**Insights on User Behavior Patterns**

1. **Usage Time:**
   * Users spend an average of **250 minutes per day** on mobile apps.
   * Heavy users (classified under User Behavior Class 4 and 5) use apps for over **350 minutes/day**.
2. **Screen Activity:**
   * Screen-on time correlates strongly with app usage. Heavy users often have their screens active for **5-7 hours daily**.
   * Efficient app interface design can reduce screen-on time, indirectly improving battery performance.
3. **Battery Drain:**
   * Higher app usage directly impacts battery drain. Heavy users consume over **1,800 mAh/day**, compared to light users (<1,200 mAh/day).
   * **Younger users (21–40)** tend to drain their batteries faster, likely due to more frequent app interaction.
4. **Data Usage:**
   * Heavy users consume **1,000–1,200 MB/day**, while light users use around **300 MB/day**.
   * Apps with high data consumption should consider optimizing background data usage.
5. **Demographic Patterns:**
   * **Gender Differences:**
     + Males show slightly higher app usage and battery drain compared to females.
   * **Age Differences:**
     + Users aged **21-40** are the most engaged, with high app usage, battery drain, and data consumption.
     + Users aged **41+** exhibit moderate usage patterns but tend to interact more consistently across fewer apps.
6. **Behavior Class Trends:**
   * **Class 4-5:** Heavy users, ideal for premium services and advanced features.
   * **Class 1-2:** Light users who may need engagement strategies like gamification or targeted notifications.

**Recommendations for App Optimization**

1. **Battery and Performance Optimization:**
   * Minimize background tasks and improve battery efficiency for heavy apps.
   * Introduce adaptive modes that reduce resource usage during prolonged app activity.
2. **Personalized Engagement:**
   * Leverage behavior classes for targeted campaigns:
     + Offer **Class 4-5** users premium features like ad-free versions or advanced analytics.
     + Use gamification and rewards to engage **Class 1-2** users.
3. **Data Usage Reduction:**
   * Optimize app data consumption by compressing images/videos and caching frequently accessed resources.
4. **Demographic-Specific Features:**
   * Design features tailored for the **21-40 age group**, such as productivity tools or entertainment enhancements.
   * Introduce tutorials or accessibility improvements for older users (41+).
5. **Gender-Specific Campaigns:**
   * Consider designing app themes or features based on observed male and female usage patterns to improve retention and engagement.
6. **Behavior-Driven Notifications:**
   * For heavy users, use intelligent notifications to promote relevant app features.
   * Encourage lighter users with periodic reminders, tutorials, or personalized recommendations.