Consulting Project

Designing a Dynamic Subscription Pricing Mechanism for Smart Energy-Saving Home Appliances in India

Background:

The rapid adoption of smart, energy-efficient home appliances is transforming the Indian consumer market. With rising electricity costs, increasing urban energy demand, and government incentives for energy-efficient appliances, companies are exploring new business models that make advanced appliances affordable while encouraging responsible energy consumption. One such model is the Smart Energy-Saver Subscription Program (SESP), where customers pay a monthly subscription fee for using a smart appliance equipped with an IoT-based monitoring system. In this context, your task is to design an innovative subscription pricing mechanism that promotes energy-efficient behavior, ensures affordability for Indian households, and maintains profitability for the appliance manufacturer.

Scenario:

You are a consultant for a leading home appliance manufacturer planning to launch a subscription-based smart appliance program in India. Through SESP, customers receive a smart appliance (e.g., air conditioner, refrigerator, washing machine) at a subsidized upfront cost and pay a monthly subscription fee based on their usage. The integrated IoT sensor monitors consumption patterns, enabling the company to offer rewards for low usage, penalties for excessive consumption, and dynamic pricing tiers. The company now faces challenges in designing a subscription mechanism that aligns customer incentives with energy efficiency goals while addressing participation constraints, incentive compatibility, and moral hazard. The mechanism must balance customer affordability, responsible usage, and profitability for the manufacturer.

T**ask:**

1. Subscription Pricing Mechanism Design:

- Design a formula/structure to determine the monthly subscription fee based on:
  - The appliance's market value (MRP)
  - Customer's estimated energy usage baseline
  - Degree of subsidy provided (if any)
  - Features of the smart appliance
- Introduce a reward–penalty mechanism for consumers based on monthly energy usage captured by the IoT system.
- Ensure that the pricing and incentives collectively:

- Encourage efficient energy usage
- Make the plan attractive compared to outright purchase
- Safeguard the manufacturer's profitability

2. Incentive Compatibility and Participation Constraints:

- Ensure that the proposed subscription structure satisfies:
  - **Participation Constraint:** Consumers must find the SESP subscription more attractive than:
    - ✓ Buying the appliance upfront
    - ✓ Standard warranty or annual maintenance charge-based models
  - **Incentive Compatibility:** The mechanism should motivate consumers to:
    - ✓ Use appliances efficiently
    - ✓ Lower their electricity usage to maximize rewards
    - ✓ Avoid misuse or unnecessary consumption
- Clearly explain how your design prevents users from exploiting the reward system while still promoting adoption.

3. Address Moral Hazard:

- Identify potential moral hazard issues, such as:
  - Overuse due to subsidized appliance access
  - Intentional misuse leading to faster wear and tear
  - Free-riding on maintenance and repairs
- Propose measures to mitigate these risks
- Discuss how these measures align with incentive compatibility.

4. Profitability Analysis:

- Estimate and compare the company's profitability before and after implementing the SESP model.
- Use hypothetical data to demonstrate:
  - Revenue generated from subscription fees
  - Cost savings due to improved customer usage behavior
  - Impact of subsidies, IoT installation costs, and maintenance expenses

- Reduction in warranty and service claims due to monitored usage
- Net effect on overall profit

- Use tables, charts, or simulations to support your analysis.

5. Considerations Specific to India:

Incorporate India-specific contextual factors, such as:

- Wide variation in consumption patterns (urban vs. semi-urban vs. tier-3 households)
- Price sensitivity of middle-income customers
- Power supply variability, voltage fluctuations
- Seasonal demand fluctuations (e.g., AC usage in summer)
- Government push for energy-efficient appliances (Bureau of Energy Efficiency BEE star ratings)
- Competition from low-cost domestic brands and informal repair markets
- Cultural preferences for ownership rather than subscription models

Deliverables:

A detailed report that includes:

- The subscription pricing formula and its rationale
- Reward–penalty structure with clear justification
- Simulation results with hypothetical usage data demonstrating the impact of the SESP model. Please also submit the code/analysis in a separate file.
- A profitability comparison for the company (before vs. after implementation)
- A set of measures to address moral hazard
- A discussion of how your mechanism satisfies participation and incentive compatibility constraints
- Practical recommendations for launching SESP in the Indian market

Note: Students who are interested in converting this project into a full teaching case, research paper, or conference submission are most welcome to contact me after completing the project. I will be happy to guide and collaborate on further development.