

# IntelliClaim

Intelligent Claims Processing for TPL Insurance

## Project Proposal

7th Semester

*By*

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***SUBMITTED TO***  
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## ABSTRACT

The IntelliClaim project aims to develop a cutting-edge claims module for TPL Insurance, focusing on efficient image processing for auto insurance claims. This module will integrate into the company's new CRM, providing an intelligent solution for damage detection and loss calculation. By leveraging advanced image processing techniques, IntelliClaim will enhance the accuracy and speed of claims processing, supporting the company's business process reengineering (BPR) efforts.

## PROJECT OVERVIEW

**A PROJECT TITLE:** IntelliClaim: Intelligent Claims Processing for TPL Insurance

**B ACRONYM:** ICP-TPL

**C TAGLINE:** Transforming Auto Insurance Claims with Intelligent Damage Detection Technology

**D START DATE:** 13-0G-2024

**E EXPECTED COMPLETION:** 01-06-2025

## Acronyms/Definitions/Abbreviations

### Abbreviations

**CRM** - Customer Relationship Management

**API** - Application Programming Interface

**BPR**- Business Process Reengineering

### Definitions

- **Comprehensive Customer Relationship Management (CRM)**

A CRM system combines customer profile management, policy details, and claims handling, allowing organizations to improve customer engagement and streamline processes for better service.

- **Claims Management Module**

The claims management module streamlines the entire process, from initial submission to final settlement, ensuring accurate and efficient claim handling for prompt customer resolutions.

- **Business Process Reengineering (BPR)**

Business Process Reengineering (BPR) is a strategic method aimed at redesigning organizational workflows to enhance efficiency, quality, and overall performance, leading to improvements in productivity and customer satisfaction.

## PROJECT BRIEF

The IntelliClaim project is designed to create a claims processing module for TPL Insurance, for auto insurance claims. Customers initiate the process by accessing a form via a link, where they upload photos of vehicle damage and provide details about the incident, such as the date, location, and the type of damage. This form serves as the customer's interface—while they submit the claim, they have no direct access to TPL's internal CRM. Customers are guided to upload images from specific angles to enhance accuracy in damage detection.

Once the form is submitted, it automatically connects to the CRM, creating a new claim. The IntelliClaim module then uses machine learning models to analyze the images, identifying dents, scratches, and other damage. A second model calculates the estimated repair costs based on the extent of the damage and the vehicle's make and model. The system then uses the customer's location to recommend nearby repair workshops, factoring in proximity and service compatibility.

The project underscores TPL Insurance's commitment to innovation and operational excellence. By reducing processing time and increasing accuracy, IntelliClaim aims to significantly enhance customer satisfaction. Through this initiative, TPL Insurance aims to set a benchmark in the industry for intelligent claims management solutions.

## PROBLEM STATEMENT

TPL Insurance's CRM system faces challenges as it is currently being updated to handle auto insurance claims more effectively. The existing system cannot precisely and smoothly evaluate vehicle damage which leads to irregularities in resolving claims. The use of a outdated interface by claims agents alongside a manual image analysis creates lengthy processing times and ups the error rate. For tackling these problems and parallel to TPL Insurance's Business Process Reengineering (BPR) objectives, a streamlined and comprehensive solution is required. This solution will fulfill the escalating requirements of clients for faster and more exact claim processing.

## MARKET / LITERATURE REVIEW

Existing Technology	Description	Inadequacies
<a href="https://www.deloitte.com/lu/en/products/deloitte-ai-car-damage-recognition.html">https://www.deloitte.com/lu/en/products/deloitte-ai-car-damage-recognition.html</a>	<p><b>Deloitte AI Car Damage Recognition:</b></p> <p>A deep learning model that accurately recognizes car damage and estimates repair costs.</p>	<ul style="list-style-type: none"> <li>• Payment for a vehicle is not capped by the market's value.</li> <li>• Subscription/license required</li> <li>• Once a quote is formed a customer does not get any generated emails.</li> </ul>
<a href="https://www.altoros.com/solutions/car-damage-recognition">https://www.altoros.com/solutions/car-damage-recognition</a>	<p><b>Altoros Car Damage Recognition:</b></p> <p>An ML-based system that detects vehicle damage, estimates repair costs, and integrates with claims automation processes.</p>	<ul style="list-style-type: none"> <li>• Vulnerability to evolving vehicle designs, which may require constant model updates.</li> <li>• No checklist for employees to evaluate airbag status, seatbelts, and other safety features, to ensure the insurance estimate is not unfairly biased toward totaling the car.</li> </ul>
<a href="https://www.mapfre.com/en/insights/innovation/artificial-intelligence-vehicle-damage-assessment/">https://www.mapfre.com/en/insights/innovation/artificial-intelligence-vehicle-damage-assessment/</a>	<p><b>MAPFRE AI Vehicle Damage Assessment:</b></p>	<ul style="list-style-type: none"> <li>• No suggestion for nearby workshops according to the location of the customer</li> <li>• Lack of communication with the customer.</li> </ul>



## Competitor Analysis

Feature	Intelliclaim (Our Solution)	Deloitte AI Car Damage Recognition	Altoros Car Damage Recognition	MAPFRE AI Vehicle Damage Assessment
Time taken to process Claims	Fast, nearly real-time, fully automated	Slow and manual involvement from surveyors	Slow, requires updates for new vehicle designs.	Slow, involves manual steps
Cost	Low operational cost (no subscription fees, open source tool)	High cost (subscription/license)	High cost (subscription/license)	High cost (subscription/license)
Accuracy	High due to trained AI models and real-time processing.	High but potentially limited by human oversight.	High but vulnerable to evolving vehicle designs.	Moderate to High with limited communication and user involvement.
Integration	Easy with CRM and backend integration.	Moderate (requires some integration work )	Easy(integration with automation)	Easy(direct integration)

## PROJECT DETAILS

### **A PROPOSED SOLUTION:**

Our project replaces the manual surveyor process by utilizing an AI model to automatically assess vehicle damage. Customers submit photos of the vehicle damage through a form, and employees log into the CRM system to access these images. The AI model analyzes the uploaded images and instantly provides an estimated claim amount, reducing the need for manual surveyors. This significantly shortens the processing time and offers a more cost-effective solution for both the company and the customers.

Typically, when a car is damaged, the customer informs the surveyor, who visits the location, inspects the vehicle, returns to the office, and computes the claim manually. At TPL, the current manual process limits the company to processing only 30-40 claims per day, even though they receive hundreds of claims daily.

By integrating AI into the CRM, employees can upload damage images immediately, allowing the system to generate an estimated cost based on comparisons with similar damage cases. This enables the AI to set a threshold according to the market price and assess the claim more efficiently. Additionally, according to the location of the customer the model suggests nearby workshops.

This approach not only speeds up claims processing but also reduces human error, increases consistency, and leads to significant operational cost savings. It enhances customer satisfaction through faster service and more competitive premiums, while also helping detect fraudulent claims.

## **B PROJECT OBJECTIVES:**

- **Integration of AI-Based Damage Assessment:**

Develop the foundation for the CRM system to integrate AI-based damage assessments using images of vehicle damage uploaded by users, employing advanced object detection techniques.

- **Comprehensive Damage Detection:**

Expand the system to encompass a diverse array of damage types and severities, enabling users to receive accurate and detailed assessments of their vehicle's condition.

- **User-Centric Web Application:**

Design and construct a user-friendly web application that incorporates interactive features for uploading images and receiving instant damage assessments, facilitating a convenient and seamless experience for users.

- **Reduction in Claim Processing Time:**

Achieve a reduction in claim processing time through automated damage detection and claims management.

- **Lower Operational Costs:**

Reduce operational costs by automating the claims assessment process, leading to significant cost savings for TPL Insurance.

- **Timely Development:**

Develop the AI damage detection system within 8 months, utilizing existing infrastructure, staff, and resources without exceeding.

## **C METHODOLOGY: (Tentative)**

we will train our data on multiple models (some are not mentioned here) and use the ones that provide the best accuracies

### **CRM Platform:**

- React.js to create the front-end interface,
- Express.js to handle server-side APIs and business logic to facilitate communication between the front-end, AI model, and databases
- Node.js to manage asynchronous tasks and handle RESTful API requests between the front-end and the backend database.

### **AI Damage Detection:**

- Mask R-CNN for detecting and segmenting areas of car damage in uploaded

### **Regression Models:**

- Random Forest Regressor, Gradient Boosting Regressors or XGBoost for Claim Calculation.

### **Workshop Recommendation (Based on Location):**

- K-Nearest Neighbors (KNN) or Haversine Distance to find the nearest repair workshops based on the customer's geolocation

### **Database Management:**













- Firebase for storing user data, claims information, and damage assessment records.

## **D THE PRODUCT:**

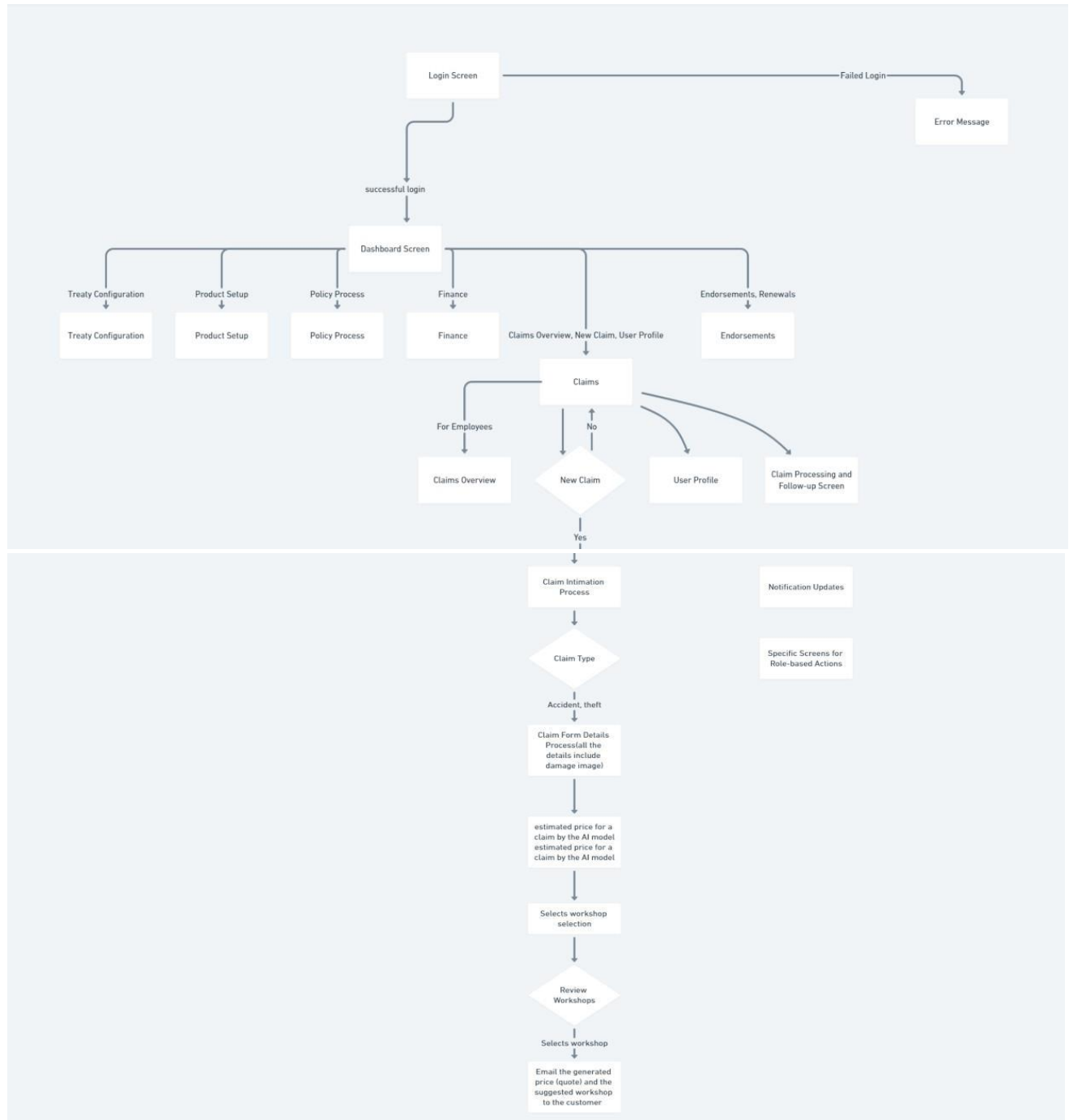
The proposed solution is a web application. Our feature will be an updated claims module integrated in the TPL CRM. It will allow employees to log in, upload vehicle damage images, and instantly receive AI-generated claim estimates. This application aims to automate claim assessments, reduce processing time, and enhance efficiency.

# PROJECT MILESTONES AND DELIVERABLES

## Gantt Chart

Tasks	Q1			Q2			Q3			Q4		
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
 Finalize FYP Problem, Industry Partner & Supervisor	 Finalize FYP Problem, Industry Partner & Supervisor											
Determine Solution for the Problem Statement		 Determine Solution for the Problem Statement										
Proposal - The First Deliverable		 Proposal - The First Deliverable										
Data Collection: Collect a dataset of vehicle images with annotated dents and damages. This will be used for training the AI model			 Data Collection: Collect a dataset of vehicle images with annotated dents									
Model Training: Determine what model to choose for object detection using the dataset. Fine-tune the model on the dataset of car images to detect and classify the types of damages.			 Model Training: Determine what model to choose for object d									
Requirement Analysis - the 2nd Deliverable			 Requirement Analysis - the 2nd Deliverable									
Project Design and Specification - The 3rd Deliverable				 Project Design and Specification - The 3rd Deliverable								
Claim Calculation: Based on the extent of the damage detected, the system will calculate the insurance claim using predefined rules and formulas.						 Claim Calculation: Based on the exte						
Damage Detection: Develop an interface for users to upload images of their vehicle, which will then be processed by the AI model to detect dents and damages.						 Damage Detection: Dev						
CRM Features: Build features to handle customer profiles, manage policies, generate reports, track claims, and automate communication with customers.							 CRM Features: f					
Minimum working software - the 4th Deliverable							 Minimum workin					

# User Flow Diagram



## WORK DIVISION

Raine Ramchand:

- AI Module Development C Integration:
  - Initialize and fine-tune the AI model for vehicle damage detection.
  - Train the AI model on the dataset to accurately identify different types of vehicle damage.
  - Integrate AI results with the backend, enabling the system to process images and calculate insurance claims.
  - Oversee the "AI Model" and "Backend Integration" modules
  - Configure the appropriate tools and libraries to ensure optimal model performance and integration.

Beenish Ahmed:

- Frontend Development C UI/UX Design:
  - Implement dynamic UI elements for the CRM system, focusing on customer profiles, policy records, and claims.
  - Design the image upload interface for vehicle damage assessment.
  - Supervise the integration of the AI results with the frontend, providing real-time feedback on damage assessments.
  - Create wireframes and prototypes for the entire CRM system.
  - Ensure user interfaces are intuitive and accessible.

Beena:

- Backend API C Claim Calculation Logic:
  - Employ backend development techniques to manage data flow between the AI model, frontend, and claims system.
  - Implement claim calculation logic based on AI-detected damage data, automating the insurance claim process.
  - Develop APIs for managing customer and policy data, ensuring secure and efficient data handling.
  - Manage overall project development, including setting up the backend architecture and integrating various system components.



- Optimize system performance and scalability, ensuring the backend can handle large volumes of data and user requests.

Teesha:

- System Architecture, Database Management C DevOps:
  - Handle the “Deployment and DevOps” module of the project, specifically targeting cloud deployment and containerization.
  - Oversee the setup and management of Docker containers and Kubernetes clusters, ensuring smooth deployment and scalability.
  - Coordinate system integration among all modules (frontend, backend, AI), resolving conflicts and ensuring seamless communication.
  - Implement CI/CD pipelines for automated testing and deployment, managing version control and code quality.
  - Lead the project management activities, including setting timelines, managing sprints, and coordinating team efforts.

## COSTING

The current scope of our project does not involve any costs and can be completed using the resources we already have, along with free online packages and services. However, there may be a need for additional funding if the existing resources do not yield the desired outcomes. In such a case, the costs could potentially be covered by TPL. The estimated budget for this is outlined below:

Item/Service	Cost Range	Description
Data Storage/Hosting	\$10 - \$50	Depending on the cloud provider (AWS, Google Cloud, or Azure) used for claim processing, storage, or server costs.
AI Model Training (GPU Instances)	\$0 - \$200	Initial training can use free-tier services like Google Colab. Small-scale cloud GPU usage for model training would incur minimal costs for limited hours.
Image Processing API Services	\$0 - \$100	API services such as Google Vision can be limited to essential usage during early development, or alternatives

		like OpenCV can be used to reduce costs.
Database/Storage (Firebase)	\$0 - \$50	Firestore offers a generous free tier that covers most early-stage data storage needs. Costs may apply only if usage grows significantly beyond free limits.

## SUCCESS METRICS

Following are the Success Metrics with Key Performance indicators (KPIs) for Intelliclaim to measure its success and ensure continuous improvement:

- Operational Efficiency:

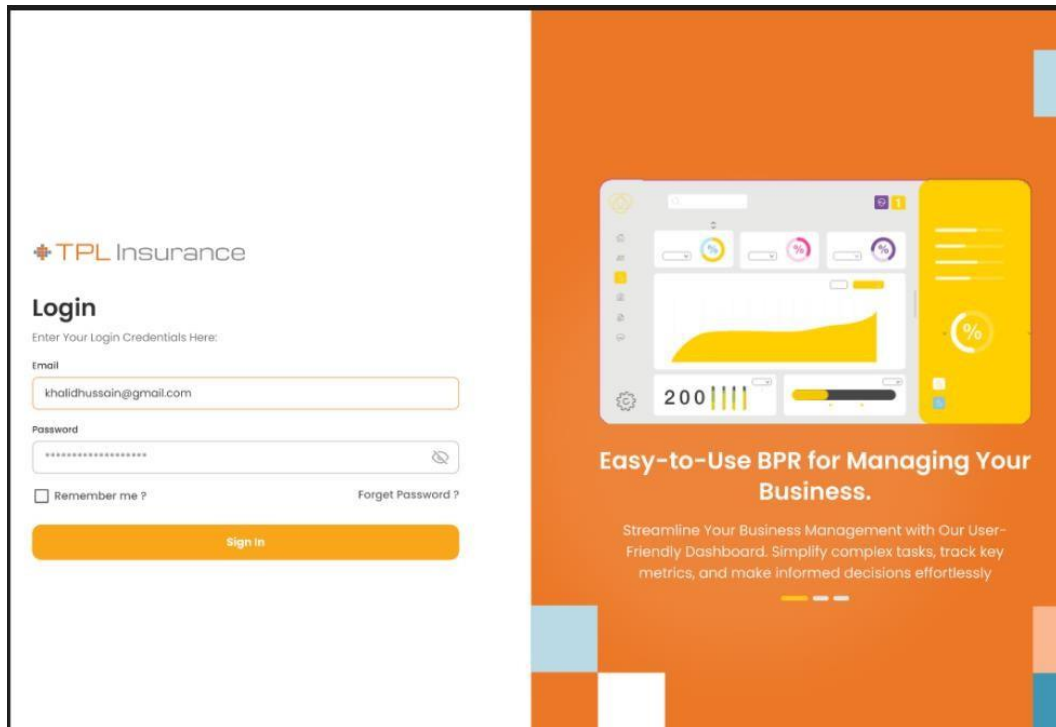
The goal is to reduce the time and cost of processing claims while improving overall efficiency. This can be tracked through specific metrics. Firstly, **Claim Processing Time** which measures the average time taken to assess and resolve the claim. Our aim will be to decrease this time. Secondly, **Claim Volume Handled**, representing the number of claims processed per day or week, our goal will be to increase this. This metric will compare the volume of claims processed before and after Intelliclaim's implementation.

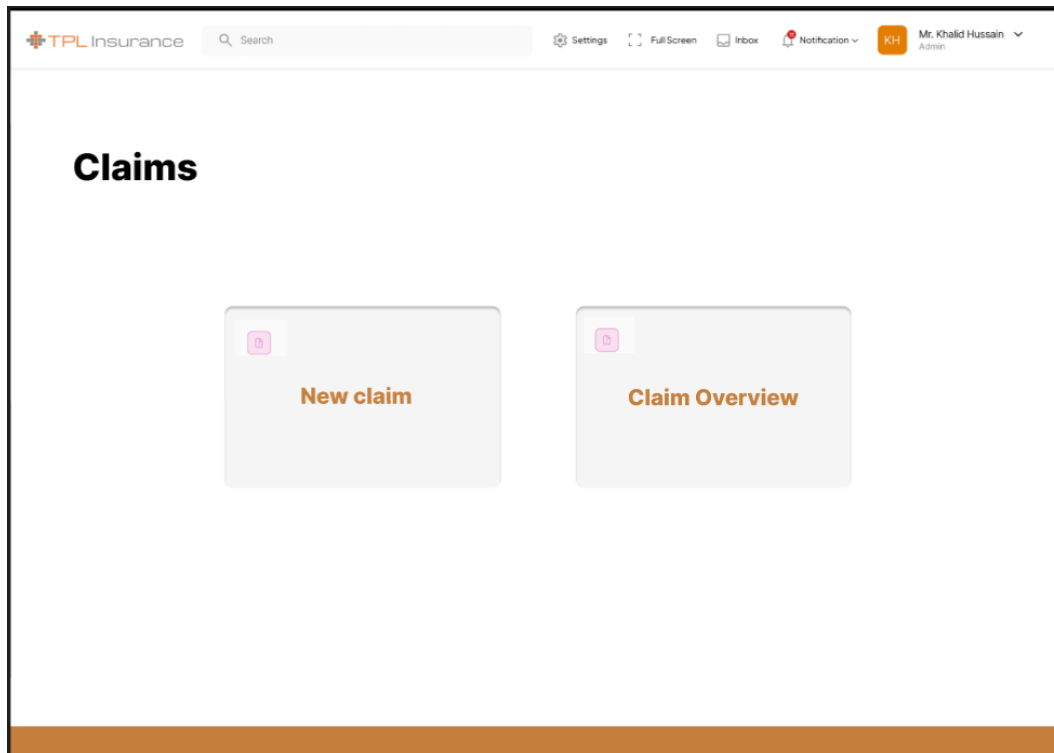
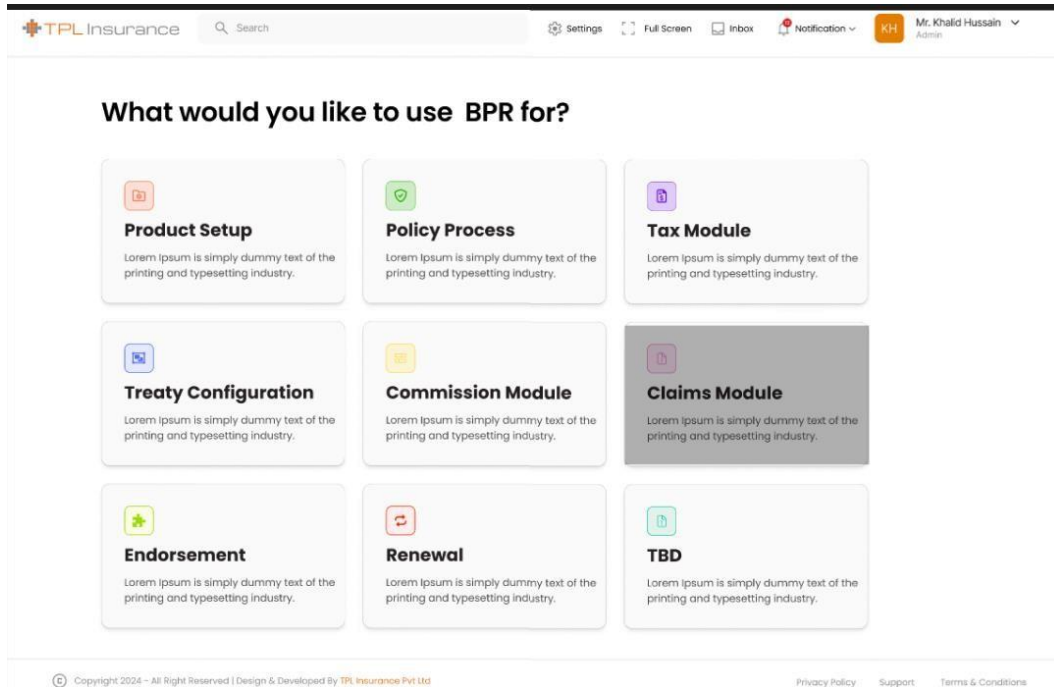
- Accuracy of AI Model :

The goal is that AI model delivers accurate damage detection and claim assessment. The specific goals and metrics are: **Model accuracy** which measures the AI's ability to correctly detect and segment vehicle damage and **Damage Estimate Consistency** which evaluates the alignment between repair cost estimates generated by the AI and those provided by human experts.

## APPENDIX

These wireframes serve as an initial blueprint, with potential adjustments to be made during the project's development phase.





The follow up page when user clicks 'New Claim'

TPL Insurance

Search

Settings

Full Screen

Inbox

Notification

KH

Mr. Khalid Hussain Admin

## Claim Intimation

Search Costumer

CLM-245LT

Q

Search

42201-69696969696

Q

Search

GF-2345

Q

Search

PJ12345U123456P.

Q

Search

PLY-12345

Q

Search

Policy Details

-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

TPL Insurance

Search

Settings

Full Screen

Inbox

Notification

KH

Mr. Khalid Hussain Admin

## Claim Calculation

Upload Survey Pictures

+

+

+

Add more

Calculate Claim

Your estimated claim is

Rs 50,000

TPL Insurance

Search

Settings

Full Screen

Inbox

Notification

KH Mr. Khalid Hussain Admin

## Workshop Selection

Select Claim Type

☒ Local claim
 ☐ Distant claim

Select location

Select Claim Nature

Accident

Select Workshop

Kia south

Generate slip

(here you can click to view the slip)

Email slip to thr surveyor

The follow up page when user clicks ‘Claim Overview’

TPL Insurance

Search

Settings

Full Screen

Inbox

Notification

KH Mr. Khalid Hussain Admin

## Claim Overview

Search Costumer

CLM-245LT

Search

Check the status of all your claims

	A	B	C
1	Claims #	Date	Status
2	Claim 1	21/6/2020	Processed
3	Claim 2	21/6/2021	Processed
4	Claim 3	21/6/2022	Error

## Regulatory Considerations

### 1. Data Protection Compliance (GDPR, CCPA):

IntelliClaim is required to abide by laws pertaining to data protection, such as the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR), guaranteeing:

- **Consent:** To gather data, express consent from the customer is required.
- **Data Minimization:** Only the information required to process claims should be gathered.
- **Right to Access/Erasure:** Clients are entitled to ask for their data to be accessed or deleted.
- **Data Security:** To avoid unwanted access, personal information must be encrypted and maintained securely.

### 2. Insurance Industry Regulations:

IntelliClaim is required to abide by the following rules pertaining to insurance:

- **Timely Processing of Claims:** Within the legally stipulated time limits, claims must be handled.
- **Openness:** Clients must be given concise justifications for any claims that are approved or rejected.
- **Accurate Assessments:** The system has to guarantee that evaluations of damage are both accurate and compliant with legal requirements.

## Ethics Considerations

### 1. AI Fairness and Bias:

For the assessment of damage and repair cost estimates, IntelliClaim's AI models must be unbiased to justify their conclusions. For fairness in results, Bias tests and frequent model reviews are necessary.

### 2. Using Ethical Data:

It's critical to handle client data sensibly, which involves:

- **Consent:** customers must provide their consent, once they are informed about how their data will be used.

- Data minimization: Information should only be collected if it is absolutely required to process claims.

### 3. Fraud Detection Using Human Monitoring:

While IntelliClaim uses AI to detect fraud, human monitoring should also be incorporated to prevent legitimate claims from being unintentionally denied or reported.

### 4. Transparency and Data Security:

All customer data stored in Firebase must be encrypted in order to ensure openness and trust. Customers must also be informed about the security and data storage policies.

## REFERENCES

[1] Deloitte, "AI Car Damage Recognition," *Deloitte*, [Online]. Available: <https://www.deloitte.com/lu/en/products/deloitte-ai-car-damage-recognition.html>. [Accessed: Sep. 28, 2024].

[2] Altoros, "Car Damage Recognition," *Altoros*, [Online]. Available: <https://www.altoros.com/solutions/car-damage-recognition>. [Accessed: Sep. 28, 2024].

[3] MAPFRE, "Artificial Intelligence for Vehicle Damage Assessment," *MAPFRE*, [Online]. Available: <https://www.mapfre.com/en/insights/innovation/artificial-intelligence-vehicle-damage-assessment/>. [Accessed: Sep. 28, 2024].