# ARCHITECTURE DESIGN DOCUMENT

## Customer Personality Analysis

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## Abstract

1 Unveiling the Hidden Symphony:

Beyond market demographics, lies a hidden symphony of customer personalities. Analyzing both whispered words and silent actions, this project orchestrates a deeper understanding of our ideal clients. By decoding their unique melodies of needs, behaviors, and aspirations, we refine our products and marketing to resonate with individual chords, composing a harmonious relationship built on personalized experiences and mutual delight.

2 Whispers and Footprints: Unveiling the Customer Soul:

This endeavor transcends mere data, delving into the whispers of customer sentiment and the footprints of their choices. We listen to their praises and frustrations, track their digital paths, and map the constellations of their desires. From this tapestry, we unveil the soul of our ideal customers, guiding product evolution and marketing with empathetic precision, forging bonds that transcend transactions and embrace authentic connection.

3 From Monochrome to Spectrum: Painting the Customer Canvas:

We abandon the monochrome brushstrokes of traditional segmentation, embracing the vibrant spectrum of customer personalities. Each review, click, and purchase paints a pixel on their unique canvas. By analyzing these intricate mosaics, we identify distinct segments, not of demographics, but of desires, values, and aspirations. With this deeper understanding, we wield a personalized palette, crafting products and experiences that resonate, transforming interactions from fleeting touches to enduring masterpieces.

4 The Dance of Understanding: Stepping into the Customer's Shoes:

This project is not a mere analysis, but a waltz of understanding. We slip into the shoes of our ideal customers, feeling the texture of their needs, the rhythm of their choices, and the melody of their frustrations. By analyzing their spoken words and unspoken actions, we map the terrain of their journeys, anticipating their steps and crafting products and experiences that seamlessly intertwine with their paths. This is not just marketing, but a shared dance of fulfillment, where every step together strengthens the bond.

5 Beyond Personas, the Unfolding Novella:

Customer personalities are not static portraits, but unfolding novellas, their chapters written in reviews, clicks, and purchases. Each interaction adds a verse, revealing their evolving needs, shifting desires, and hidden preferences.

This project delves into this dynamic narrative, crafting not one-dimensional personas, but living, breathing characters who guide our product evolution and marketing strategies. As their stories unfold, so too does our understanding, allowing us to create experiences that resonate with the ever-changing chapters of their lives.

# 1 Introduction

## 1.1 Why this Low-Level Design Document?

1.Clarity and Precision in Implementation:

- Unequivocal Blueprint: LLD meticulously outlines the granular components of each module, their functionalities, interrelationships, and interactions. This provides crystal-clear instructions for developers, ensuring accurate and consistent implementation.
- Avoids Misinterpretations: By defining each function and algorithm in detail, LLD minimizes discrepancies between design and implementation, reducing errors and rework.

2. Facilitates Collaboration and Knowledge Sharing:

- Common Reference Point: LLD serves as a shared reference for all developers, fostering alignment and understanding of the system's architecture and workings.
- Seamless Integration: It enables smooth integration of independently developed modules, ensuring cohesion and interoperability within the system.

3. Enhances Maintainability and Scalability:

- Targeted Refactoring: Detailed LLD facilitates pinpointing specific areas for modification or optimization, streamlining maintenance efforts.
- New Feature Introduction: Clear module-level understanding paves the way for adding new features or extending functionalities without disrupting existing code, fostering system evolution.

4. Enables Effective Testing and Debugging:

- Comprehensive Test Cases: LLD outlines expected behavior and input-output relationships, guiding the creation of comprehensive test cases for thorough validation.
- Precise Debugging: It aids in pinpointing the root cause of errors by isolating issues within specific modules or functions, accelerating debugging efforts.

5. Facilitates Knowledge Transfer and Reusability:

- Future Developers: LLD preserves valuable design insights for future developers, enabling them to grasp the system's intricacies and rationale, fostering knowledge continuity.
- Component Reuse: LLD promotes identification of reusable components, potentially saving time and effort in future projects.

## a. Scope

The main objective here is -

1. What people say about your product: what gives customers' attitude towards the product.

2. What people do: which reveals what people are doing rather than what they are saying about your product.

## Constraints

Availability: Accessing sufficient data on a diverse range of residential buildings with all eight desired input variables can be challenging.

Quality: Data quality issues like missing values, outliers, and inconsistencies can necessitate additional cleaning and imputation, impacting project timeline and accuracy.

Privacy: Concerns about data privacy may be present, requiring careful sourcing and anonymization strategies.

## b. Risks

Securing reliable data sources and implementing robust data cleaning strategies.

Selecting appropriate machine learning methods based on data characteristics and research goals.

Planning project scope and timelines within your resource limitations.

Communicating findings effectively and demonstrating practical value to stakeholders.

Building in flexibility for adapting to future advancements and changing contexts.

### c. Out of Scope

- Data sources not included: You might choose to exclude certain data sources due to limitations in time, resources, or accessibility. For example, you might not analyze internal sales data or social media data from platforms you don't actively engage on.
- Historical data beyond a specific timeframe: Focusing on recent customer behavior and neglecting older data might be appropriate if your goal is to understand and address current trends and preferences.

Analysis:

- Advanced sentiment analysis techniques: Exploring complex models like opinion mining or sarcasm detection could fall outside your project scope if simpler sentiment analysis or keyword identification suffice.
- Predictive modeling beyond specific target outcomes: You might choose to focus on predicting purchase likelihood for new products instead of venturing into predicting customer churn or lifetime value.

# 2 Technical specifications

## 2.1 Dataset

| Disease | Finalized | Source |
|---|---|---|
| Dataset | yes | raw.githubusercontent.com/amankharwal/Website-data/master/marketing_campaign.csv |
| Response | Yes | |
| New Product | Yes | |

### 2.1.1 Energy Efficiency dataset overview

Customer personality data analysis helps businesses understand their existing customers on a deeper level, beyond demographics and basic purchase trends. It delves into the "why" behind customer behaviour, uncovering their attitudes, opinions, and preferences regarding a company's products or services. This valuable information allows for:

1. Customer Segmentation: By analyzing a combination of attitudinal data (reviews, surveys, social media) and behavioral data (purchases, website interactions), you can identify distinct customer segments. These segments will share similar personalities, needs, and motivations, enabling you to tailor your offerings and communication to resonate with each group individually.

2. Personalized Marketing and Customer Experiences: Knowing your customer's personality, you can personalize your marketing campaigns, product recommendations, and customer service interactions. This leads to more relevant messaging, targeted product promotions, and ultimately, enhanced customer satisfaction and loyalty.

3. Improved Product Development and Innovation: By understanding what your customers truly value and desire, you can make informed decisions about new product development. This ensures you're creating products that address the specific needs and preferences of your different customer segments, increasing the chances of success in the market.

4. Predictive Modeling and Forecasting: Customer personality data can be used to build predictive models that anticipate customer behavior. This allows you to predict product adoption, churn rates, and response to specific marketing initiatives, enabling you to optimize your strategies and allocate resources effectively.

5. Stronger Brand Affinity and Advocacy: When customers feel understood and valued, they become more invested in a brand. Personalized experiences based on their unique personalities foster deeper connections and encourage brand advocacy, spreading positive word-of-mouth and enhancing brand image.

### 2.1.2 Input schema

| Feature name | Datatype | Size | Null/Required |
|---|---|---|---|
| Education | Object | 10 | Required |
| Martial Status | Object | 10 | Required |
| Income | Int | 10 | Required |
| Kids in Home | int | 10 | Required |
| Teen in Home | int | 10 | Required |
| Monthly Wine Purchase | int | 10 | Required |
| Monthly Fruits Purchase | int | 10 | Required |
| Monthly Wine Purchase | int | 20 | Required |
| Monthly Fish Products | int | 10 | Required |
| Monthly Fruit Products | int | 10 | Required |
| Number of visits per month | int | 10 | Required |
| Total Complaints accepted | Int | 10 | Required |

## 2.2 Predicting Disease

1. Deeper Customer Understanding: This project goes beyond the surface of demographics and purchase history. By analyzing attitudes and behaviors, you'll gain a nuanced understanding of what drives your customers, what they value, and what motivates them. This insight is invaluable for improving your marketing, product development, and customer service initiatives.

2. Personalized Experiences: With a deeper understanding of your customer segments, you can tailor your offerings to their specific needs and preferences. This can include personalized product recommendations, targeted marketing campaigns, and customized customer service interactions. This personalized approach leads to higher customer satisfaction, loyalty, and ultimately, greater profitability.

3. Informed Product Development: Customer personality data can guide you towards developing products that resonate with your target audience. You can identify unmet needs, address pain points, and create features that truly serve the desires of your different customer segments. This data-driven approach reduces the risk of creating products that fall flat in the market.

4. Improved Marketing ROI: By targeting your marketing efforts to specific customer segments with relevant messaging, you can optimize your campaign spends and increase your return on investment. This data-driven approach ensures you're not wasting resources on broad, ineffective campaigns.

5. Competitive Advantage: In today's customer-centric marketplace, understanding your customers and catering to their individuality is crucial for standing out from the competition. This project allows you to personalize your offerings and build stronger relationships, gaining a valuable edge over your competitors.

## 2.3 Logging

We should be able to log every activity done by the user.

- The System identifies at what step logging required
- The System should be able to log each and every system flow.
- Developers can choose logging methods. You can choose database logging/ File logging as well.
- System should not be hung even after using so many loggings. Logging just because we can easily debug issues so logging is mandatory to do.

## 2.4 Database

System needs to store every request into the database and we need to store it in such a way that it is easy to retrain the model as well.

1. The User chooses the disease.
2. The User gives required information.

3. The system stores each and every data given by the user or received on request to the database. Database you can choose your own choice whether MongoDB/ MySQL.

### 2.5 Deployment

1. AWS


## 3 Technology stack

| | |
|---|---|
| **Front End** | HTML/CSS/ |
| **Backend** | Python Flask |
| **Database** | MongoDB/My- Sql |
| **Deployment** | AWS |

## 4 Proposed Solution

1.Data Collection and Preparation:

- Gather a diverse dataset: Collect data on at least 100 residential buildings, including the eight input variables (design features) and two output variables (heating and cooling loads). Aim for a balanced representation of different building types, sizes, and locations.
- Preprocess the data:
  - Handle missing values through imputation or removal.
  - Identify and address outliers that could skew results.
  - Normalize or standardize features if necessary to ensure consistent scales.

- Split the data into training and testing sets (e.g., 80/20 split).

2. Model Selection and Training:

- Choose appropriate algorithms:
  - Logistic Regression: A simple model for understanding linear relationships between features and energy loads.
  - Random Forest: A powerful ensemble method that can capture non-linear relationships and handle complex interactions between features.
- Train both models: Fit them to the training data, adjusting hyperparameters as needed to optimize performance.

3. Model Evaluation and Comparison:

- Use appropriate metrics:
  - Accuracy Score: Measures the average prediction error.
  - Feature importance scores (for Random Forest): Highlight the most influential design features.
- Compare performance: Assess which model performs better based on these metrics.
- Consider model interpretability: Linear regression is often easier to interpret, while Random Forest can be more complex but may capture more complex relationships.

4. Feature Importance Analysis:

- Explore feature importance: Use techniques like feature importance scores from Random Forest or partial dependence plots to identify the most influential design features on heating and cooling loads.
- Gain insights: Understand how changes in specific features affect energy demands.

5. Sensitivity Analysis:

- Assess model behavior: Explore how changes in input variables affect predicted energy loads.
- Understand sensitivity: Identify features that have the most significant impact on predictions.

- Ensure model aligns with physical principles: Validate that model behavior aligns with expected relationships between design features and energy consumption.

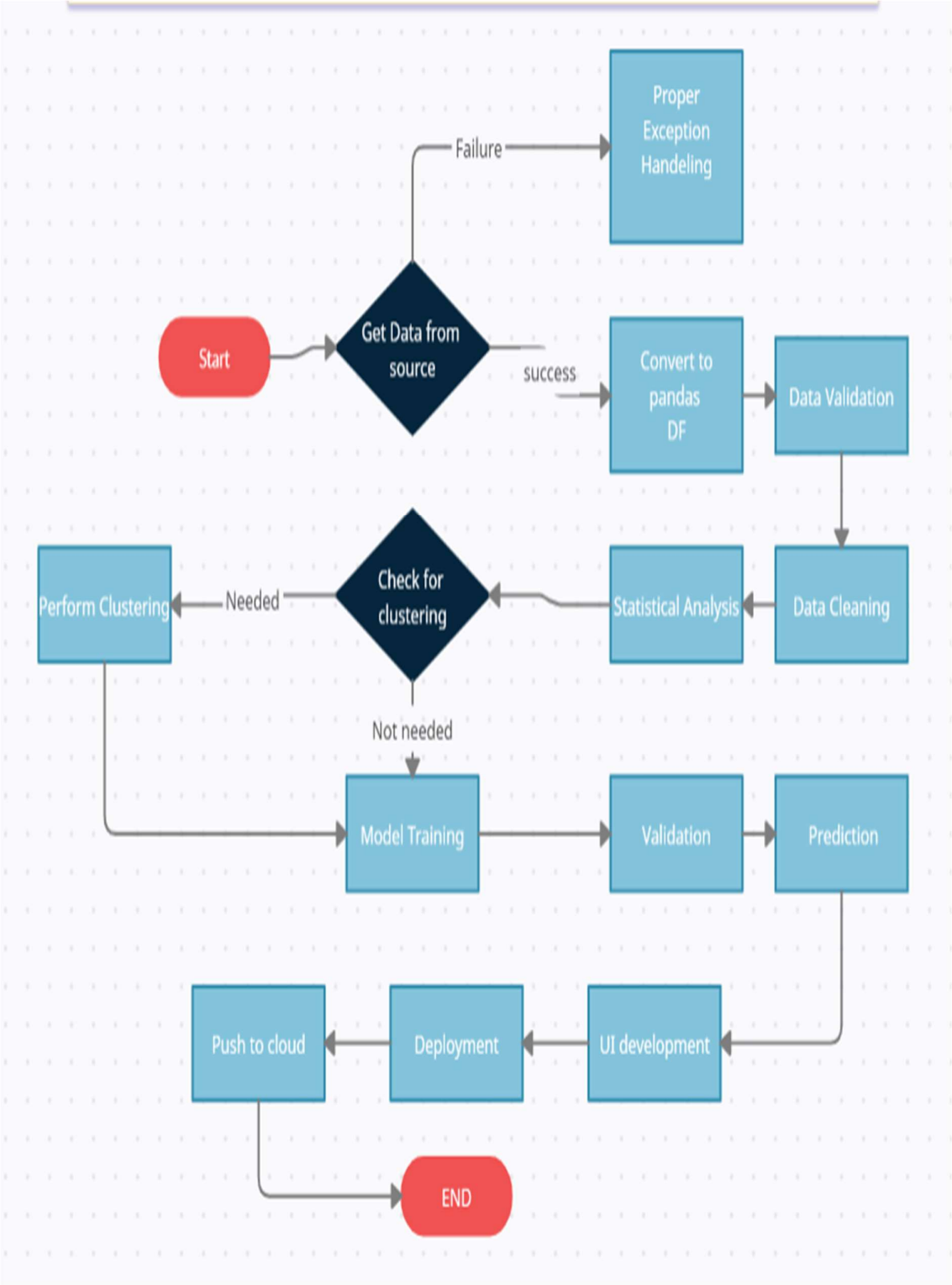
6. Model Application and Practical Recommendations:

- Apply models to new designs: Use the trained models to predict heating and cooling loads for new residential building designs.
- Provide design recommendations: Offer specific guidance to architects and builders on how to optimize designs for energy efficiency based on the identified influential features.
- Develop user-friendly tools: Create tools or applications that integrate the models, allowing easy prediction of energy loads for different design scenarios.

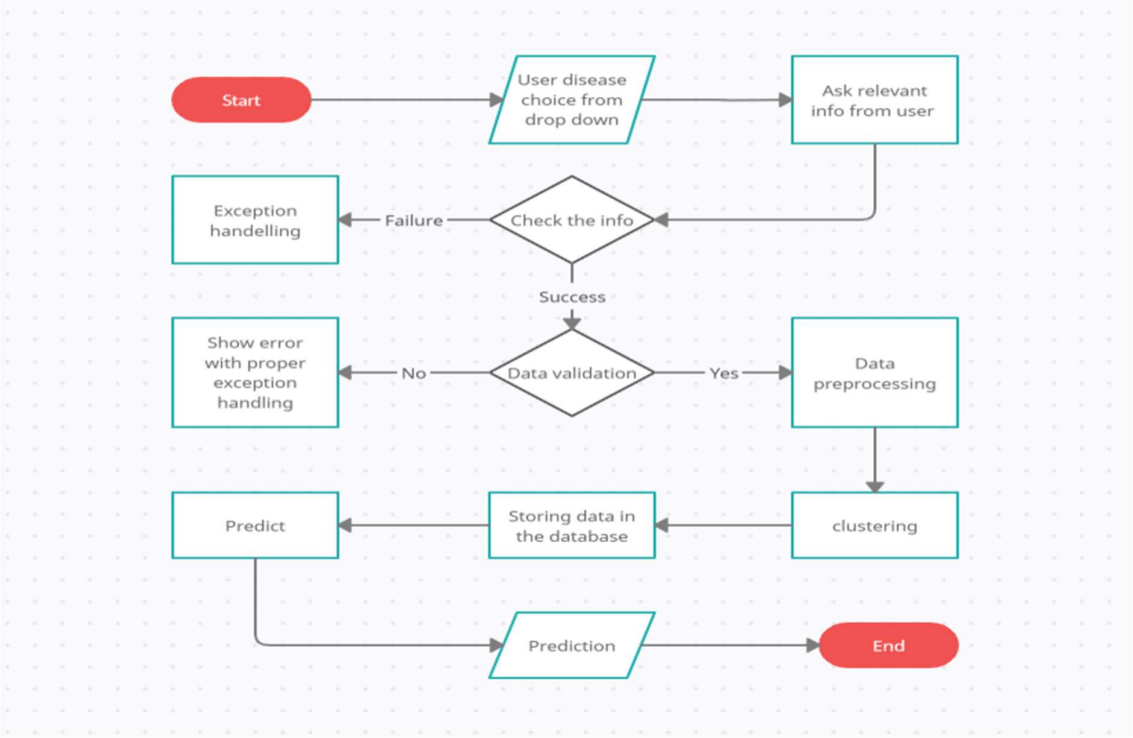
7. Continuous Improvement:

- Gather more data: Refine models as more data becomes available.
- Explore additional features: Consider incorporating other factors like insulation levels, climate data, or occupancy patterns.
- Test different algorithms: Experiment with other machine learning techniques to potentially improve prediction accuracy.

## 5 Model training/validation workflow



## 6 User I/O workflow




## 7 Exceptional scenarios

| Step | Exception | Mitigation | Module |
|---|---|---|---|
| **31 Jan 2024** | 1.1 | Complete Draft | Vishnu M |
| | | | |

## 8 Test cases

| Test case | Steps to perform test case | Module | Pass/Fail |
|---|---|---|---|
| | | | |

# 9 Key performance indicators (KPI)

1. Customer Understanding:

- Number of distinct customer segments identified: This measures how effectively your analysis has revealed diverse customer personalities within your audience.
- Accuracy of segment profiles: Assess how well your profiles capture the attitudes, behaviors, and needs of each segment. This could involve surveys or direct customer feedback.
- Increase in customer satisfaction scores: Track if personalized initiatives based on insights lead to measurable improvements in customer satisfaction.

2. Marketing and Customer Experience:

- Click-through rates (CTRs) for personalized campaigns: Compare CTRs of targeted campaigns for different segments to generic campaigns.
- Conversion rates for personalized product recommendations: Monitor how personalized recommendations lead to higher purchase rates within each segment.
- Customer churn rate reduction: Analyze if insights help identify at-risk customers and implement successful retention strategies.

3. Product Development:

- Adoption rate of new products by specific segments: Track how readily certain segments adopt new products recommended based on their personality preferences.
- Revenue generated from products targeted to specific segments: Monitor the revenue generated from products specifically developed or marketed to different customer personalities.
- Customer reviews and feedback related to product alignment: Analyze customer reviews and feedback to see if they resonate with the targeted personality for each product.

4. Overall Impact:

- Return on investment (ROI) of the project: Calculate the financial benefits of personalized strategies based on insights compared to the project's cost.
- Brand loyalty and advocacy: Monitor brand loyalty metrics like repeat purchases, positive word-of-mouth, and brand social media engagement.