Mobile Device Selection Guide

Disclaimer

This document is intended to act solely as a guide. It is intended to assist the reader in making their own decision regarding a choice of device hardware for their mobile solution. Bright Software does not warrant that this document is error-free.

Introduction

A large variety of Windows CE and Windows Mobile devices are available on the market today. This document aims to help in the narrowing down process by offering several considerations for device selection. These considerations are:

1. Requirement for a "ruggedised" device
2. Software platform: Pocket PC or Windows CE
3. Wireless connectivity options
4. Integrated functionality and peripheral requirements
5. Keyboard or Stylus input
6. Battery life requirements
7. Ergonomic considerations, such as size and weight
8. Screen type (high-glare and low-light environments)
9. Vendor support

Each individual criterion will be discussed in further detail, the advantages and disadvantages of each option will be outlined. The reader will be able to decide which criteria are important, and which closely match the requirements of their particular mobile solution.

In this way, it is hoped that the reader will be able to more clearly understand the differences between the devices on the market, their relative advantages and disadvantages, and to decide which device is the best fit.

1. Requirement for a “ruggedised” device

This is the first consideration to be taken because it clearly divides the field from the outset. A device will fall into one of four categories; semi-ruggedised, fully-ruggedised, ultra-ruggedised, or not ruggedised at all. The last category can also be referred to as consumer-oriented.

Semi-ruggedised devices are typically devices built using standard components, but that have been purposely and significantly enhanced for rugged use. Often, the plastic casing has been replaced with a magnesium casing; or rubber bumpers have been added that surround the plastic. In most units, some shock sensitive components will have been mounted on a layer of soft gelatinous material or is mounted on shock-absorbing springs. Another common ruggedisation technique is to include a rubber sheet underneath the keyboard for water-resistance. Also, the display may be sealed for protection against liquids, moisture and dust.
Semi-ruggedised devices are designed for business travellers or field workers where normal environmental conditions apply. Most semi-ruggedised devices do not offer daylight-readable display screens and are meant for indoor or possibly in-vehicle use.

Fully-rugged devices have been designed from the ground up for use in outdoor, dusty or mobile conditions. Every component, and even the placement of those components, has been carefully considered. Fully-rugged devices can handle a spray of water from any direction due to their “sealed nature”. This sealing also keeps out dust, dirt, sand, salt, moisture, heat and cold. Also, fully-rugged devices often come with display screens that can be viewed in outdoor lighting conditions.
Not only are rugged computers durable but they also tend to be extremely reliable. The component failure rate is significantly lower than with consumer devices. This is true for both the fully-rugged and ultra-rugged categories

Ultra-rugged devices are made to handle the most extreme and harshest environmental conditions. They often include enhancements designed to address specific environments, industries or user requirements. They are usually vacuum-sealed to keep out the outside elements. Ultra rugged devices, because of the detail that goes into their design and also the testing of their components, are not only durable but extremely reliable with a long expected life. This category includes devices that are Intrinsically Safe, which is a rating that refers specifically to a device being capable of operating safely around flammable gases or explosives.

Consumer oriented devices do not provide any of the robust features above, however if the user environment is not as harsh then they may still be considered. Consumer devices have a broad market; hence the unit price is generally much lower. Also, the product development cycle of a consumer device is much shorter than a rugged device. This means that more up-to-date technology will be available on the latest model release.

For more details, refer to **Appendix (A) - Ingress Protection (IP) Rating**.

2. Pocket PC or Windows CE

The next consideration is the device platform. Mobile solutions can be run on the following device platforms:

- **Windows Mobile for Pocket PC Phone Edition**
- **Windows Mobile for Pocket PC**
- **Windows CE**

Windows CE is the operating system that provides a basic Windows user experience on handheld devices.

The difference between the Pocket PC platforms and Windows CE is that the Pocket PC has both the Windows CE operating system as well as application components bundled specifically for PDAs. These include a set of system components from the Windows CE operating system (OS) as well as application components, such as Microsoft® Pocket Internet Explorer, Microsoft® Pocket Word, Microsoft® Pocket Excel, and Microsoft® Pocket Outlook.

From a device selection perspective, it might be considered beneficial to have the bundled applications, such as web-browsing and email, plus the look-and-feel of a Pocket PC. If not, then a Windows CE device may be considered.

There is a different look-and-feel between Pocket PC and a Windows CE device. Pocket PC offers its own look-and-feel, whereas on a Windows CE device, it is up to each OEM to provide their own user experience, because they have only the operating system in common.

For this reason, Windows CE devices can differ greatly, and this may affect how some applications run on different devices. The Pocket PC platform offers a more consistent experience between devices. Application behaviour is more predictable between different Pocket PC devices than between Windows CE devices.

Further down the track, if device migration is being considered, then migrating between Pocket PC devices would require less testing and user re-training, than migrating between Windows CE devices.

Finally, Windows Mobile includes the Pocket PC and the Pocket PC Phone Edition. The difference is the Pocket PC Phone Edition incorporates mobile phone functionality.

3. Wireless connectivity options

Connectivity options play a large part in device selection. Choices range from very limited connectivity in the base models to highly connectable devices at the top end. Accordingly, the unit price scales up greatly with the connectivity options available.

Within every each class of device already outlined, i.e. rugged, consumer, Pocket PC, etc, the full range of connectivity options is available. Therefore, it is simply a matter of choosing the appropriate connectivity option, after having made an initial selection on class of device.

Connectivity options include:

- Infra-red
- Serial connection
- Bluetooth
- Wireless LAN
- Mobile telephony - GSM, GPRS, CDMA, WCDMA, 1X, etc.

Practically all models will have an infra-red and serial connection available. The serial connection may be via cable or via cradle.

Bluetooth may be useful for connecting with a mobile phone, headset, or some other personal devices. When used with a mobile phone, Bluetooth can be used for remote data synchronisation.

Wireless LAN (WLAN) connectivity is useful in a controlled environment, such as a warehouse, that can be fully illuminated by wireless access points. This method offers cheap, reliable, and fast synchronisation. Using WLAN, it is also possible to gain web access via remote hotspots, and this may also be used as a method to synchronise.

Of course, the other wireless option is to use mobile telephone functionality. The mobile phone might be integrated within the device, such as a Pocket PC Phone, or connected otherwise using cable or Bluetooth.

A mobile phone connection might be a simple dial-up, to a remote access service at the backend, or to a VPN provider. A packet-switched network such as GPRS, that offers “always-on” functionality may connect to a static IP address at the synchronisation gateway, or again through a VPN, thus offering better security.

It is important to note that it is possible for synchronisation to occur without the need for any wireless connectivity. Users may simply connect via a cable or a cradle hosted by a computer that has a connection to the synchronisation gateway. That connection might be LAN, dial-up, or better still, via VPN access.

4. Integrated functionality and peripheral requirements

As well as mobile telephone functionality, some devices might provide other built-in functionality such as:

- Barcode scanners
- Printers
- GPS receivers
- Cameras
- Magnetic stripe readers
- RFID readers

Otherwise, peripheral devices may be connected using SDIO slots, CompactFlash slots, or other expansion slots. These slots may also be used for memory expansions as well.

5. Keyboard or Stylus input

Some devices feature keyboards, which may be numeric or complete QWERTY. Keyboards are typically rubberised. The size of the keys themselves varies greatly, and sometimes key combinations are required to access certain keystrokes.

Other devices rely on the user entering data using the stylus. In this case, a software input panel is used to enter alpha-numeric data. The Pocket PC offers handwriting recognition and transcription as an alternative.

The choice between an actual keyboard and stylus input depends a lot on the design of the user interface for the mobile application. Mobile application user interfaces should tend towards using drop-down lists or numeric-only fields, in place for simple text-entry fields. If there are a great number of text-entry fields appearing in the application, then an actual keyboard might be preferable.

6. Battery life requirements

How long a device will function between battery recharges remains an important factor in selecting a handheld device. Battery life depends on the battery technology and on the quality of the battery itself.

Of course, battery life will depend on the typical usage patterns of the device. Heavy consumers of battery power are the device backlight, and radio circuitry. Any device running Bluetooth, WLAN, or a mobile phone will require a radio to be operating in the device. Of these, Bluetooth is the lightest consumer of power, due to its short range.

CPU clock speed affects the battery life as well. Some handheld devices can automatically change the CPU clock speed. They will change down in periods of low usage, and speed up when the user is operating the device.

Some vendors will quote battery life with respect to a specific usage pattern. This is the most useful. Others will quote a battery as having a certain number of mAh, milliamp hours. This is not useful, unless the average power usage for the device is known.

A lot of device vendors offer a larger battery as an option, for their devices. A larger battery will come at the expense of weight and ergonomic comfort in the hand.

It is important to consider what will happen to a device, should the battery become fully exhausted.

Some devices offer a **back-up battery**. In this case, when the main battery has been completely drained, a message is displayed to the user, telling them that the back-up battery is now being used. In this way, no data is lost, and the user is advised to recharge the main battery as soon as possible.

If all battery power for the device fails, then normally the data and even the applications in the device memory would be lost. However, some vendors offer what is called **non-volatile memory**. This type of memory retains its data when power is lost, and remains intact during even a hard reset. Some devices will feature this type of memory internally.

Another way of keeping data beyond power loss is to save it on SD memory cards. Applications may access the card just like another folder. Power loss might cause the application to be lost, but if an installation image and the application data are stored on the SD card, then a complete recovery can be made in minutes.

7. Ergonomic considerations

Ergonomic considerations for device selection include size, weight, accessories, and even button placement on the device. This area is often underestimated in how important it can be in the overall success of a mobile solution.

The size and weight of the device are important considerations, and tie in closely with the usage patterns that will be expected, as a part of the mobile solution.

What accessories that the vendor can supply are also important. Will the users be climbing ladders, or entering crawl-spaces? If so, then an appropriate holster or clip-on holder needs to be provided. Does the stylus need to be attached to the device, in order to prevent loss?

Will the device be used in-vehicle? Does it need to be able to be easily removed from the vehicle mount, or remain in place? How many cradle dockings are expected in a normal day, and therefore, how robust is the device cradle? Will the cradle connections wear out after a certain dockings? Again, identifying the typical usage pattern is important.

It might be worth considering a trial run using the final shortlist of devices. Since determining the usage pattern is so important, then a trail-run might be the best way to evaluate the ergonomic factors of the devices under consideration.

8. Screen type

Selecting a screen type has to do with the lighting that is expected in the user environment. There are three types of LCD's (liquid-crystal displays) used in today's devices: transmissive, reflective, and transflective.

Transmissive LCD's are illuminated by fluorescent backlighting and are capable of rendering the greatest colour depth, sharpest text, and highest resolutions. The backlighting is a power consumer for the device battery, however. And it's easily overpowered by bright sunlight. The result is that transmissive screens become nearly unreadable, with little discernible contrast, when exposed to sunlight.

Because of their high quality indoors, though, transmissive colour screens have become the most widely produced displays. Like any technology, the more transmissive colour screens produced, the less costly the displays are to make.

A **reflective** screen forgoes backlighting in favour of a mirror that reflects ambient light to illuminate the display. As a result, reflective screens are ideal for use in bright sunlight and use the least amount of battery power. The disadvantage is that reflective screens are typically dim when viewed indoors, which severely limits their use.

Transflective (or transreflective) LCD's are a kind of hybrid between transmissive and reflective screens. Indoors, transflective screens use backlighting to render images. Outdoors, transflective screens are still legible, because they absorb the sun's rays to produce a bright, readable image (which also saves battery power).

Typically, transflective LCD's render good-quality colour and images, but they can't measure up to the high resolutions and sharp images that transmissive screens produce.

Virtually all ruggedised devices feature transflective screens.

9. Vendor support

By this stage, a short list of devices should be forming up. It is recommended to contact both the device vendor's and all the peripheral vendor's support channels, to understand how they address problems. Further, it should be understood how they handle their defective and damaged equipment repair, including the expected turn-around time.

Some vendors may offer extended warranty options, and possibly next-day replacement. This might be especially useful if you have a field force operating in many different locations.

Also, some vendors may offer some higher degree of support if you use their peripherals with their devices.

Conclusion

There is an ever increasing range of devices available on the market today. But by taking into consideration all of the factors discussed here, it should be possible to arrive at a shortlist of devices that are suited to a particular mobile solution.

If it is feasible, then a complete trial-run incorporating all of the short listed devices should be considered. This trial run should be end-to-end, meaning that the users should take them into the field and work with the mobile application, and synchronise data to the backend.

Failing this, then at the very least, all of the short listed devices should be lab tested using a prototype of the mobile application.

Appendix (A) – Ingress Protection (IP) Rating

A rating has been established by the IEC, that is used to rate the environmental protection for a piece of equipment. It is a three digit rating called the Ingress Protection (IP) rating. The three digits represent three different forms of environmental influence:

The **first digit** represents protection against ingress of solid objects.
The **second digit** represents protection against ingress of liquids.
The **third digit** represents protection against mechanical impact damage.

The third digit is often omitted, resulting in a 2-digit IP Rating covering ingress against solid objects and liquids only.
The larger the value of each digit is, then the greater the protection from that influence. As an example, a product rated as IP573 would be better protected against environmental factors than another similar product that was only rated as IP432.

IP TABLE

	First Number (Solids)	Second Number (Liquids)	Third Number (Mechanical Impact)
0	No protection	No protection	No protection
1	Protected against solid objects over 50mm e.g. hands, large tools.	Protected against vertically falling drops of water or condensation.	Protected against 0.225 joule impact (150g @ 15cm).
2	Protected against solid objects over 12mm e.g. hands, large tools.	Protected against direct sprays of water up to 15° from vertical.	Protected against 0.375 joule impact (250g @ 15cm).
3	Protected against solid objects over 2.5mm e.g. wire, small tools.	Protected against direct sprays of water up to 60° from vertical.	Protected against 0.5 joule impact (250g @ 20cm).
4	Protected against solid objects over 1.0mm e.g. wires.	Protected against water sprayed from any direction. Limited ingress permitted.	
5	Limited protection against dust ingress (no harmful deposit)	Protected against low pressure water jets from any direction. Limited ingress permitted.	Protected against 2.0 joule impact (500g @ 40cm).
6	Totally protected against dust ingress.	Protected against high pressure water jets from any direction. Limited ingress permitted. (Shipdeck)	
7	N/A	Protected against the effects of immersion between 15cm and 1M.	Protected against 6.0 joule impact (1.5Kg @ 40cm).
8	N/A	Protected against long periods of immersion under pressure.	
9	N/A	N/A	Protected against 20 joule impact (5Kg @ 40Protected against 0.225 joule impact (150g @ 15cm).cm).