ANALYSIS OF WARRANTY DATA

TEAM MEMBER :

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PREPARED BY: INSIGHT STRATEGISTS

DATE: 18/2/23

Project Coordinator: L ANUSH BHARATHWAJ

Overview	Project Outline
0.Warranty Proposal	General description Of Project Mentor and Team Members.
1. Introduction	Does the proposal provide a succinct description of the phenomena, issue, or opportunity driving this project? Does it provide justification for why this project is necessary?
2. Project objectives	Does the proposal state the project's goals clearly? Are the sponsor's expectations for this project captured and reflected in the stated objectives?
3. Scope of the project	Does the proposal reflect a project scope that has been mutually agreed upon and is in line with the talks, negotiations, and decisions made during the initial meeting between the student team and sponsors?
4. Key Stakeholders of the project	Does the proposal list all pertinent project stakeholders?
5. Resource and time requirements	Does the proposal provide an accurate estimate of the project's resource and time needs?
6. Implementation plan	Does the proposal provide a thorough project implementation plan that shows the team considered and established a knowledge of the tasks necessary for this project's successful execution?
7. Data and computation set-up	Does it state whether the team has finished the data's preliminary work and readied it for in-depth analyses?
8. Potential risks	Does the proposal list and describe the main possible risks associated with this project?
9. Mitigation plans	Are there appropriate risk mitigation plans included in the proposal?
10. Literature review	conceptual framework, methodologies, and analytical techniques: Does the proposal review pertinent practitioner and scholarly literature on the project's business questions?

WARRENTY PROPOSAL

PROJECT TITLE	SET CONNECT RAC – WARRANTY ANALYSIS		
SUBMITTED BY	INSIGHT STRATEGIST	**SUBMITTED TO**	KrishnaMoortyVenugopal
INSTRUTOR NAME	Ramesh Rajagopalan	**TOTAL MEMBERS**	6
DATE SUBMITTED	18/02/2023	**PROJECTED START DATE**	07/2/2023

INTRODUCTION

- Information On the Caliber and Dependability of a Product Can Be Found in Warranty Claims and Supporting Documentation. In Order to Identify Early Warnings of Abnormalities in Their Products, Provide Useful Information About Failure Modes to Aid Design Modification, Estimate Product Reliability for Deciding on Warranty Policy, And Forecast Future Warranty Claims Needed for Developing Financial Plans, Manufacturers Can Benefit from Analyzing Such Data.

- In Conjunction with The Sale of a Product, A Manufacturer (Also Known as A Vendor or Seller) Is Legally Obligated to Provide a Warranty. In General, The Goal of a Warranty Is to Establish Liability in The Event That a Product Fails Early Or Is Unable to Work as Planned.

- Claims Data and Supplemental Data Make Up Warranty Data.

- One Of the Most Significant and Urgent Concerns Facing the Industry Is Still Warranty Management. Warranty Programs Are Used by Automakers and Their Dealers to Attract and Keep Consumers.

PROJECT OBJECTIVE

- The Goal of The Analysis Is to Identify Key Variables That Could Affect Whether a Consumer Will Make a Warranty Claim for A Genuine or Counterfeit Item After an Item Is Sold.

- What Does Warranty Fraud Mean?

- Review Acute Warranty Failure: Warranty Management.

- In The Event That A "Serial Flaw" Is Found by A Large Buyer, A Warranty May Also Fail to Fulfill Its Fundamental Obligation.

- Implementing suitable warranty servicing strategies when the warranty is in effect.

- There are various methods for analyzing warranty in business; the common flow Issue of a product under warranty from the dealer to the vehicle manufacturer in order to verify a warranty.

PROJECT SCOPE

- Obtain Information About the Client and The Offering

- Make Sure the Warranty Claim Is Legitimate.

- Identify Whether You Need New Parts, And If So, Place an Order for Them.

- Ascertain Whether Service Is Necessary, And If It Is, Schedule A Field Technician.

- Examine The Data from The Service Visit.

- To Ensure That the Issue Has Been Handled, Follow Up with The Customer.

- Finish The Case.

KEY STACKEHOLDER

- A Crucial Participant for The Warranty Is Essential to The Long-Term Profitability of a Business. Stakeholders Can Aid Businesses in Risk Management, Strategic Decision-Making, And Corporate Expansion.

- The Function of a Major Stakeholder Inside a Company Is Dependent on A Variety of Variables. The Duties of Important Parties May Include:

  1. Financial Assistance for Your Business
  2. Assisting With Projects or Initiatives for The Workplace
  3. Requesting Information About the Latest Developments or Ongoing Initiatives for Your Company
  4. Participating In Planning or Executive Meetings for The Company

ADTIONALLY STACKEHOLDER

STAKEHOLDER NAME	STAKEHOLDER ROLE
Aadinath sales and services	Air Processing Unit - APU
D.B. Automobiles	Quick Release Valve - QRV
Spectra Cargo Engineers	ABS ECU - Electronic Control Unit for Mahindra.
SHREE KRISHNA AUTOMOBILES	Active Sensor for TATA Motor.
HINDUSTAN DIESEL	Inversion Relay Valve - IRV
Chopra Sales & Service	Pressure Sensor
Laxmi Air Brake System	VTS - ECU
TAURUS TURBO	SLU - Shift lever Unit
Johnson Auto Garage	Relay Valve

TIMELINE / MILESTONES

OVERVIEW

- The estimated time to Complete (ETC) of a project is a measurement of the time and effort needed to accomplish all of the project's tasks.

1) **Bottom-up estimating:**
   - This strategy entails breaking the project down into individual tasks or activities and estimating how long it will take to finish each one. The sum of the various estimations equals the overall time estimate for the entire project.

2) **Comparison-based estimation:**
   - Comparative or equivalent estimation entails comparing the timing of previous projects to the current one. The ETC is calculated using historical data in this way.

3) **Estimating parametrically:**
   - Using this technique, you estimate the time needed for one work and multiply that estimate by the number of related tasks the project entails.

MILESTONE	DEADLINE
1) Import The Data, Inspect and Clean It, Remove Any Missing Values	25/2/23
2) Exploratory And Statistical Data Analysis	01/2/23
3) Descriptive Statistics Testing	06/3/23
4) Data Visualization Using Gg Plot / Plot nine	12/3/23
5) Logistic Regression	19/3/23
6) Confusion Matrix and Cumulative Probability Chart	26/3/23
7) Linear Regression Model	01/4/23
8) Nonlinear Regression Mode	05/3/23

PROJECT COST AND RESOURCE ESTIMATE

OVERVIEW

- Predicting the overall cost of the activities, time, and resources needed to complete the scope of work for a project is known as project cost estimating.

1) Cost of the material:

➢ Typically, you think of the material as the asset's physical makeup. However, the cost components of scrap material or manufacturing spares, building form work and safety items, as well as the cost of transporting the material to the job site, may also be included in the asset's worth.

2) Labor Of Cost:

➢ The cost of labor is the work that must be done in order to finish an activity or create an asset, such as painting a building or soldering electrical contacts.

➢ The work of the engineer who creates the design, the foreman who oversees the field operation, or the technician who looks after the wave soldering equipment is also considered labor.

3) Additional Fees:

➢ The resources required to support the asset or activity are represented by overhead. Examples include the cost of a home office, the cost of running the plant on energy, rent, and financing expenses.

➢ Even while time and money are occasionally considered resources, they simply permit or restrict the usage of the physical resources previously mentioned. The price of the resources utilized to produce each activity or item determines its cost.

NEEDS / INVESTMENT	COST
TRAINING / DOCUMENTATION (BOOKS)	Rs 180
HARDWARE (PENDRIVE/HARDISK DRIVE)	RS 1000
SOFTWARE (Tableau Professional / Power Bi Pro)	Rs 1000 (Optional)
OTHER	Rs 60
ESTIMATE TOTAL	Rs 2240

IMPLEMENTATION PLAN

OVERVIEW	
	• A project implementation plan for warranty is a document outlining the process for carrying out a project. Implementation plans outline the project's strategic goals and steps, specify the schedule for completion, and describe the resources (such as team members) required for a job well done.
	• Project execution strategy Includes Activities Like:
	1) Know what the business requires
	2) Identify the sources of the data
	3) Build the infrastructure for data
	4) Selecting a tool for real-time data analytics

SNO	TASK NAME	ASSIGNED TO	START DATE	END DATE	DURATION IN DAYS
1	Import The Data, Inspect and Clean It, Remove Any Missing Values.	BALAMURUGAN B	26/2/23	01/3/23	3
2	Exploratory And Statistical Data Analysis.	DHATCHANA H	02/3/23	06/3/23	4
3	Descriptive Statistics Testing.	ANUSH BHARATHWAJ L	07/3/23	12/3/23	5
4	Data Visualization Using Gg Plot / Plot nine.	HIRTHICK RAJ	13/3/23	19/3/23	6
5	Logistic Regression.	DHINAKARAN D G S	20/3/23	26/3/23	6
6	Confusion Matrix and Cumulative Probability Chart.	ABISHEK V	27/3/23	01/4/23	5
7	Linear Regression Model.	DHATCHANA H	02/4/23	07/4/23	5
8	Nonlinear Regression Model.	ANUSH BHARATHWAJ L	08/4/23	13/4/23	5
9	conclusion.	BALAMURUGAN B	14/4/23	15/4/23	1

DATA AND COMPUTATION SET-UP

- There Are a Variety of Alternative Uses for Warranty Data, Including the Following:

  - ❖ To Identify Problems with Production Processes, Parts, And Designs Early On.

  - ❖ In Order to Provide Helpful Data for Product Change and Enhancement.

  - ❖ To Determine and Describe the Price of Warranty Claims.

  - ❖ To Forecast the Cost of Upcoming Warranty Claims.

  - ❖ Determining The Right Warranty and Maintenance Policies by Estimating Product Reliability.

- A Free and Open-Source Python Library for Scientific and Technical Computing Is Called SciPy, NumPy, Matplotlib, And Pandas.
- These Libraries' Modules Include Those For-

  - ❖ Optimization
  - ❖ Algebraic Linear
  - ❖ Integration
  - ❖ Special Function
  - ❖ Processing Of FFT Signal and Images
  - ❖ Solving ODE

- To Determine the Product's Reliability in Order to Decide on A Warranty Policy and The Best Maintenance Strategy.
- A Tool for Machine Learning Is Called TensorFlow. While TensorFlow Has a Wide Range of Features, Deep Neural Network Models Are Its Primary Focus.
- A High-Level Neural Network API Called KERAS Was Created in Python and May Be Used with TensorFlow, CNTK, Or Theano.

POTENTIAL RISK

- **Dealer Cost:**

  1. The Manufacturer or Retailer Contracts with An Insurance Carrier and Third-Party Administrator to Handle All Underwriting and Possibly Claim Management (TPA).

  2. In Addition to The Dealer Cost, The Manufacturer or Retailer for Warranty Claims Also Adds Their Own Markup and Sells Contracts.

  3. May Not Be Able to See the Claims Data.

  4. Pricing Freedom Is Constrained.

- **Profit Share:**

  1. The Carrier Determines Profit Share Calculations Based on Actuarial Analysis and Premium Revenue Trends.

  2. Although The Manufacturer or Retailer May Be Responsible for Claim Administration, The Insurer Controls Approval.

  3. Actuarial Analysis Frequently Contains Severe Flaws That Result in Unnecessarily High Expenses, Rates, And Pricing.

  4. The Manufacturer or Merchant Will Not Be Aware of Undiscovered Optimization Opportunities Without Cutting-Edge Risk Oversight.

- **Lack of awareness about future change:**

  1. This Is Especially True in Predictive Analysis, Which Uses Historical Data to Provide Probabilistic Forecasts for The Future. The Largest Danger in Making Such Predictions Is That the Environment Can Change in The Future, Making the Past Insufficiently Predictive of The Present.

MITIGATION PLANS

- When Contracts Are Sold, You Should Record All Revenue.

- **Transfers Risk:** The Manufacturer or Retailer's Books Are No Longer Open to Danger.

- Underwriting Profits Might Have a Sizable Profit Share.

- Possibly More Open Information About Claim Trends and Outcome Rates

- **Risk Transfer:** The Manufacturer or Retailer No Longer Has Any Risk on Their Books.

- When Contracts Are Sold, You Should Record All Revenue.

- Retain The Risk.

- Possibility Of Compliance Risk.

- Possibly Not a Core Competency

- Income May Be Postponed During the Course of The Contract Without the Involvement of The Carrier.

- Insurance And Legal/Compliance Skills Are Necessary.

- Requires Cutting-Edge Modeling and Analytic Skills to Fully Reap the Rewards.

LITERATURE REVIEW

- In general, predicting warranty claims involves estimating the anticipated volume of claims and/or the associated costs for the warranty coverage. Forecasting warranty claims is crucial for a company's finance department as they create their budgets.

- **Bivariate strategy**

  - ❖ The bivariate technique uses warranty data to directly estimate a combined bivariate distribution. bivariate failure model with a method to calculate the density function of failure using a log-log 11 model using data on vehicle warranty claims indexed by time and mileage.

- **Marginal strategy**

  - ❖ The marginal method makes the assumption that, while consumption intensity varies among customers, it remains constant for a given consumer over the warranty duration. The consumption rate is therefore a random variable.

ADDTIONALLY INFO ABOUT LITERATURE REVIEW

- **Analysis depending on age:**

  - Age-based field reliability estimation has not received much attention in the literature.
  - This might be because methods for predicting field reliability, given comprehensive age information, are well established.

- **Covariate evaluation:**

  - ❖ Claim frequencies could be influenced by a variety of different elements.
    - ➤ Details on the kinds and frequency of issues
    - ➤ Manufacturing details of the things being used
    - ➤ The volume of use and the environment

- **Approach in two dimensions (2-D):**

  - A large portion of the literature on warranty analysis takes into account failure models that are indexed by just one factor, like age or mileage. There are instances where a number of features are combined as standards for determining whether a defective product qualifies for warranty coverage. For autos, for instance, age and mileage restrictions may occasionally apply to warranty coverage.

  - For instance, while analyzing 2-D warranty data, we must gather information on both the age and usage of the items if we wish to predict the distribution. The fact that the maker of some products might not be aware of the item's age or usage complicates the situation.

  - Three methods—marginal approach, bivariate approach, and composite scale approach—have been put forth in the literature to evaluate 2-D warranty data with uncertain censoring times.