Case Studies & Guesstimates for E-Commerce Industries

The e-commerce industry has fundamentally transformed the way people shop and conduct business, becoming a vital part of the global economy. In today's era, its importance is highlighted by the convenience and accessibility it offers, allowing consumers to shop anytime and anywhere. E-commerce breaks down geographical barriers, enabling businesses to reach a global audience and fostering international trade. It also brings cost efficiencies, reducing overhead costs compared to traditional brick-and-mortar stores. The industry thrives on innovation, with advancements in technology continually enhancing the shopping experience.

Data scientists play a crucial role in the growth and evolution of e-commerce. Their expertise in data analysis helps businesses understand customer behaviour, preferences, and purchasing habits, enabling personalised marketing and improved customer experiences. They optimise inventory management through predictive analytics, ensuring products are available when needed while minimising excess stock. Data scientists also develop dynamic pricing strategies, analyse market trends, and enhance fraud detection systems to protect both businesses and customers. By leveraging data, they help e-commerce platforms improve customer service and streamline operations, driving growth and maintaining a competitive edge in the market.

PART - I

Product Dissection

1. Platform Selection.

Amazon

Popularity: Amazon is the largest e-commerce website, ruling the online retail market in several nations. Amazon boasts more than 310 million active customer accounts and over 2 million active sellers and has become the preferred marketplace for a wide range of products, such as electronics, clothing, home goods, and foodstuffs. Its success is due to its wide range of products, affordable prices, smooth user interface, and customer-friendly policies like quick returns and speedy delivery. Amazon Prime services have also increased customer loyalty by providing benefits like free shipping, special offers, and access to Prime Video and Prime Music.

Impact: Amazon has transformed the world e-commerce sector by introducing new benchmarks in convenience, efficiency, and logistics. Its technologies, including one-click buying, customized suggestions, and same-day shipping, have transformed consumer habits. Furthermore, Amazon Web Services (AWS) has profoundly impacted cloud computing by offering scalable infrastructure to global businesses. Through Fulfillment by Amazon (FBA), third-party sellers can leverage Amazon’s robust logistics network, ensuring

efficient storage, packaging, and delivery of their products. Amazon's heavy investments in AI, machine learning, and automation have optimized supply chain management, reducing costs and improving delivery speed. Its sustainability initiatives, like Amazon Climate Pledge, further highlight its commitment to reducing carbon footprints and promoting environmentally friendly business practices.

Relevance: In the modern digital-first economy, Amazon's position is unmatchable based on its potential to evolve as consumer behaviors shift and utilize frontier technologies. Increased use of e-commerce, voice commerce (Alexa), and AI-powered personalization has augmented its stronghold. Through its wide-ranging ecosystem consisting of Amazon Fresh (grocery delivery), Amazon Pay (cashless payments), and Amazon Business (B2B marketplace), it serves differentiated customer needs. Investments in drone-based delivery (Prime Air) and cashier-less grocery stores (Amazon Go) clearly reflect its eagerness to keep innovating and making it a vital force within contemporary retailing. Its algorithm-driven strategy towards a maximized shopping experience, by virtue of which it dominates the e-commerce market, reiterates itself.

2. Core Features and Functionalities

- **Massive Product Range:** With millions of products across categories, Amazon is one-stop shopping for customers.
- **Timely and Prompt Delivery:** Amazon provides same-day, one-day, and two-day delivery services (particularly for Prime members) for rapid fulfillment of orders.
- **Simple Interface:** Simple website and mobile app with powerful search features, easy checkouts, and wish lists for hassle-free shopping.
- **Personalized Recommendations:** Purchase history and browsing-based AI-driven recommendations enhance engagement and conversions.
- **Customer Reviews and Ratings:** Authentic customer reviews create trust and drive purchase decisions.

- **Multiple Payment Methods:** Accepts credit/debit cards, UPI, net banking, Amazon Pay, EMI, and "Buy Now, Pay Later" for fiscal flexibility.
- **Amazon Prime Membership:** Faster delivery, special discounts, and access to Prime Video, Prime Music, and Prime Reading ensure loyalty.
- **Order Tracking and Notifications:** Live tracking and notifications through the Amazon app ensure transparency and reliability.
- **Hassle-Free Returns and Refunds:** Simple returns, immediate refunds, and Amazon's A-to-Z Guarantee guarantee a risk-free experience.
- **Alexa Voice Shopping:** Facilitates voice shopping using Alexa-enabled devices, making ordering even more convenient.

Contribution to Success and User Engagement

- **Convenience:** Huge choice, quick delivery, and flexible payment make the customer experience better.
- **Trust & Transparency:** Authentic reviews, real-time monitoring, and safe payment enhance trust.
- **Loyalty & Retention:** Prime membership, promotions, and special offers promote frequent buying.
- **Personalization:** Personalized recommendations through AI enhance engagement and conversions.
- **Operational Efficiency:** Robotic warehouses and AI-based logistics enable hassle-free order fulfillment.

Amazon's success lies in its capacity to deliver convenience, variety, and price with trust and reliability. Through AI-driven personalization, a strong logistics system, and customer-centric policies, Amazon offers an interactive and seamless shopping experience that draws users back time and again. All these aspects combine to establish Amazon as the leader in global e-commerce.

3. Real World Problems

1. **Convenience in Shopping:**
    - **Problem:** Consumers struggle with finding time for in-store shopping.
    - **Solution:** 24/7 availability, mobile accessibility, and doorstep delivery solve this issue.
2. **Limited Product Availability in Local Markets:**
    - **Problem:** Some products are unavailable in physical stores.
    - **Solution:** Amazon’s vast inventory ensures consumers can find everything they need online.
3. **High Prices and Lack of Discounts:**
    - **Problem:** Customers may hesitate to shop due to high prices.
    - **Solution:** Daily deals, coupons, and Prime-exclusive discounts make products more affordable.
4. **Concerns Over Secure Transactions:**
    - **Problem:** Fear of fraud discourages online purchases.
    - **Solution:** Amazon’s secure payment gateway, buyer protection policies, and trusted sellers ensure safe transactions.

5. **Uncertainty in Deliveries:**
    - **Problem:** Customers worry about late or lost shipments.
    - **Solution:** Real-time tracking, order updates, and Amazon's robust logistics guarantee reliable deliveries.
6. **Hassle in Returns & Refunds:**
    - **Problem:** Difficult return processes deter online shopping.
    - **Solution:** Easy return policies and instant refunds encourage risk-free purchases.

How Amazon Addresses These Problems

- **Fast Delivery & 24/7 Availability:** Makes shopping more accessible and efficient.
- **Global Product Selection:** Ensures availability of a **wide range of products**.
- **AI-Powered Personalization:** Enhances user experience through **customized recommendations**.
- **Secure Payments & Buyer Protection:** Builds **trust and security**.
- **Prime Membership & Exclusive Discounts:** Encourages customer **loyalty and retention**.
- **Transparent Tracking & Easy Returns:** Increases **customer satisfaction and reliability**.

These features collectively position Amazon as the **leading e-commerce platform**, ensuring **high user engagement, trust, and convenience**.

Database Management & Schema Design

4. Schema Design

1.User Table:

Attribute	Type	Description
UserID	Primary Key	Unique identifier for the user
Name	String	Name of the user
Email	String	Email address
Password	String	Encrypted password
Phone	String	Contact number
Address	String	Shipping address
RegistrationDate	Date	Account creation date
LoyaltyPoints	Integer	Reward points earned

2.Product:

Attribute	Type	Description
ProductID	Primary Key	Unique identifier for the product
Name	String	Product name
Description	String	Product details
Price	Float	Price of the product
StockQuantity	Integer	Available stock
Category	String	Product category
Rating	Float	Average user rating
SellerID	Foreign Key	ID of the seller

3.Order:

Attribute	Type	Description
OrderID	Primary Key	Unique identifier for each order
UserID	Foreign Key	User who placed the order
OrderDate	Date	Date of order placement
TotalAmount	Float	Total order cost
Status	String	Order status (Pending, Shipped, Delivered)

4.OrderDetail:

Attribute	Type	Description
OrderDetailID	Primary Key	Unique identifier for order items
OrderID	Foreign Key	Associated order
ProductID	Foreign Key	Ordered product
Quantity	Integer	Number of units purchased
Price	Float	Price per unit

5.Cart:

Attribute	Type	Description
CartID	Primary Key	Unique cart ID
UserID	Foreign Key	User associated with the cart
CreatedDate	Date	Date of cart creation

6.CartItem:

Attribute	Type	Description
CartItemID	Primary Key	Unique identifier for cart items
CartID	Foreign Key	Associated cart
ProductID	Foreign Key	Product added to the cart
Quantity	Integer	Number of units

7.Review:

Attribute	Type	Description
ReviewID	Primary Key	Unique identifier for the review
UserID	Foreign Key	Reviewer user ID
ProductID	Foreign Key	Reviewed product
Rating	Float	Star rating (1-5)
Comment	String	User feedback
ReviewDate	Date	Date of review submission

8.Payment:

Attribute	Type	Description
PaymentID	Primary Key	Unique identifier for payment
OrderID	Foreign Key	Related order
Amount	Float	Payment amount
PaymentMethod	String	(Credit Card, UPI, COD, etc.)
PaymentStatus	String	(Pending, Completed, Failed)

9.Seller:

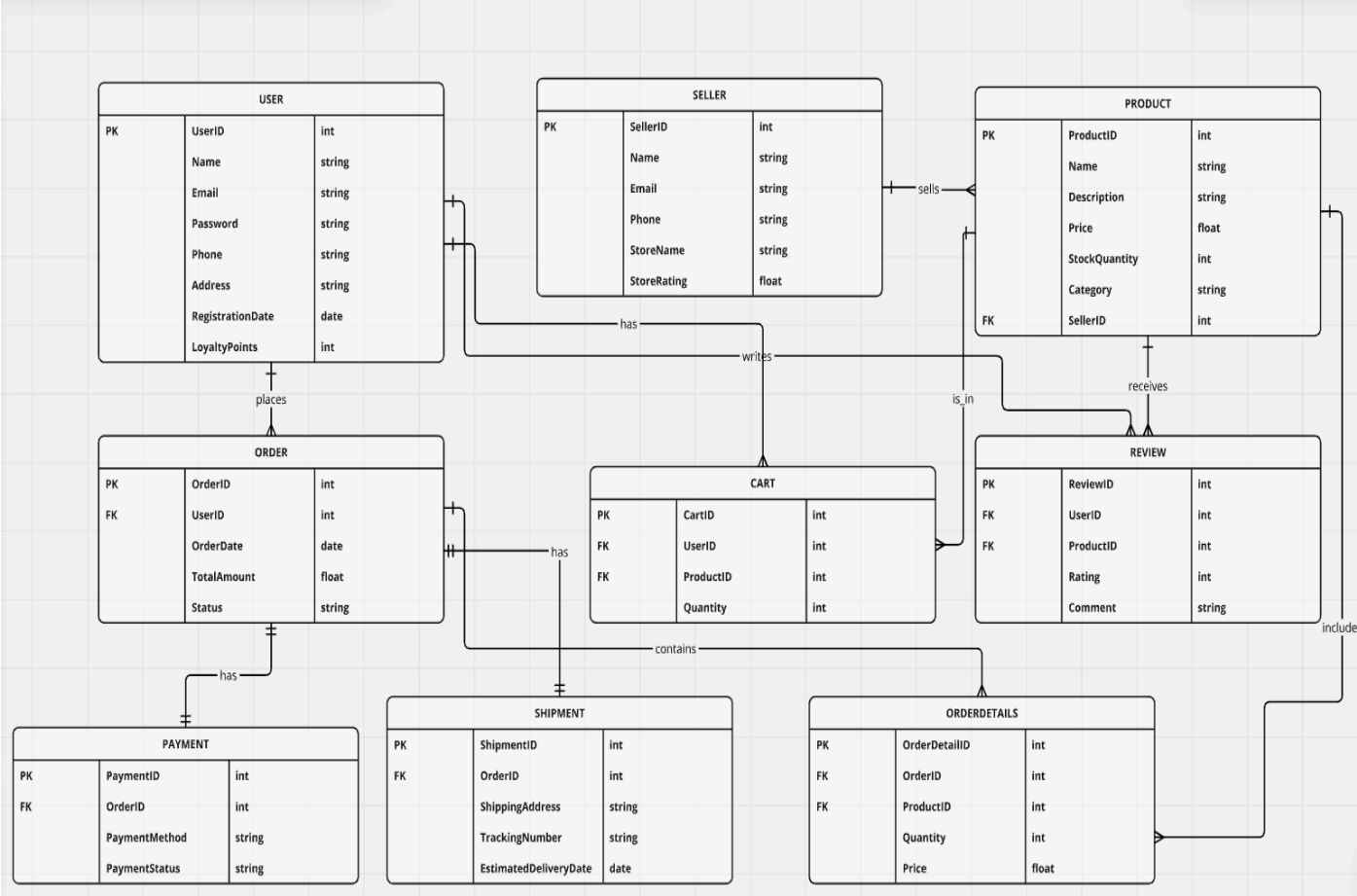
Attribute	Type	Description
SellerID	Primary Key	Unique identifier for sellers
Name	String	Seller name
Email	String	Contact email
Phone	String	Contact number
Address	String	Seller's warehouse location

Relationships:

From Table	From Attribute	To Table	To Attribute	Relationship Type
User	UserID	Order	UserID	One-to-Many
Order	OrderID	OrderDetail	OrderID	One-to-Many
Product	ProductID	OrderDetail	ProductID	Many-to-One
User	UserID	Review	UserID	One-to-Many
Product	ProductID	Review	ProductID	One-to-Many
User	UserID	Cart	UserID	One-to-One
Cart	CartID	CartItem	CartID	One-to-Many
Product	ProductID	CartItem	ProductID	Many-to-One
User	UserID	Payment	UserID	One-to-Many
Order	OrderID	Payment	OrderID	One-to-One
Seller	SellerID	Product	SellerID	One-to-Many

This schema efficiently structures data for an Amazon-like e-commerce platform. The relationships optimize order processing, inventory tracking, user reviews, and payment handling. The design ensures scalability, performance, and a seamless user experience, driving engagement and business success.

5. ER Diagram Creation



This schema design captures the essential data interactions and relationships within the Amazon e-commerce platform, supporting its features and functionalities efficiently. It ensures scalability, performance, and a personalized user experience, contributing to the platform's overall success.

Revenue and Profit Growth Strategies

I. Analysing Amazon's Current Status

To develop a strategic plan for increasing Amazon's e-commerce revenue by 25%, we must first conduct a thorough analysis of its current financial status, revenue sources, expenses, and customer acquisition and retention strategies.

Category: Current Financial Data

Details	Analysis
Revenue Streams	Revenue from product sales, subscriptions (Prime), advertising, AWS integration for third-party sellers, and marketplace commissions.
Expenses	Operational costs including supply chain, fulfillment centers, logistics, marketing, technology investments, and employee salaries.
Profit Trends	Analysis of revenue and profit growth over past years to identify trends and opportunities.

Category: Sources of Revenue

Revenue Stream	Contribution Analysis
Product Sales	Revenue from Amazon's own inventory and marketplace sellers.
Amazon Prime	Subscription-based revenue stream offering benefits like fast delivery and streaming services.
Advertising	Revenue from sponsored ads and brand promotions on Amazon’s platform.

Revenue Stream	Contribution Analysis
Product Sales	Revenue from Amazon's own inventory and marketplace sellers.
AWS for Sellers	Income from third-party sellers using AWS for hosting, data storage, and analytics.
Marketplace Commission	Revenue from commissions charged to third-party sellers.

Category: Sources of Expenses

Expense Type	Breakdown
Supply Chain & Logistics	Costs of warehousing, inventory management, transportation, and last-mile delivery.
Marketing & Advertising	Digital advertising costs, influencer collaborations, and seasonal promotions.
Technology Investments	Cloud infrastructure, AI-driven recommendation engines, security, and customer data management.
Employee Salaries	Salaries for fulfillment center staff, tech teams, customer support, and logistics personnel.

Category: Customer Acquisition & Retention

Focus Area	Strategy
Customer Acquisition	Identifying the most effective channels: social media, Google search, email campaigns, and influencer marketing.
Customer Retention	Analyzing retention rates, Prime membership renewals, and customer engagement with personalized shopping experiences.
Churn Reduction	Understanding reasons for customer drop-offs and optimizing service quality and pricing.

II. Focus Areas for Increasing Amazon's Revenue by 25%

To drive a 25% increase in e-commerce revenue, Amazon must optimize internal management, expand product offerings, penetrate new markets, enhance customer experience, and strengthen branding.

Category: Internal Management (~8% Contribution to Growth)

Focus Area	Measures
Operational Efficiency (6.5%)	Implement AI-driven inventory forecasting, reduce shipping inefficiencies, and automate warehouse operations.
Employee Productivity (1.5%)	AI-driven workforce optimization, performance tracking, and training programs for fulfillment center staff.

Category: Product Strategy (~3% Contribution)

Focus Area	Measures
New Product Launches (1%)	Expand exclusive Amazon-branded products and high-margin categories like health & wellness.
Product Optimization (2%)	Reduce underperforming SKUs, launch combo deals, and enhance private label offerings.

Category: Market Expansion (~4% Contribution)

Focus Area	Measures
Geographic Expansion (2%)	Target emerging markets with tailored local strategies and invest in logistics for rural accessibility.
Market Penetration (2%)	Enhance localized product offerings, partnerships with regional brands, and mobile-first experiences.

Category: Post-Sales Management (~2% Contribution)

Focus Area	Measures
Customer Satisfaction (1%)	Optimize customer support through AI chatbots and proactive resolution mechanisms.
Customer Retention (1%)	Expand loyalty programs and offer personalized discount structures.

Category: Branding & Marketing (~6% Contribution)

Focus Area	Measures

Brand Awareness (1.5%)	Expand digital marketing, influencer partnerships, and targeted ad campaigns.
Referral & Word of Mouth (2.5%)	Incentivize referrals, customer reviews, and leverage social commerce.
Community Engagement (1%)	Invest in eco-friendly initiatives and corporate social responsibility to enhance brand trust.

Category: Acquisition Channels (~1% Contribution)

Focus Area	**Measures**
Digital Advertising	Optimize Amazon's PPC ad network, leverage AI for ad targeting, and use video marketing.
Partnerships & Affiliates	Expand partnerships with third-party sellers and influencer affiliate programs.

III. Defining Strategies

1. Optimize Expenses

- Reduce operational costs by renegotiating supplier contracts and optimizing inventory management.
- Invest in automated AI-driven customer support and fulfillment operations.
- Streamline delivery logistics to lower last-mile transportation costs.

2. Enhance Revenue Streams

- Introduce premium Prime tiers with additional benefits.
- Increase cross-selling and upselling using AI-based recommendation engines.
- Develop exclusive partnerships with popular brands and niche product categories.

3. Improve Customer Satisfaction & Retention

- Personalised shopping experiences using machine learning and behavioral analytics.
- Expand loyalty programs and create tailored discounts based on shopping habits.
- Offer improved return and exchange policies to boost customer confidence.

By implementing a data-driven inside-out approach, Amazon can strategically optimize expenses, improve revenue streams, and enhance customer satisfaction to achieve a 25% increase in e-commerce revenue. Through AI-driven insights, supply chain improvements, market expansion, and personalized customer engagement, Amazon can solidify its leadership in the e-commerce industry while driving sustainable growth.

PART - II

1. What percentage of total retail sales in 2025 will be conducted through e-commerce platforms?

Approach: Demand-Side Estimation
We estimate the total e-commerce sales using global retail sales projections and the e-commerce penetration rate.

Methodology:

- Global retail sales in 2025 (estimated): $30 trillion (Statista).
- E-commerce penetration rate (2025 projection): ~16.4% (eMarketer).

Formula:
E-commerce Sales = Total Retail Sales × E-commerce Penetration Rate
$30T × 16.4% = $4.92T

- Amazon's share in global e-commerce (2025 estimated): ~12% (Statista, Business Insider).
- Amazon's total sales:
  $4.92T × 12% = $590B
- E-commerce will contribute ~$4.92 trillion (16.4% of total retail sales) in 2025.
- Amazon's estimated e-commerce sales: $590 billion.

2. How much will the average online shopper spend annually in 2025?

Approach: Demand-Side Estimation
We estimate spending per user by dividing total e-commerce sales by the number of online shoppers.

Methodology:

- Total e-commerce sales in 2025: $4.92 trillion (from Q1 calculation).
- Total online shoppers (2025 estimate): ~4.9 billion (Statista, UNCTAD).

Formula:
Average Spend Per Shopper = Total E-commerce Sales / Total Online Shoppers
$4.92T / 4.9B = $1,004 USD per user annually

- Amazon's active customers: ~310 million (Amazon Annual Report).
- Amazon's per-user spend:
  $590B / 310M ≈ $1,900 USD per Amazon user
- An average online shopper will spend ~$1,004 annually in 2025.
- Amazon users will spend ~$1,900 per year.

3. What will be the market share of mobile e-commerce (m-commerce) in total e-commerce sales in the next five years?

Approach: Demand-Side Estimation
We project mobile commerce based on historical growth trends and market share.

Methodology:

- **Current m-commerce share (2023):** ~72% of total e-commerce (Statista, Insider Intelligence).
- **Expected annual growth rate:** ~5 percentage points increase per year (eMarketer).

Projected m-commerce share (2025):
2024: **72% + 5% = 77%**
2025: **77% + 5% = 82%**

- **Mobile-driven e-commerce sales in 2025:**
  $4.92T × 82% = $4.03T
- **Amazon's mobile-driven sales:**
  $590B × 82% = $484B
- By 2025, mobile commerce will contribute **82%** of total e-commerce ($4.03T).
- Amazon's mobile sales will be ~$44B8.

4. What is the estimated increase in the number of e-commerce websites in the next three years?

Approach: Demand-Side Estimation
We use a projected growth rate to estimate the increase in the number of e-commerce websites.

Methodology:

- Current e-commerce websites (2023): ~26 million (Business.com).
- Annual growth rate: ~12% per year (Statista, Shopify data).

Formula (compound growth):
Future Value = Current Value × (1 + Growth Rate) ^ n

- Projected e-commerce websites in 2028:
  2025: $26M × 1.12^2 ≈ 32.6M$
  2026: $32.6M × 1.12 ≈ 36.5M$
- 2027: $36.5M × 1.12 ≈ 40.9M$
  2028: $40.9M × 1.12 ≈ 45.8M$
- The number of e-commerce websites will grow to ~45.8 million by 2028.

5. How much will global e-commerce sales grow annually over the next five years?

Approach: Demand-Side Estimation
We use CAGR (Compound Annual Growth Rate) to estimate future e-commerce growth.

Methodology:

- Current global e-commerce sales (2023): ~$5.8 trillion (eMarketer, Statista).
- Expected CAGR (2023-2028): ~10-12% (McKinsey, IBISWorld).

Formula (compound growth):
Future Value = Current Value × (1 + Growth Rate) ^ n

- Projected 2028 market size:
  $5.8T × (1.12^5) ≈ 10.2T$

- Amazon's estimated market share (assuming stable dominance at ~12%):
  $10.2T × 12% = 1.22T$
- Global e-commerce sales will reach ~$10.2 trillion by 2028.
- Amazon's sales could grow to ~$1.22 trillion.

Scenario Based Questions

Scenario 1:

The company is launching a subscription service where customers can subscribe to receive products every month at a discounted rate. They want to understand how the retention of subscription customers compares to regular customers who do not subscribe.

Question 1:
How would you compare the retention rates of subscription customers versus non-subscription customers? What metrics would you focus on, and how would you structure the cohort analysis?

To compare retention rates, I would conduct a **cohort analysis** by dividing customers into two groups:

1. **Subscription Customers** – Those who opted for the subscription model.
2. **Non-Subscription Customers** – Those who made one-time purchases.

Key Metrics to Track:

- **Customer Retention Rate** = (Customers retained at month X / Total customers at the start) * 100
- **Average Order Frequency** – How often customers purchase within a given timeframe.
- **Repeat Purchase Rate** – % of customers making another purchase after their first.
- **Customer Lifetime Value (CLV)** – Total revenue a customer generates over their relationship with Amazon.
- **Churn Rate** – Percentage of customers who stop purchasing.

Cohort Analysis Structure:

- Track retention over multiple months (e.g., 1-month, 3-month, 6-month retention).
- Compare trends: Is there a higher drop-off in non-subscription customers?
- Use **survival analysis** to determine how long customers stay active.
- Visualize findings using retention curves.

Question 2:
Suppose you find that subscription customers have a 20% higher retention rate after 3 months compared to non-subscription customers. What recommendations would you make to the business based on this finding?

If subscription customers show a **20% higher retention rate**, I would recommend the following:

1. **Increase Subscription Adoption:**
    - Offer a **first-month free trial** or **discount on the first three months**.

    - Highlight savings and convenience in marketing campaigns.
    - Use email and push notifications to remind users of their subscription benefits.
2. **Improve the Subscription Experience:**
    - Offer **flexibility** (pause, modify, or cancel subscriptions easily).
    - Add exclusive benefits such as **early access to deals** or **free shipping**.
    - Personalize product recommendations for subscribers.
3. **Target Non-Subscribers:**
    - Identify high-potential non-subscribers based on purchase history.
    - Offer one-time buyers a **discounted upgrade to a subscription**.
    - Send targeted reminders showcasing the benefits of subscribing.
4. **Monitor & Optimize:**
    - Conduct surveys to understand **why non-subscribers hesitate**.
    - Perform A/B testing on subscription signup pages.
    - Track churn reasons and improve pain points in the subscription model.

Scenario 2:

The company is testing two different **landing pages** for new users. **Version A** emphasises discounted products, while **Version B** highlights the quality and premium nature of products. The company wants to know which version drives more conversions (i.e., purchases).

Question 1:
How would you design an **A/B test** to determine which landing page (Version A or Version B) performs better in terms of conversion rate?

To test which landing page (A: Discount-focused vs. B: Quality-focused) performs better, I would follow these steps:

1. **Define Key Metrics:**
    - **Conversion Rate (CR)** = (Purchases / Total Visitors) * 100
    - **Bounce Rate** – % of users leaving without interacting.
    - **Average Order Value (AOV)** – How much customers spend per order.
    - **Revenue per Visitor (RPV)** – Revenue generated per site visit.
2. **Ensure Random Assignment:**
    - Use an **A/B testing tool** (e.g., Amazon's internal tools, Optimizely, Google Optimize).
    - Randomly assign 50% of users to **Version A** and 50% to **Version B**.
3. **Set a Testing Period & Sample Size:**
    - Ensure a **statistically significant sample size** (use tools like A/B test calculators).
    - Run the test for **at least 2-4 weeks**, depending on traffic volume.
4. **Analyze Results:**
    - Check which version has a **higher conversion rate** and other key metrics.
    - Perform **statistical significance testing** (e.g., p-value < 0.05) to confirm reliability.

Question 2:
After running the A/B test, you find that **Version B** has a higher conversion rate, but the

difference is not statistically significant. What would you do next? Should the company adopt Version B, or continue with Version A?

Since the difference is **not statistically significant**, I would take the following steps:

1. **Extend the Testing Period**
    - If the test duration was too short, continue running it for more data.
    - Seasonal trends may impact user behavior, so consider external factors.
2. **Increase Sample Size**
    - If the sample size is small, increase the number of visitors assigned to each version.
    - Use statistical power calculations to determine the necessary sample size.
3. **Segment the Results**
    - Analyze results by customer type (new vs. returning users).
    - Check if specific demographics respond better to **Version B**.
4. **Perform a Multivariate Test**
    - Instead of just two versions, test **different variations** (e.g., combining discounts & premium messaging).
    - Experiment with **CTA button colors, images, and page layouts**.
5. **Use Additional Metrics**
    - Even if **conversion rates** are similar, check **Average Order Value (AOV)** or **Customer Lifetime Value (CLV)**.
    - If Version B attracts **higher-value customers**, it may still be beneficial.
6. **Final Recommendation:**
    - If after all refinements, Version B still does not show a **statistically significant** advantage, **stick with Version A**.
    - If Version B starts showing consistent improvement in **conversions, AOV, or customer retention**, **consider rolling it out permanently**.