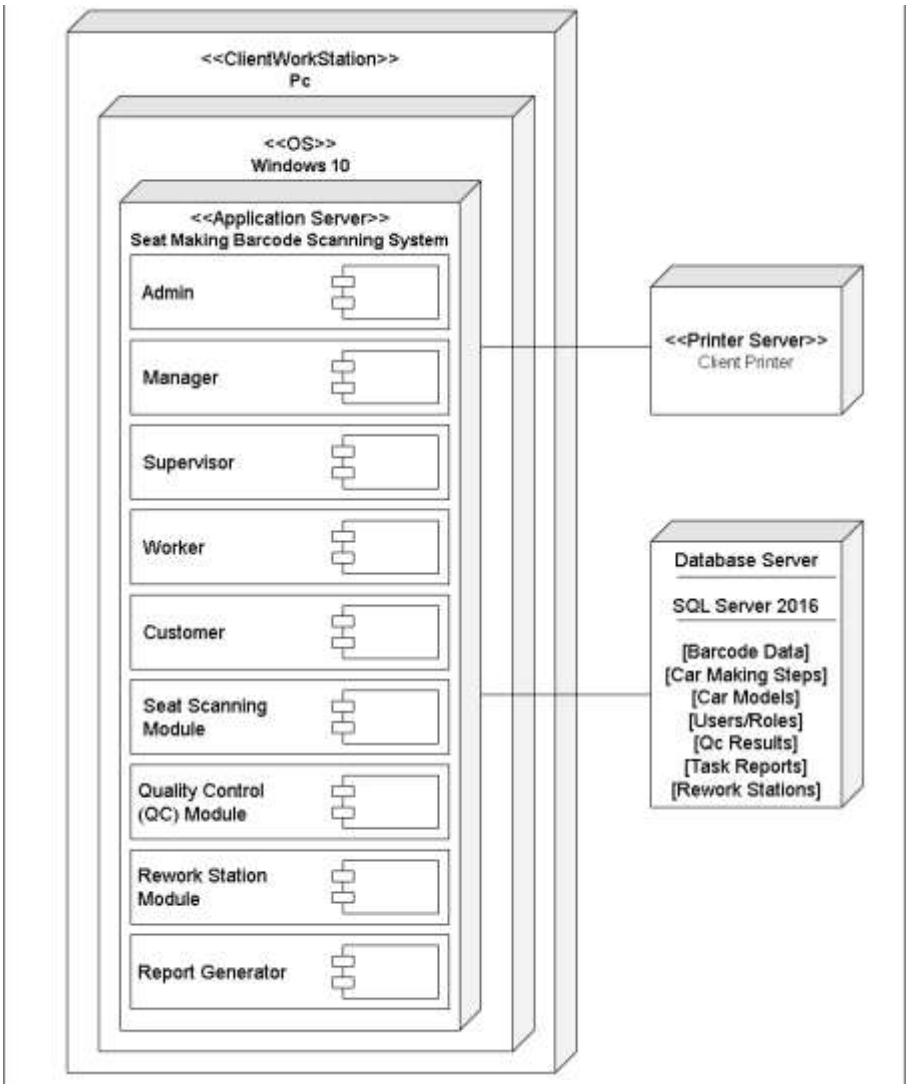
6.5 Class Diagram:



6.5 Component Diagram:



6.7 Deployment Diagram:



3 Data Dictionary

- **User Registration:**

Column Name	Type	Constraint	Description
EmployeeID	int	Primary Key	
FirstName	nvarchar (50)	NOT NULL	
LastName	nvarchar(50)	NOT NULL	
Email	nvarchar(100)	NOT NULL	
AlternativeEmail	nvarchar(100)	DEFAULT NULL	
PhoneNumber	char (10)	NOT NULL	
AadharNumber	char (12)	NOT NULL	
PanNumber	char (10)	NOT NULL	
UserRole	nvarchar(20)	NOT NULL	This role select accordingly your post like manager, worker, supervisor etc.
Status	bit	DEFAULT (0) NULL	
Password	nvarchar(255)	NOT NULL	
RegDatetime	datetime	DEFAULT (getdate)NULL	DateTime generated when the user registered

- **User Login**

Column Name	Type	Constraint	Description
LoginID	int	Primary Key	
Email	nvarchar(100)	NOT NULL	
Password	nvarchar(255)	NOT NULL	
LoginDatetime	datetime	DEFAULT (getdate()) NULL	Login Datetime generated
Status	bit	DEFAULT (0) NULL	
UserRole	nvarchar(20)	DEFAULT NULL	As per registered role can be used during login

- **Car Making Process:**

Column Name	Type	Constraint	Description
ProcessID	int	Primary Key	ProcessID use as a primary Key
CarModelID	int	NOT NULL	This is a foreign key of Car Models table

StepNumber	int	NOT NULL	How many steps will be created in one list
StepName	Varchar (100)	DEFAULT NULL	
StepDescription	text	DEFAULT NULL	
EquipmentUsed	Varchar (255)	DEFAULT NULL	Which equipment used during seat making
Duration	int	DEFAULT NULL	
ResourcesRequired	text	DEFAULT NULL	
WorkerCount	float	DEFAULT NULL	
QualityCheck	bit	DEFAULT NULL	
IsCritical	bit	DEFAULT (0) NULL	Condition of seat
DateAdded	datetime	DEFAULT (getdate) NULL	

- **Car Models**

Column Name	Type	Constraint	Description
CarModelID	int	Primary Key	CarModelID use as a primary Key
ModelName	Varchar (100)	NOT NULL	
Manufacturer	Varchar (100)	NOT NULL	
YearOfManufacture	int	DEFAULT NULL	
EngineType	Varchar (50)	DEFAULT NULL	As per Car Model Engine type selected like petrol, diesel
EngineCapacity	decimal (5,2)	DEFAULT NULL	
TransmissionType	Varchar (50)	DEFAULT NULL	
FuelType	Varchar (50)	DEFAULT NULL	
NumberOfDoors	int	DEFAULT NULL	
SeatingCapacity	int	DEFAULT NULL	
ColorOptions	Varchar (255)	DEFAULT NULL	
Price	Decimal (10,2)	DEFAULT NULL	
SafetyRating	Decimal (3,2)	DEFAULT NULL	Checking heat capacity and safety
IsAvailable	bit	DEFAULT (1) NULL	Availability of CarModel
DateAdded	datetime	DEFAULT (getdate)NULL	DateTime when the Carmodel generated

- **Car Type:**

Column Name	Type	Constraint	Description
CarTypeID	int	Primary Key	CarTypeID use as a primary Key
CarTypeName	varchar (100)	NOT NULL	
CarTypeDescription	text	DEFAULT NULL	
BodyStyle	varchar (50)	DEFAULT NULL	
DriveType	varchar (50)	DEFAULT NULL	
EngineType	varchar (50)	DEFAULT NULL	
SeatingCapacity	int	DEFAULT NULL	
FuelEconomy	decimal (5,2)	DEFAULT NULL	
IsElectric	bit	DEFAULT (0) NULL	Check Car electric or not
IsAvailable	bit	DEFAULT (1) NULL	Availability of cartype
DateAdded	datetime	DEFAULT (getdate)NULL	DateTime when the CarTpye decide

- **Car Seat Making:**

Column Name	Type	Constraint	Description
SeatID	int	Primary Key	SeatID use as a primary Key
CarModelID	int	NOT NULL	This is a foreign key of Car Models table
SeatType	varchar (100)	NOT NULL	
SeatMaterial	varchar (100)	DEFAULT NULL	
SeatFrameMaterial	varchar (100)	DEFAULT NULL	
CushioningType	varchar (100)	DEFAULT NULL	
AssemblyStep	varchar (255)	DEFAULT NULL	
Duration	int	DEFAULT NULL	
WorkerCount	int	DEFAULT NULL	How many worker used for creating seat
QualityCheck	bit	DEFAULT (0) NULL	
StepStatus	varchar (50)	DEFAULT(Pending) NULL	
DateAdded	datetime	DEFAULT (getdate) NULL	DateTime when the making Seat

- **Car Making Steps:**

Column Name	Type	Constraint	Description
StepID	int	Primary Key	StepID use as a primary Key
CarModelID	int	NOT NULL	This is a foreign key of Car Models table
StepNumber	int	NOT NULL	
StepName	varchar (100)	NOT NULL	
StepDescription	text	DEFAULT NULL	
EquipmentUsed	varchar (255)	DEFAULT NULL	
Duration	int	DEFAULT NULL	
ResourcesRequired	text	DEFAULT NULL	
WorkerCount	int	DEFAULT NULL	
QualityCheck	bit	DEFAULT NULL	
StepStatus	varchar (50)	DEFAULT(Pending) NULL	Step will be pending or completed this status shown
DateAdded	datetime	DEFAULT (getdate) NULL	

- **Car Making Process:**

Column Name	Type	Constraint	Description
ProcessID	int	Primary Key	This is a primary key but used two different table
CarModelID	int	NOT NULL	This is a foreign key of Car Models table
StepNumber	int	NOT NULL	
StepName	varchar (100)	DEFAULT NULL	
StepDescription	text	DEFAULT NULL	
EquipmentUsed	varchar (255)	DEFAULT NULL	
Duration	int	DEFAULT NULL	
ResourcesRequired	text	DEFAULT NULL	
WorkerCount	float	DEFAULT NULL	
QualityCheck	bit	DEFAULT NULL	
IsCritical	bit	DEFAULT (0) NULL	
DateAdded	datetime	DEFAULT (getdate) NULL	

- **Car BOM Details:**

Column Name	Type	Constraint	Description
BOMID	int	Primary Key	BOMID use as a primary Key
CarModelID	int	NOT NULL	This is a foreign key of Car Models table
PartID	int	NOT NULL	
PartName	varchar(100)	NOT NULL	
PartDescription	text	DEFAULT NULL	
Quantity	int	NOT NULL	
Supplier	varchar(100)	DEFAULT NULL	
UnitCost	decimal(10,2)	DEFAULT NULL	
TotalCost	decimal(10,2)	DEFAULT NULL	Total Cost of material
DateAdded	datetime	DEFAULT(getdate) NULL	

- **Car Engine Details:**

Column Name	Type	Constraint	Description
EngineID	int	Primary Key	EngineID use as a primary Key
CarModelID	int	NOT NULL	
EngineType	varchar(50)	DEFAULT NULL	
EngineCapacity	decimal(5,2)	DEFAULT NULL	
FuelType	varchar(20)	DEFAULT NULL	
HorsePower	int	DEFAULT NULL	
Torque	int	DEFAULT NULL	
Cylinders	int	DEFAULT NULL	
EngineModel	varchar(50)	DEFAULT NULL	As per car engineModel selected
CompressionRatio	decimal(3,2)	DEFAULT NULL	
EngineWeight	decimal (6,2)	DEFAULT NULL	
IsTurbocharged	bit	DEFAULT(0) NULL	
ProductionYear	int	DEFAULT NULL	
DateAdded	datetime	DEFAULT(getdate) NULL	

- **Car Function Details:**

Column Name	Type	Constraint	Description
SeatID	char (10)	Primary Key	SeatID use as a primary Key
CarModelID	int	NOT NULL	
FunctionName	varchar(100)	NOT NULL	
FunctionDescription	text	DEFAULT NULL	How its work
FunctionCategory	varchar(50)	DEFAULT NULL	
AdditionalCost	decimal(10,2)	DEFAULT NULL	
DateAdded	datetime	DEFAULT(getdate) NULL	

- **Car Rework Station:**

Column Name	Type	Constraint	Description
ReworkStationID	int	Primary Key	
StationName	varchar(100)	NOT NULL	After fail any step to send here for recovery
StationType	varchar(50)	DEFAULT NULL	
Address	varchar(255)	DEFAULT NULL	
PhoneNumber	varchar(20)	DEFAULT NULL	
Email	varchar(100)	DEFAULT NULL	
Website	varchar(255)	DEFAULT NULL	
ReworkServices	text	DEFAULT NULL	Renovate seat
AverageTurnaroundTime	varchar(50)	DEFAULT NULL	
Rating	decimal(3,2)	DEFAULT NULL	
IsActive	bit	DEFAULT(1) NULL	
DateAdded	datetime	DEFAULT(getdate) NULL	

- **Barcode Data:**

Column Name	Type	Constraint	Description
BarcodeID	int	Primary Key	
ListID	int	NOT NULL	This is a foreign key of List table
StepID	int	NOT NULL	Step id will be generated completing steps
CarModelID	int	NOT NULL	
CarModelNo	nvarchar(255)	NOT NULL	Against carmodel no barcode saved
CarModelName	varchar(MAX)	NOT NULL	
StepName	nvarchar(255)	NOT NULL	

Status	nvarchar(10)	NOT NULL	
BarcodePath	nvarchar(255)	DEFAULT NULL	When barcode created and saved

- **Step List:**

Column Name	Type	Constraint	Description
ListID	int	Primary Key	ListID use as a primary Key
CreatedDate	datetime	getdate() NOT NULL	

- **Task:**

Column Name	Type	Constraint	Description
Task_ID	int	Primary Key	TaskID use as a primary Key
Task_Name	varchar (100)	DEFAULT NULL	Work related Task will be assigned
Task_Description	varchar(255)	DEFAULT NULL	
Estimated_Hours	int	DEFAULT NULL	Work related hours will be decide here

- **Employees:**

Column Name	Type	Constraint	Description
Employee_ID	int	Primary Key	Employee_ID use as a primary Key
Employee_Name	varchar(100)	DEFAULT NULL	Every person who's used system
Position	varchar(100)	DEFAULT NULL	
Department	varchar(100)	DEFAULT NULL	

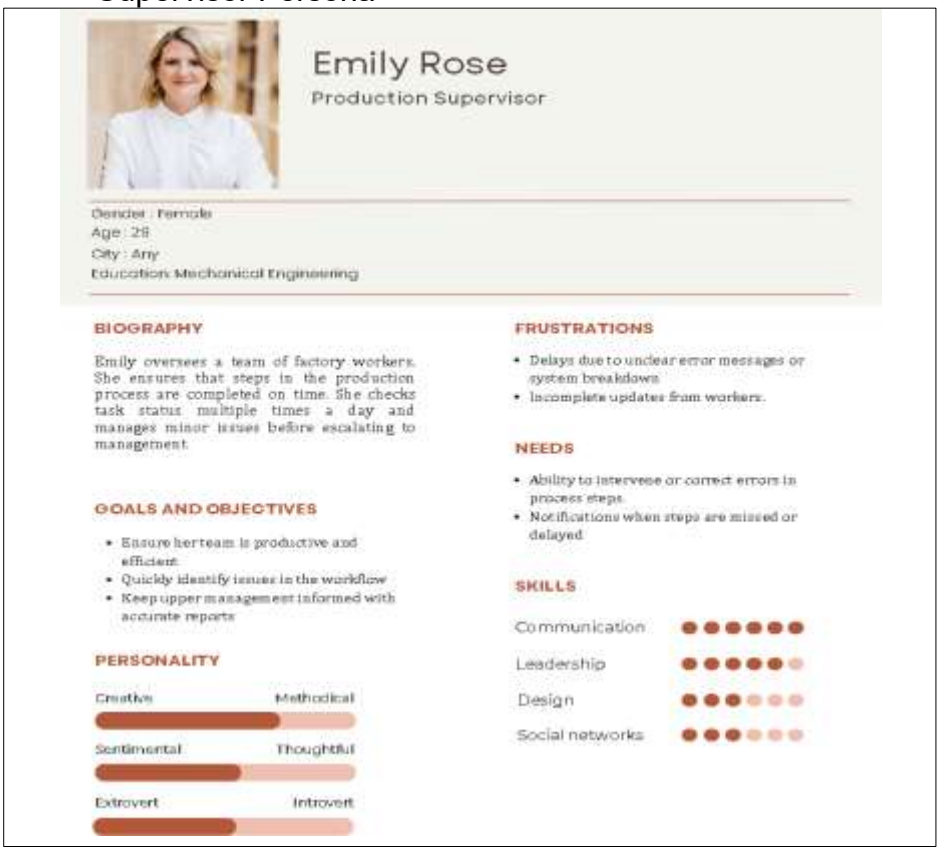
- **Car Registration Details:**

Column Name	Type	Constraint	Description
CarRegId	int	Primary Key(NOT NULL)	CarRegId use as a primary Key
CarName	varchar(50)	DEFAULT NULL	
ModelNo	varchar(225)	DEFAULT NULL	
CarColor	varchar(50)	DEFAULT NULL	
CarTypeModel	varchar(100)	NOT NULL	
CarType	varchar(225)	DEFAULT NULL	
SeatingCapacity	int	DEFAULT NULL	Capacity of car seat
DriveType	varchar(50)	DEFAULT NULL	
EngineType	varchar(50)	DEFAULT NULL	
FuelEconomy	decimal(5,2)	DEFAULT NULL	

3. User Persona, Wireframe or Prototypes

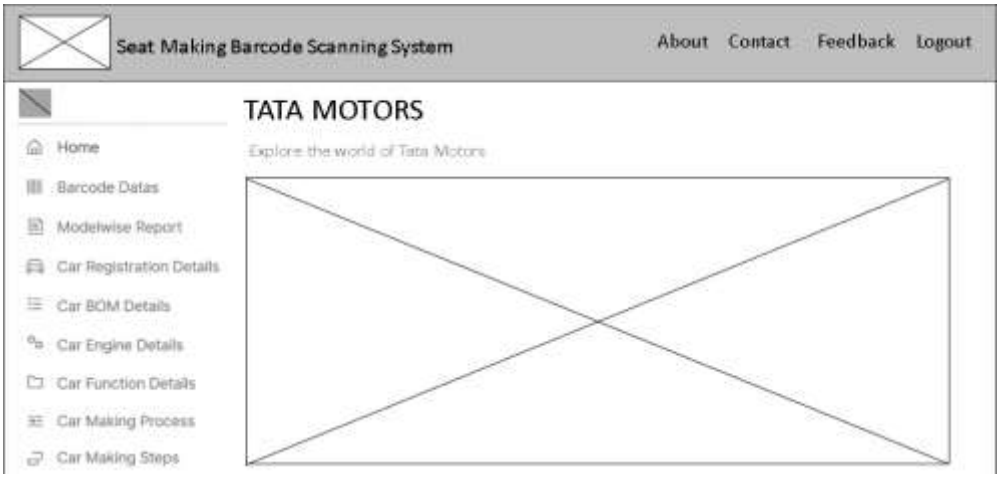
- UI/UX Designer Persona:

- Supervisor Persona



Wireframes

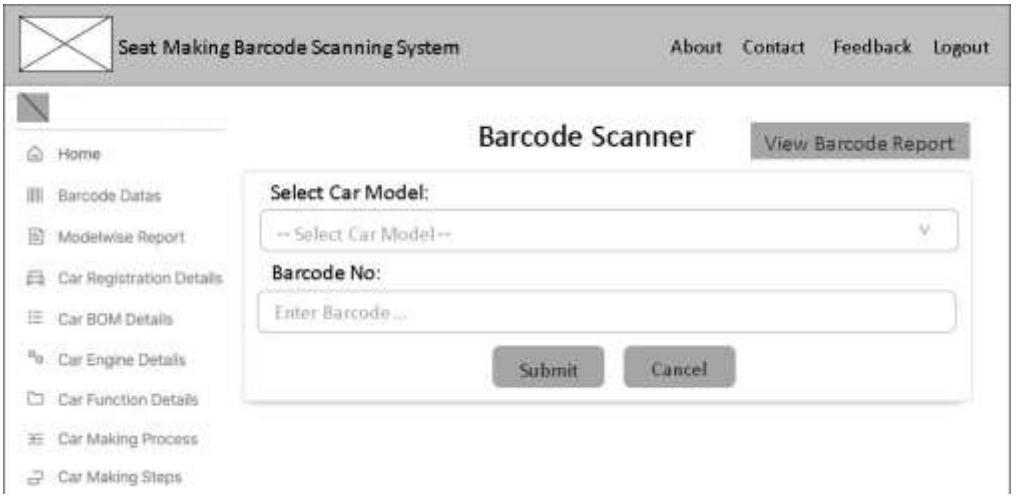
Home Page:

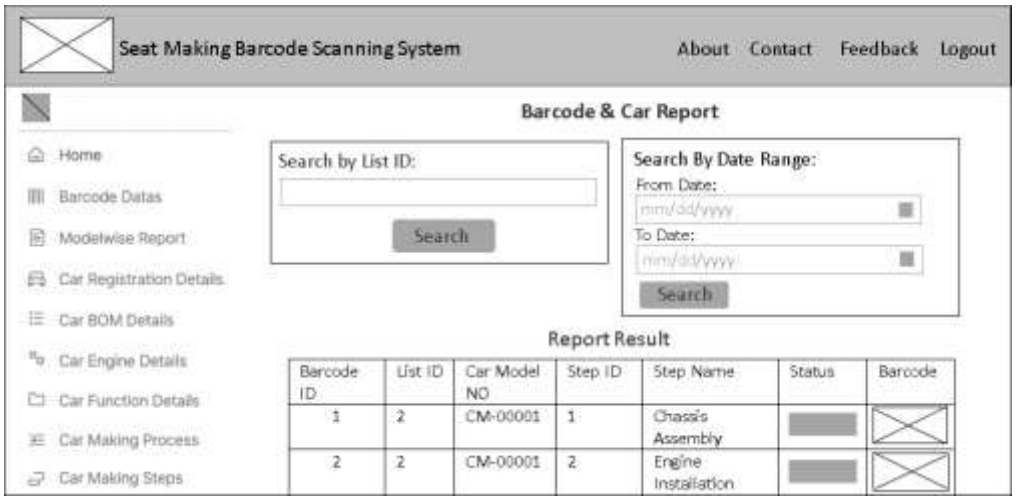


Login:

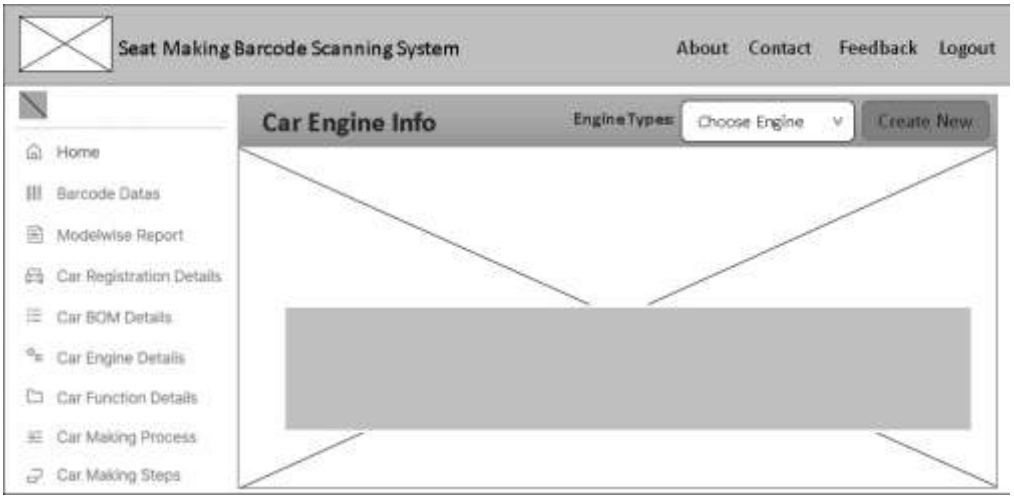
Registration:

BarcodeData:



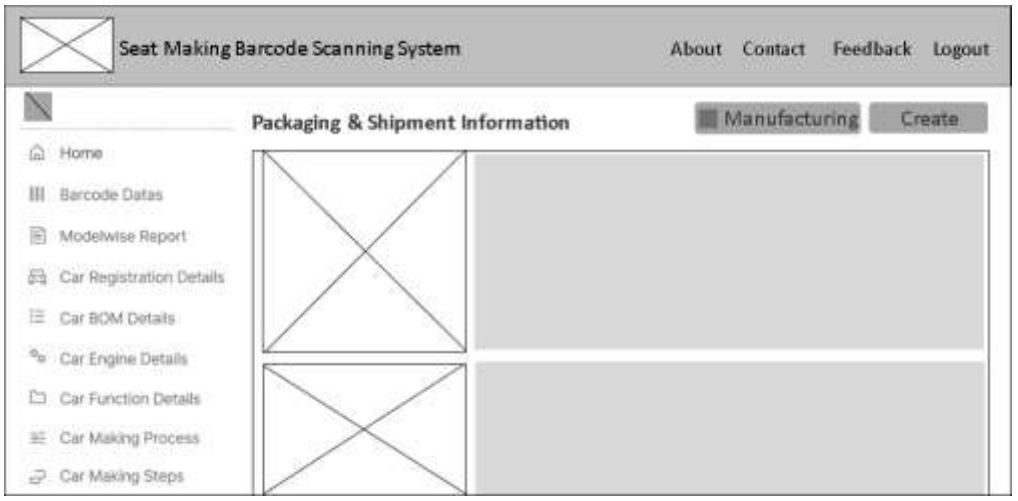


Car Engine detail:

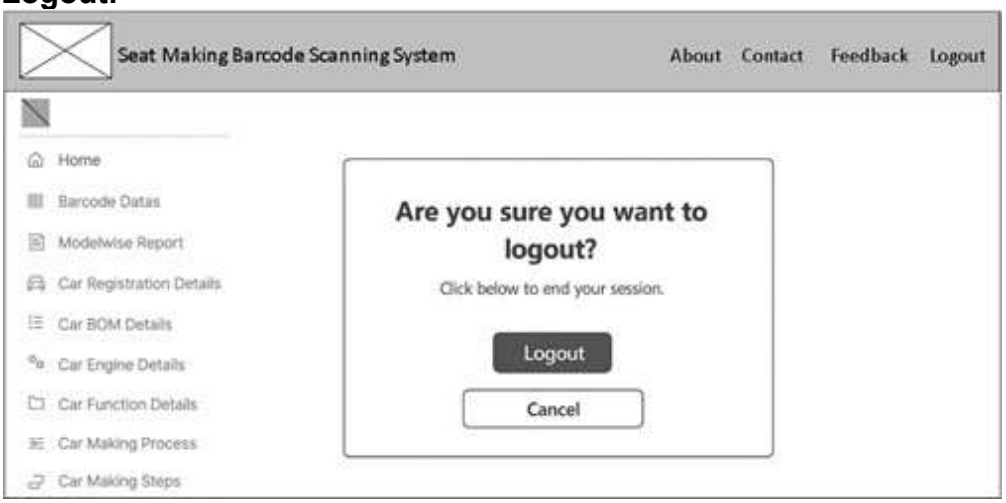


Modelwise Report:

Packaging and Shipment

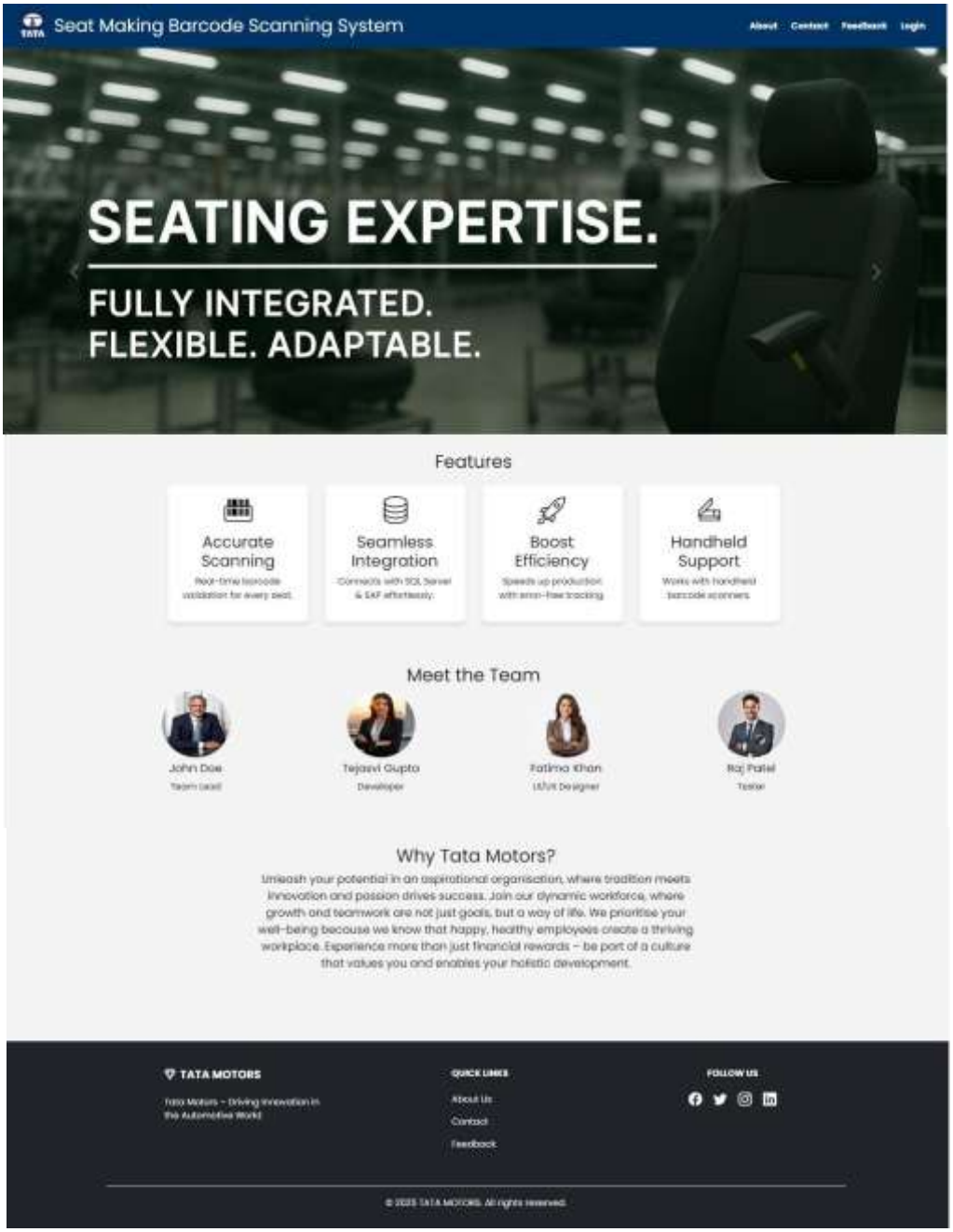


Logout:



4 Screens

Landing Page:



Seat Making Barcode Scanning System
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Streamline Your Seat Production
Get Started

Login Page:

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Feedback
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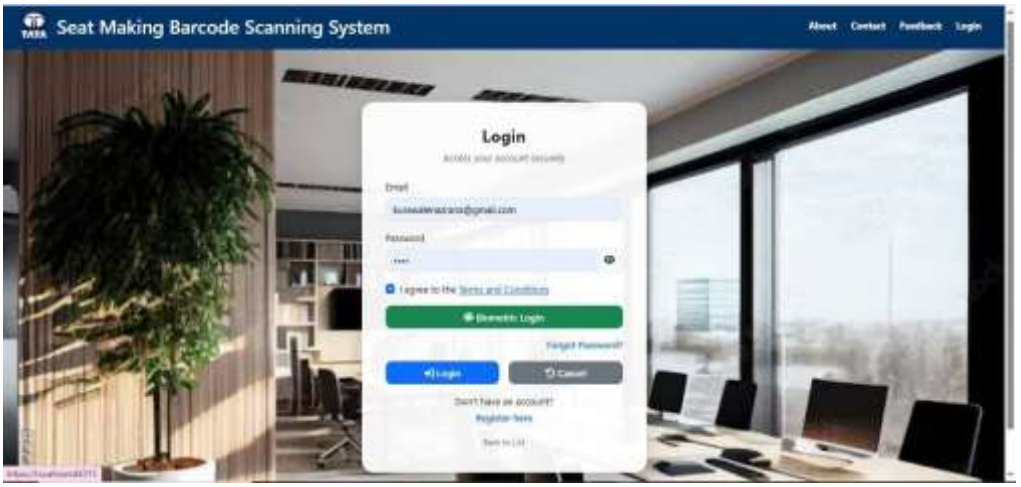
Login


Seat Making Barcode Scanning System
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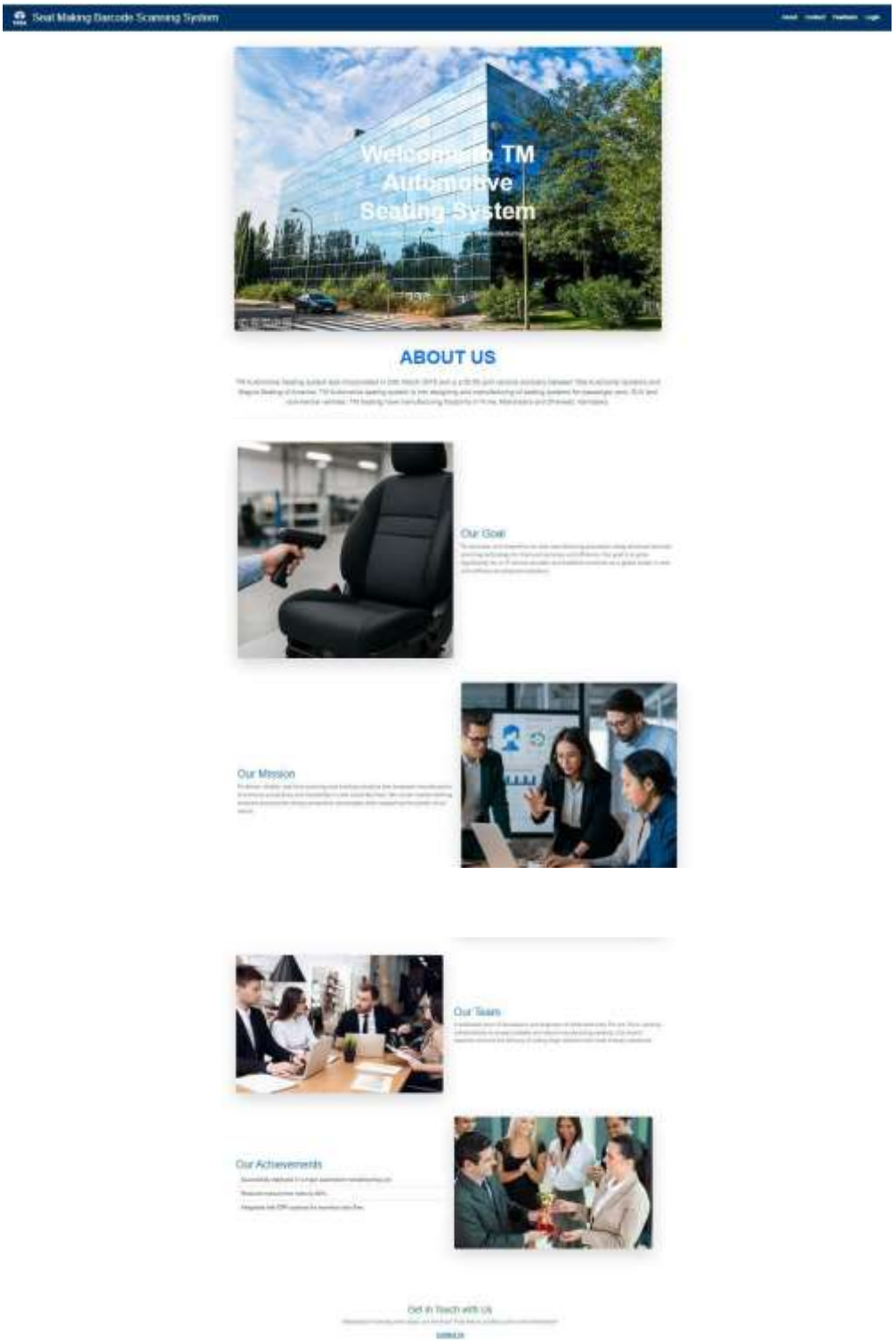
Seat Making Barcode Scanning System

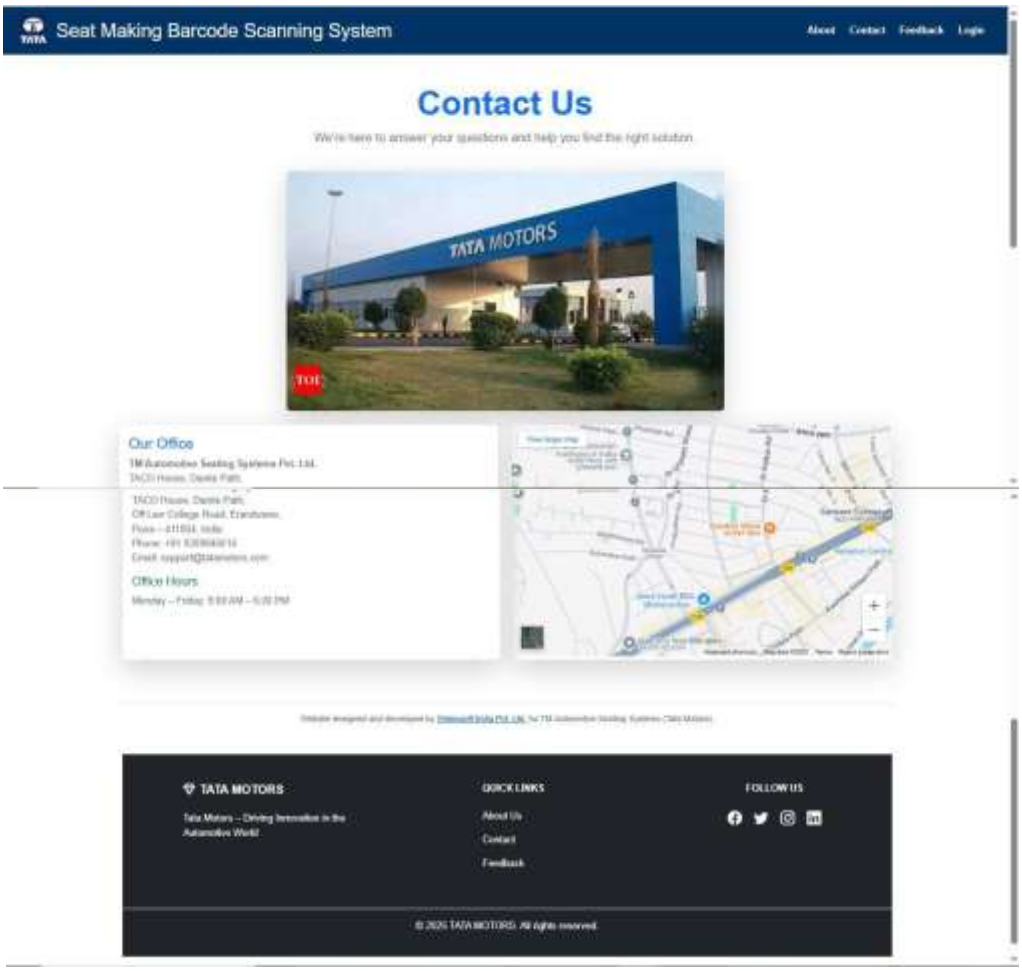
Registration Page:

Feedback:

About Us:


Seat Making Barcode Scanning System
Welcome to TM Automotive Seating System
ABOUT US
Our Goal
Our Mission
Our Team
Our Achievements
Get In Touch with Us

Contact Us: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Office Hours
TATA MOTORS
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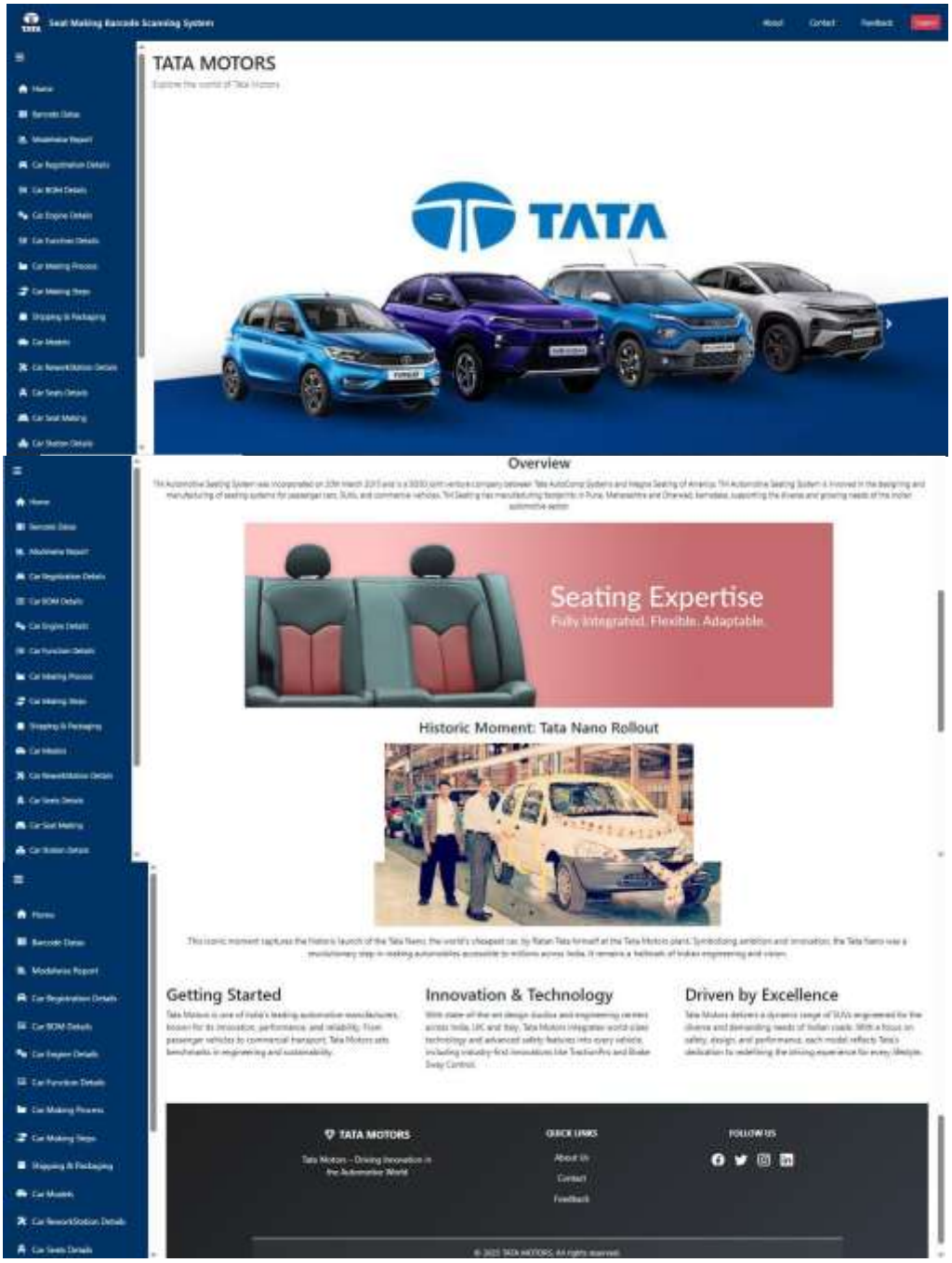
Project Gallery

Home:


Seat Making Barcode Scanning System
About
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TATA MOTORS
TATA
Overview
Seating Expertise
Fully Integrated. Flexible. Adaptable.
Historic Moment: Tata Nano Rollout
Getting Started
Innovation & Technology
Driven by Excellence
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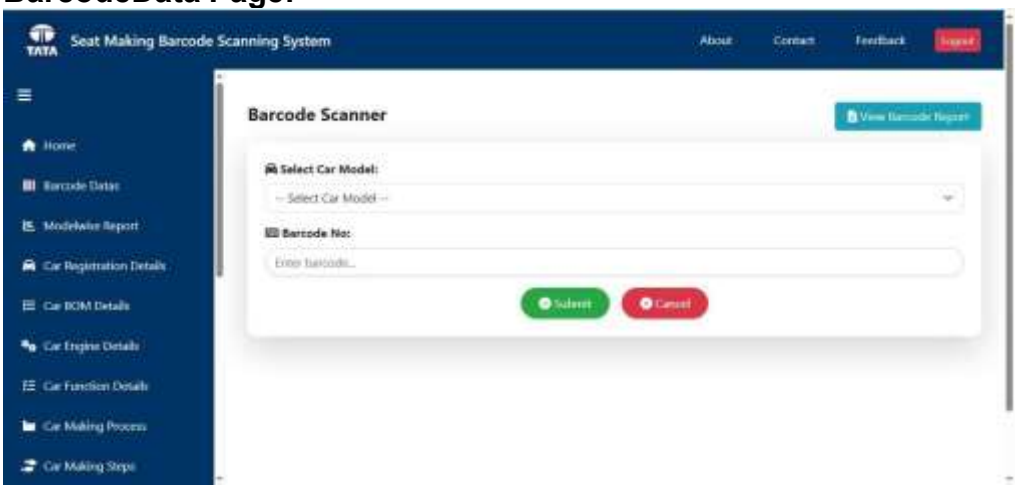
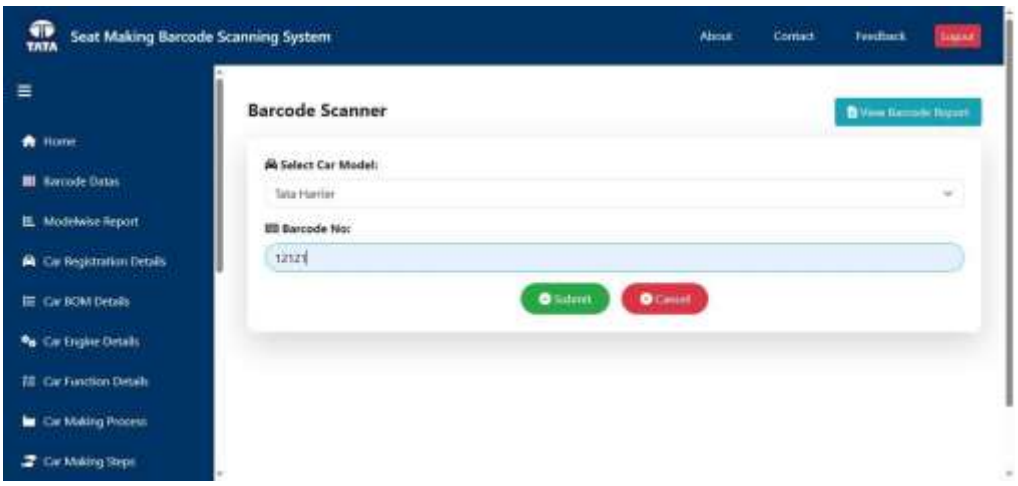
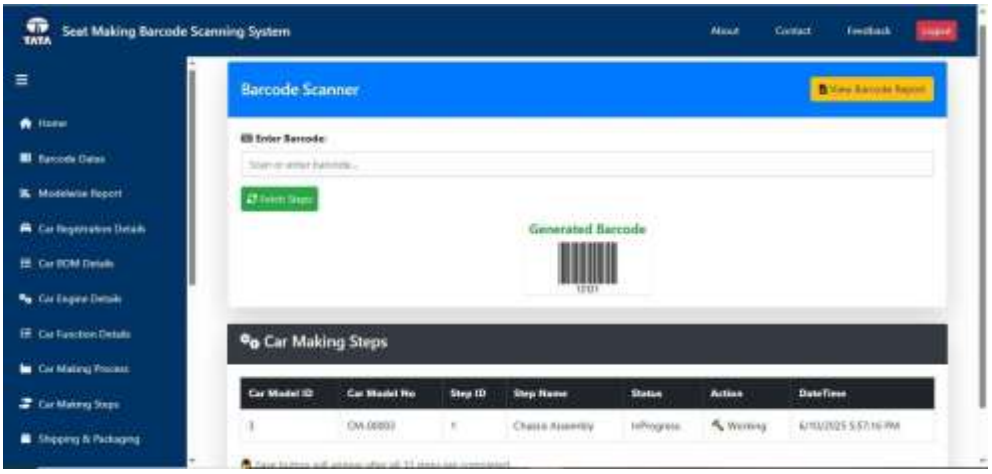
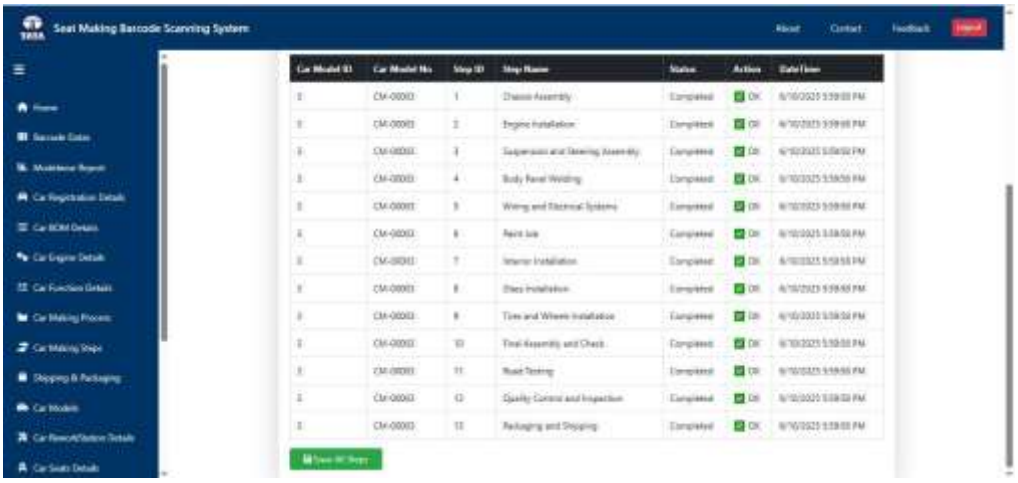
BarcodeData Page:





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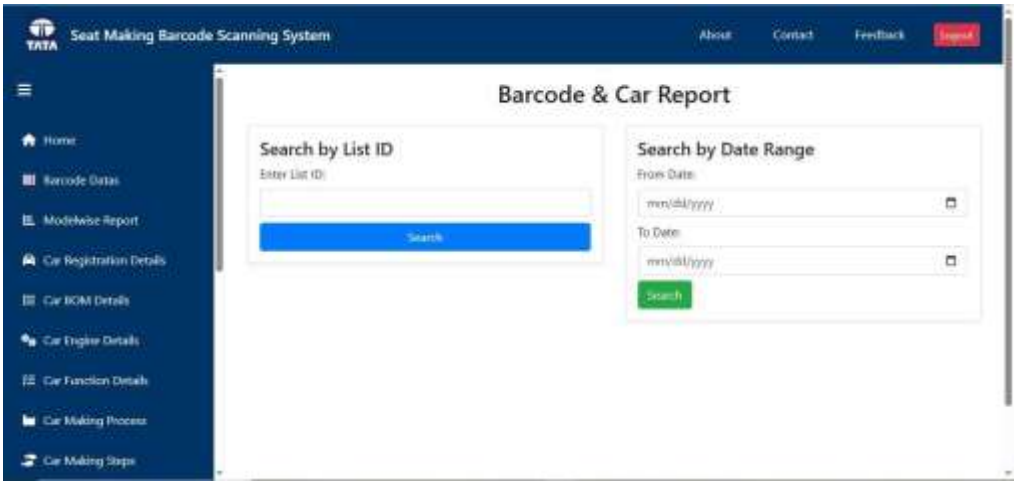
Logout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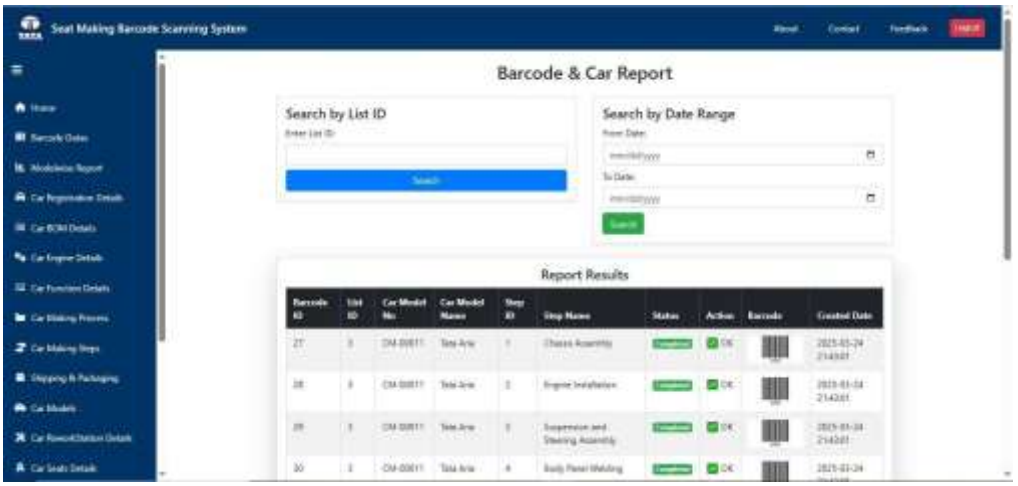
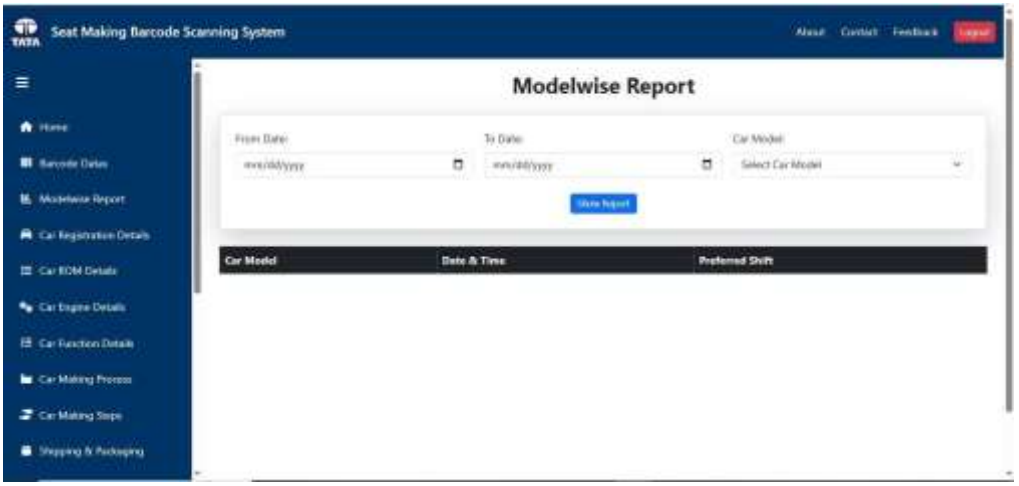
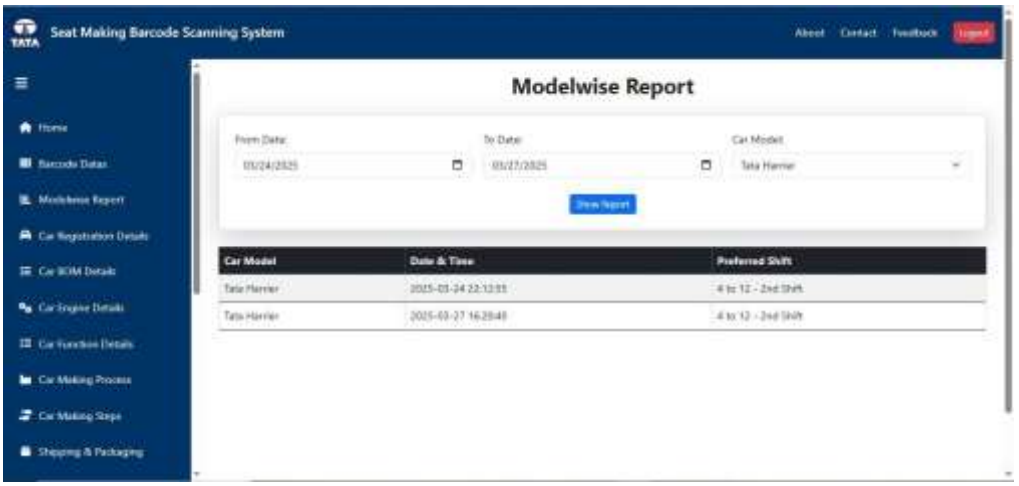
Feedback
Logout
Barcode & Car Report
Home
Barcode Datas
Modelwise Report
Car Registration Details
Car BOM Details
Car Engine Details
Car Function Details
Car Making Process
Car Making Steps
Search by List ID
Enter List ID:
Search
Search by Date Range
From Date:
mm/dd/yyyy
To Date:
mm/dd/yyyy
Search

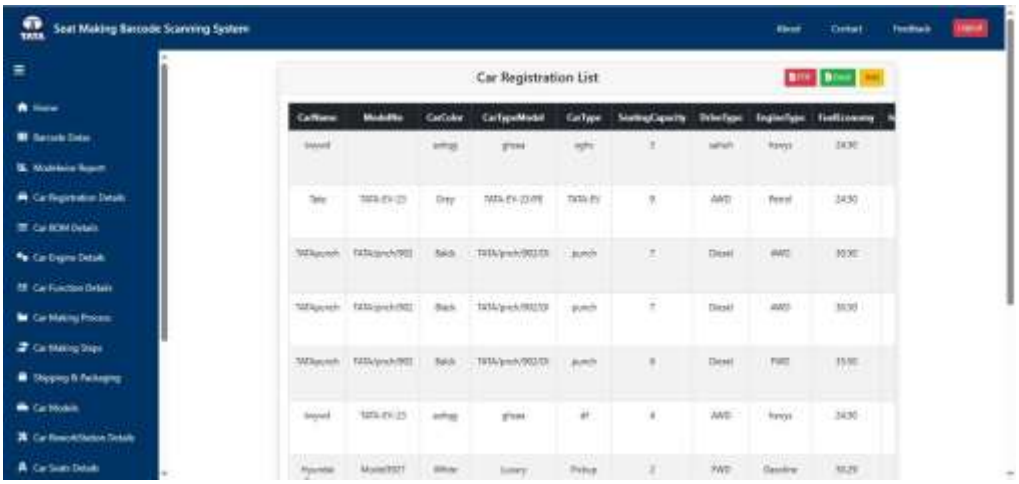

Seat Making Barcode Scanning System
Barcode & Car Report
Search by List ID
Search by Date Range
Report Results

Modelwise Report:

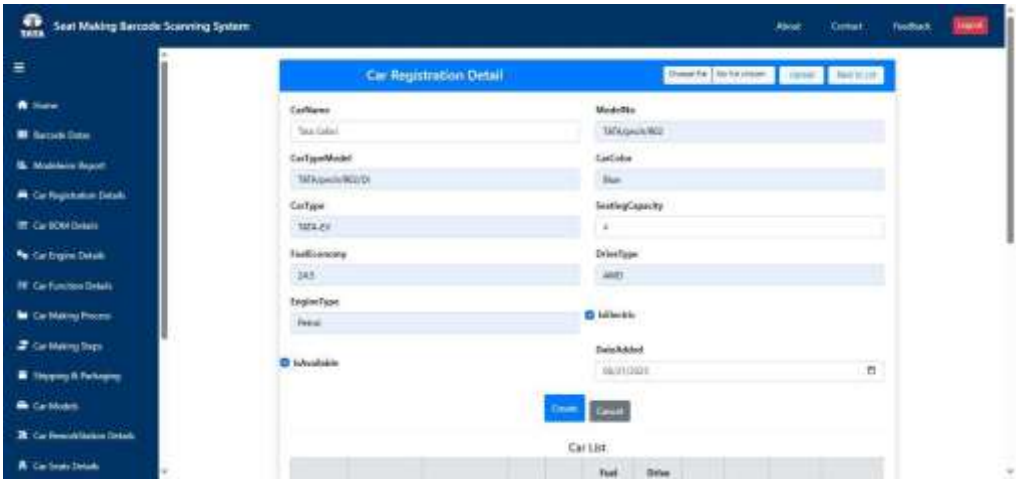


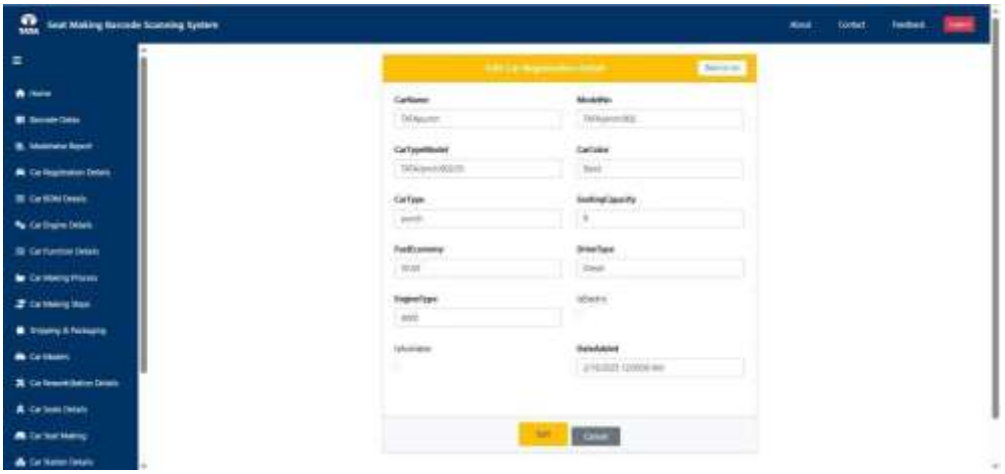


Car Registration Page:

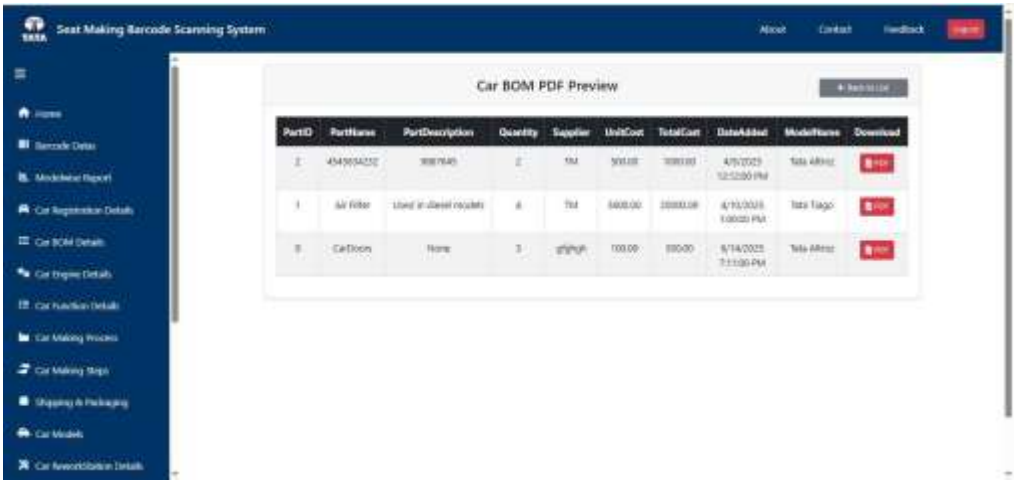


Seat Making Barcode Scanning System
Car Registration Detail
Car List


Seat Making Barcode Scanning System
Car Registration Detail
Car List


Seat Making Barcode Scanning System

Car BOM Details Page:


Seat Making Barcode Scanning System
About
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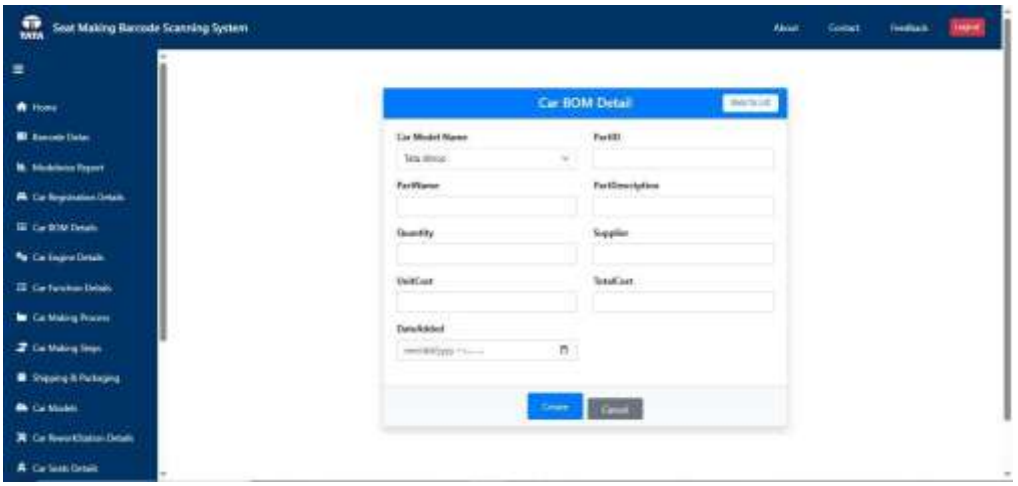
Logout
Car BOM PDF Preview
PartID
PartName
PartDescription
Quantity
Supplier
UnitCost
TotalCost
DateAdded
ModelName
Download


Seat Making Barcode Scanning System
About
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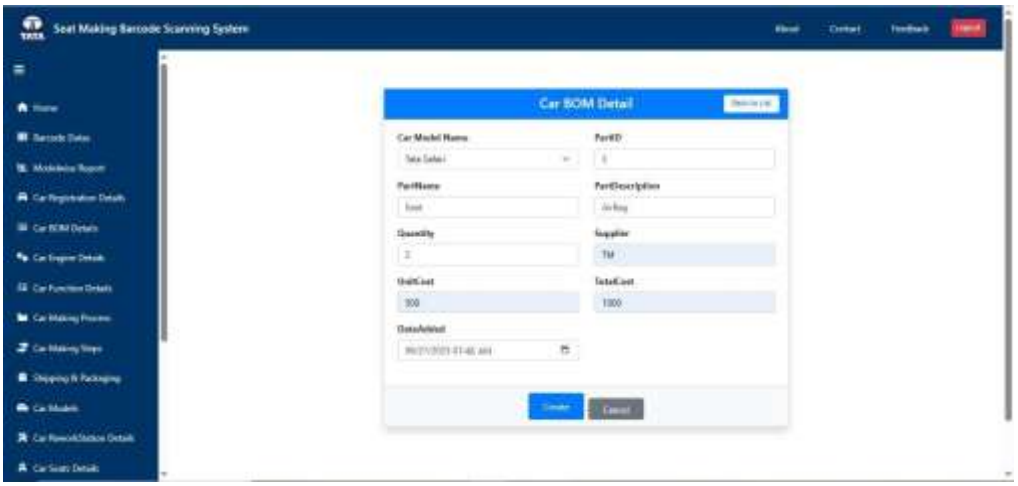
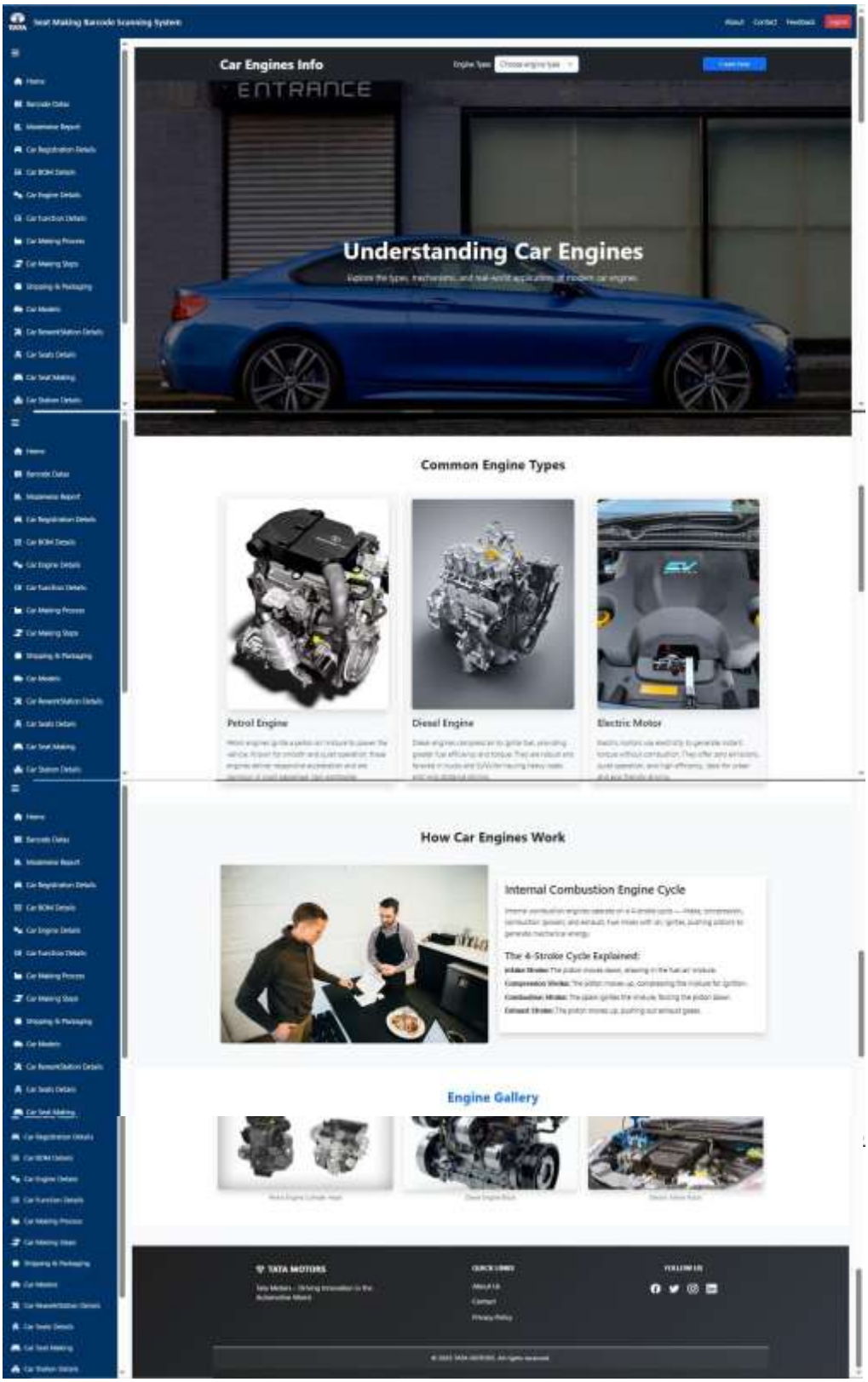
Feedback
Logout
Car BOM Detail
Car Model Name
PartID
PartName
PartDescription
Quantity
Supplier
UnitCost
TotalCost
DateAdded

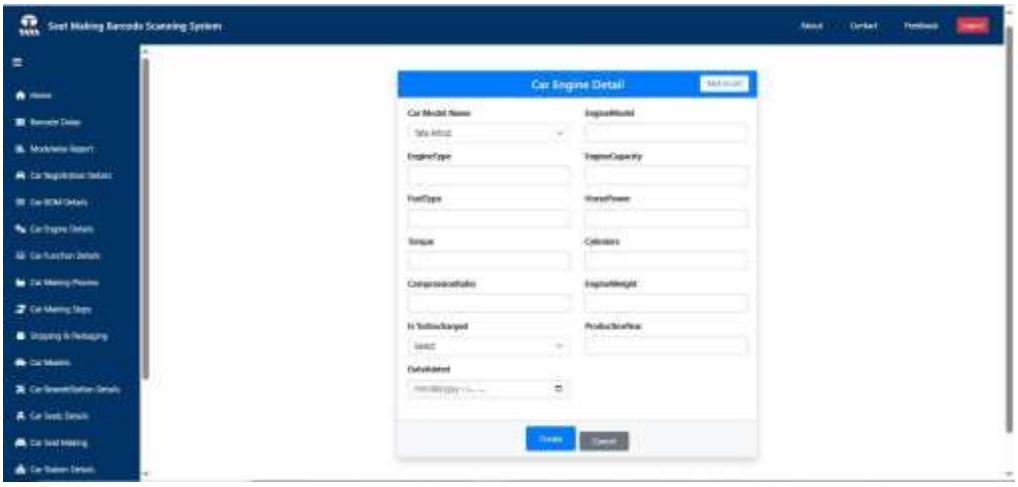

Seat Making Barcode Scanning System
About
Contact
Feedback
Logout
Car BOM Detail
Car Model Name
PartID
PartName
PartDescription
Quantity
Supplier
UnitCost
TotalCost
DateAdded

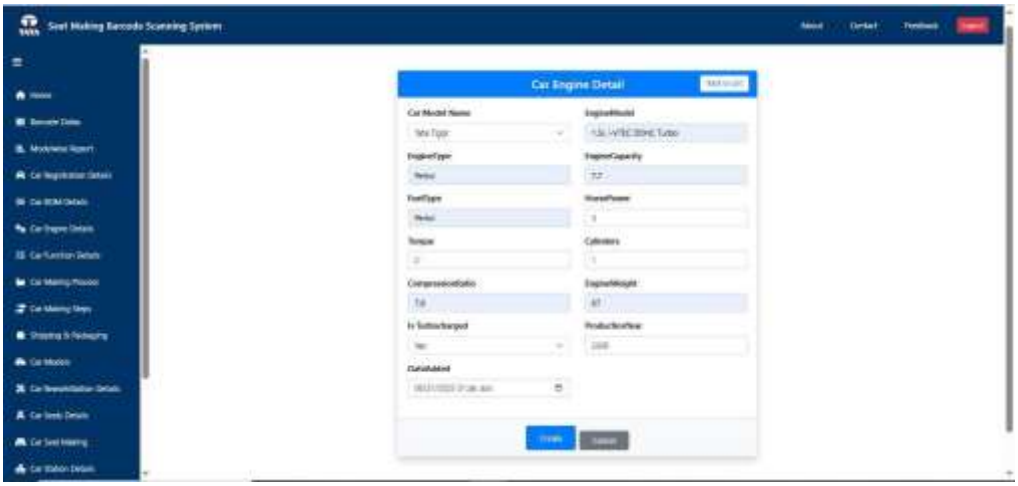
Car Engine Details:



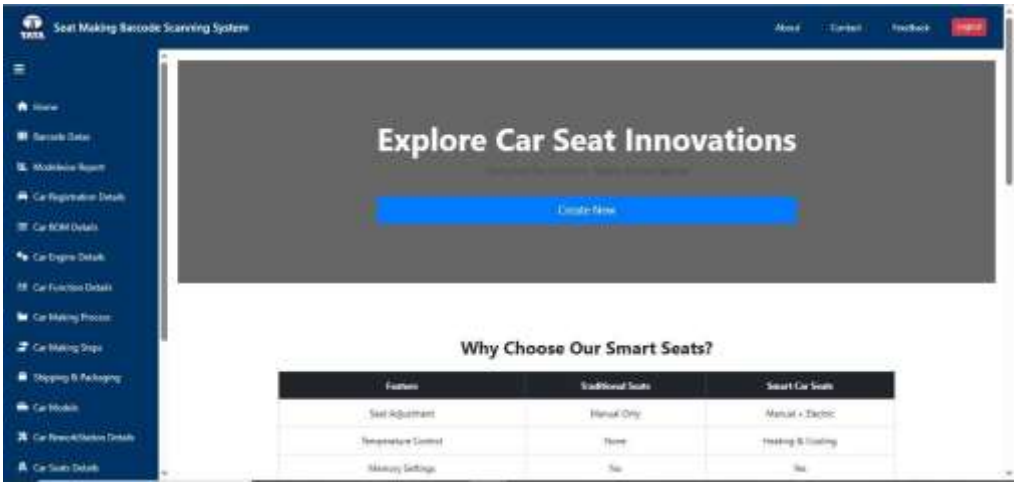
Seat Making Barcode Scanning System
Petrol Engine
Tata Harrier
Tata Nexon
Tata Punch
Key Features
Engine Specifications

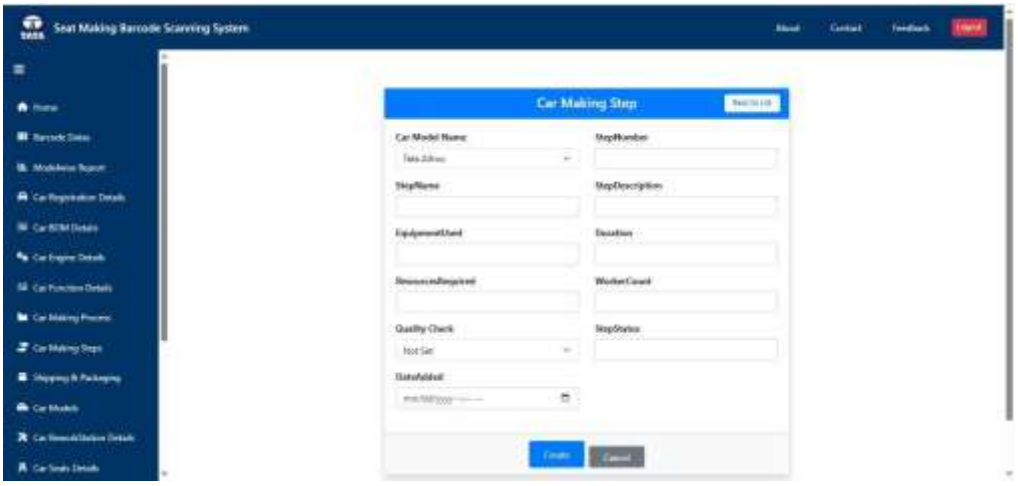
Seat Making Barcode Scanning System
Car Engine Details

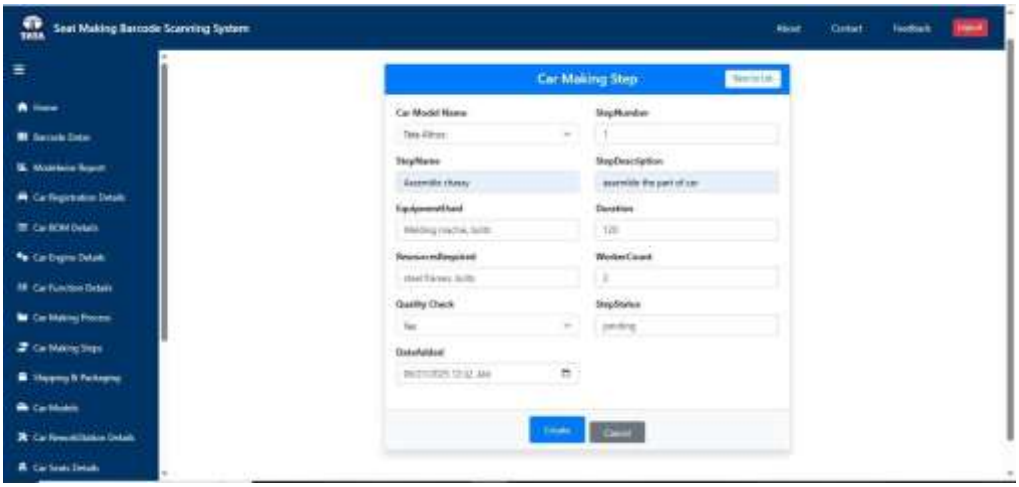




Car Function Details:




Seat Making Barcode Scanning System
Car Making Step


Seat Making Barcode Scanning System
Car Making Step

Seat Making Barcode Scanning System
Car Function List

10. Test Cases

Test Case ID	Work Type	Test Scenario	Steps	Step Action	Input Data	Expected Result	Result
01	Barcode Scanning	Validate barcode scanning of seat step	1	Scan barcode	Valid barcode (4536)	Step Name, Status, and Remark displayed correctly	Pass
			2	View step details & save			Pass
02	Barcode Scanning	Scan invalid barcode	1	Scan barcode	Invalid barcode (#$%ygh677)	Error message shown: "Invalid barcode"	Fail
03	Seat Step Update	Update and save step status	1	Scan barcode	Valid barcode(86467)	Step status saved and shown as "Completed"	Pass
			2	Click "OK" and Save			
04	Quality Control Module	QC inspector fails a seat step	1	Scan barcode	Barcode (#55562y)	Seat status updated to "Fail" and moved to rework	Pass
			2	Select "Fail"			
			3	Enter remark and Submit	Text remark		

05	Authentication	Worker login with correct credentials	1	Enter credentials	Valid email and password(kurawalenazrana@gmail.com)	Redirect to worker dashboard	Pass
			2	Click Login			
06	Authentication	Unauthorized user tries to access Manager view	1	Login	Worker credentials(riyaDawale2507@gmail.com)	Access denied message shown	Pass
			2	Try accessing Manager Report view			Fail
07	Report Module	Generate production report	1	Login as Manager	Manager credentials	Report displayed with filtered production data	Pass
			2	Navigate to Reports			
			3	Select date range	Date range		
08	System Validation	Prevent re-scanning of completed steps	1	Scan already completed seat step	Completed step barcode	Message: "Step already completed" shown	Pass

09	Database Integration	Check if scan data is stored correctly	1	Scan and save step	Barcode	Data recorded with timestamp and step info	Pass
			2	Check database `BarcodeData` table			
10	Role Management	Supervisor overrides a failed seat	1	Login as Supervisor	Supervisor credentials	Seat status updated, and override logged	Pass
			2	Open failed seat record			
			3	Change status to "OK" and save			
11	User Registration	Register new employee	1	Open registration page		New employee record added in database	Pass
			2	Fill required fields	Name, Email, etc.		
			3	Submit			
12	User Registration	Register with missing fields	1	Leave mandatory fields empty	Missing Name/ Email	Validation messages shown	Fail
13	Login	Valid user login	1	Enter credentials	Valid email and	User redirected to their	Pass

					password	dashboard	
14	Login	Invalid user login	1	Enter wrong credentials	Invalid email/password	Error message shown: "Invalid credentials"	Pass
15	Login	Inactive user login	1	Try login with deactivated account	Inactive user credentials	System blocks login with appropriate message	Pass
16	Car Models	Add new car model	1	Navigate to Car Models		New model saved in database	Pass
			3	Enter details and save	Model name, type, etc.		
17	Car Models	Edit existing car model	1	Select a model	Existing model	Changes updated in database	Fail
			2	Edit fields	Modified fields		
			3	Click Save			
18	Car Models	Delete car model	1	Select a model	Model to delete	Model removed from database	Pass
19	Seat Making	Assign step to a seat	1	Select seat	Seat ID	Steps linked to seat successfully	Pass
			2	Assign production steps	Step details		

20	Car BOM	Add part to BOM	1	Go to BOM module		Part added to BOM list	Pass
			3	Enter details and save	Part name, code, etc.		pass
21	Car Function	Add seat function	1	Navigate to Car Function		Function added and visible in UI	Pass
			2	Add new function with details and save	Function name, description		pass
22	Car Registration	Register car with valid details	1	Enter registration data and submit	Car info (number, model, etc.)	Car registered successfully	Pass
23	Reports	Export report to Excel	1	Open reports		Excel file downloaded with data	Pass
			2	Select date range	From – To		
24	Access Control	Verify worker cannot access admin section	1	Login as worker	Worker credentials	Access denied message displayed	Pass
			2	Attempt to access admin URL			

11. Limitations and Enhancements

Limitations:

1. Hardware Dependency:
   - The system heavily relies on barcode scanners and label printers.
   - Malfunctioning devices can disrupt production tracking.
2. Limited Offline Support:
   - Scanning and logging actions depend on real-time server sync.
   - No local data caching or delayed sync currently implemented.
3. Initial Learning Curve:
   - Workers and supervisors may require training.
   - Future integration of RFID or QR/NFC.
4. ERP Integration Constraints:
   - The system depends on compatibility with third-party ERP APIs.
   - Any ERP schema changes may require system updates.

Future Enhancements:

1. RFID Integration:
   - Upgrade from barcodes to RFID tags for hands-free tracking.
   - Useful in high-speed or bulk processing environments.
2. Digital Twin Integration:
   - Real-time 3D model of seat production for virtual monitoring.
   - Data sync with IoT devices on the factory floor.
3. Cross-Platform App Expansion:
   - Mobile app for iOS and Android with push notifications and camera-based scanning.
   - Smartwatch alerts for supervisors and inspectors.
4. Cloud & Multi-Factory Support:
   - Cloud-hosted solution for centralized data access.
   - Multi-location dashboards and factory-level analytics.

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