1. Smartphones are vectors of innovation

a. Smartphones' specifications are more advanced than black boxes'

The modern smartphone is a highly sophisticated consumer device which has a lot to offer to both insurance companies and users of UBI. Most smartphones feature a large number of integrated components, which could have direct applications in the UBI market. The size of R&D budgets available to smartphone OS vendors and OEMs also means that the pace of technological development is very likely to continue to surpass that of dedicated telematic devices.

A comparison of the technical characteristics of black boxes and smartphones reveals a number of clear advantages that the smartphone has.

The latest Android and iOS devices have greater processing power and memory than the latest black boxes.

The advanced quality of **positioning** technology within smartphones can support GPS and GLONASS as well as the supporting WAAS and EGNOS augmentation systems. This capability can support a positioning accuracy of fewer than 2 metres.

As has been the case for GLONASS, the iPhone and Samsung's high end handsets are likely to be the first to support **Galileo**, scheduled for end 2016. With its Commercial Service, the constellation, which already has 9 operational satellites in the air, is expected to deliver an authenticated signal and 10 cm accuracy to users.

Integrated 4G **connectivity**, which is already threatening traditional short range communications platforms in the road charging market, can offer far greater data transmission capability than the common GPRS/EDGE or 3G provided by most black boxes.

Bluetooth connectivity, which is not present in most black boxes, comes as standard on all smartphone platforms. In October 2011, the iPhone 4s was the first smartphone to include Bluetooth 4.0. To combat concerns regarding battery use, the Bluetooth Special Interest Group developed Bluetooth Smart, which provides considerably reduced power consumption while maintaining a similar communication range. By 2018, more than 90% of Bluetoothenabled smartphones will support Bluetooth Smart.

To perform this analysis, we compared two high end black boxes from **CalAmp** and **Mobile Devices** with both latest generation phones from **Apple** and **Samsung** as well as previous generation handsets from the same brands.



Fig 5.19: The evolution of smartphone's positioning capabilities

Fig 5.17: Comparison of technical specifications of black boxes and smartphones

| | Calamp LMU-300 | Mobile Devices C4 Max | Samsung Galaxy S4 | Samsung Galaxy S6 edge | iPhone 5 | iPhone 6 |
|-----------------------------|---|---|--|---|---|---|
| Positioning technologies | A-GPS (+ EGNOS assistance system) | SiRF Atlas A-GPS (+ EGNOS assistance system) | GPS, A-GPS, Glonass, WiFi and Cell-ID | GPS, A-GPS, Glonass, WiFi and Cell-ID | A-GPS, GLONASS, WiFi and Cell-ID (+ EGNOS and WAAS assistance systems) | A-GPS, GLONASS, WiFi, Cell-ID, EGNOS and WAAS assistance systems |
| Positioning accuracy | < 2.5m (-162 dBm) | < 2.5m (-162 dBm) | <2m | <2m | <2m | <2m |
| Accelerometer | 3 axis | 3 axis ±2g, ±4g, ±8g | 3 axis with <u>+</u> 2g, <u>+</u> 4g <u>+</u> 8g, <u>+</u> 16g scale | 3 axis with ±2g, ±4g ±8g, ±16g scale | 3 axis with ± 2g/± 4g /± 8g scale | 3 axis with ±2g, ±4g ±8g, ±16g scale |
| Gyroscope | No | 3-axis | 3-axis MEMS gyroscope | 3-axis | 3-axis | 3-axis |
| Digital compass | No | No | Yes | Yes | Yes | Yes |
| Ambient light sensor | No | No | Yes | Yes | Yes | Yes |
| Microphone | No | No | Yes | Yes | Yes | Yes |
| Processor | n.a. | ARM11 500 Mhz | 1.7GHz Dual-core ARM Cortex-A15 | 2.1GHz, 1.5GHz; Octa-Core | 1.3 GHz Dual- core ARM Cortex- A159 1 GHz | 1.4 GHz Apple A8 chip, 64-bit |
| Memory | Typically 128-256 MB flash memory | 256 MB flash memory (ext. to 4 GB) | 2GB RAM, 16 GB SSD | 32 GB RAM, 128 GB micro SD | 1G500 MB RAM, 16 GB - 64 GB SSD | 1024 MB LPDDR3 RAM, 16 – 128 GB NAND |
| Data transmission | GPRS | GPRS or 3G | GPRS, 3G HSPA, LTE | GPRS, 4G, HSDPA, HSUPA, LTE Cat-6, WiFi | GPRS, 3G HSPA, LTE, WiFI | GPRS, 4G, HSDPA, HSPA+, LTE, WiFi |