GAP ANALYSIS: SMART PHONE BATTERY LIFE IMPROVEMENT

Gap analysis checks the current performance of a product or process against the desired performance and finds the gaps. In this scenario we will perform a gap analysis on the product improvement project for Smartphone battery life

1. Current State: The average phone now has between 10-12 hours of active-use battery. However, this is often not sufficient for power users or frequent travelers, who suffer from battery drain issues. This has resulted in dissatisfaction, frequent needs to recharge devices, and dependence on portable power banks.
2. Desired State: As a result, the ultimate goal for phone makers in this regard is a phone with battery life that is greater than or equal to 24 hours on average, and doesn't need recharging. This would suit everyone, particularly people who rely on their phones for long periods for work, travel, or leisure.

3. Gap Identification: Battery Capacity:

Today: Most smartphone batteries are rated between 3000mAh to 5000mAh.

Desired State: Improve the longevity of a battery without needing to increase the physical size of the device itself.

Gap: Current battery capacity doesn’t deliver the desired 24-hour usage for power users. Bigger batteries do add bulk to the phone, and consumers prefer thin designs.

Power Efficiency of the Processor:

Current State: Today’s smartphones integrate energy-efficient processors like Apple’s A series and Qualcomm’s Snapdragon. However, they still drain a lot of power when they are used for tasks like gaming or video streaming that require a lot of resources.

Desired State: Processors that guarantee excellent performance without consuming too much power while playing games or watching videos.

Gap: The uptrend in energy efficiency in processors has not slowed down yet, and that is good for mobile users. However, this is the case if we look at processing power and not power efficiency. In the mobile GPU side, the situation is getting worse with SOC’s being more powerful every year. Manufacturers sometimes use the GPU full power even when it is not needed.

Display Technology:

Current State: Most smartphones employ OLED or AMOLED, which is highly color-rich but consumes a lot of power, especially at higher brightness levels.

Desired State: A display that is resolution-rich and colorful without consuming a lot of power.

Gap: Despite improvements in the technology, display remains one of the primary reasons for excessive battery consumption.

Software Optimization:

Current State: Some operating systems such as iOS and Android have implemented battery-saving modes, which are sometimes insufficient to extend battery life for more than 12 hours of active usage.

Desired State: Software that efficiently optimizes how background apps, screen brightness, and other system functions operate to save energy.

Gap: Current operating systems should be optimized better regarding power usage when phones go into idle or underuse conditions.

Charging Speed:

Current State: Fast charging technologies, including Qualcomm's Quick Charge and USB-C charging, can charge the smartphone from 0 to 50% within less than 30 minutes. However, a full charge still takes some time.

Desired State: Super-fast charging technologies, which can charge the battery to full capacity within a shorter amount of time.

Gap: The current speed of charging is not sufficient enough to meet the requirements of users who want quick top-ups during short breaks or travel.

Battery Life in Extreme Conditions:

Current State: Extreme temperatures affect the performance of a battery. Some smartphones lose their charge faster, and in certain weather conditions, the smartphone just shuts down.

Desired State: A smartphone battery that is capable of functioning at its peak under a broad range of environmental conditions.

Gap: Current battery technology is not sufficiently resistant to temperature.

4.Action Plan to Bridge the Gaps:

Battery Technology Advancements:

Solution: Research and development into solid-state batteries and graphene-based batteries could significantly increase battery capacity and longevity without compromising size or weight.

Energy-Efficient Processors:

Solution: Manufacturers should prioritize low-power processors and adaptive performance technology that adjusts performance based on real-time usage to preserve energy without sacrificing user experience.

Advanced Display Technologies:

Investment in microLED technology: They are believed to be energy-saving compared to OLED and should emit the same luminance and colour gamut

Optimized software:

The solution is AI-controlled battery management of OS, which is able to study the habits of the user, and adjusts and optimizes its energy usage, for instance in screen brightness and app refresh rate, background operations, etc

Super Fast Charging

Solution: The possible improvements and emerging technologies, especially super-fast graphene charging, might reduce the amount of time for charging the mobile phone significantly.

Temperature-Resistant Batteries:

Solution: Develop temperature-resistant batteries using more advanced materials and minimize the high and low performance impact.