NUFFIELD TECHNOLOGIES

The Definitive Guide

Windows® CE to Android™ Migration



Executive Summary

Time is running out – you must start planning now to upgrade obsolete Windows business mobile devices.

Mobile computers, tablets and other business technology solutions boost the productivity of colleagues and transform relationships with customers. However, as with all technology, to maintain performance you do need to keep up with the latest developments.

If your business relies on Microsoft mobile solutions, recent changes to operating systems could significantly disrupt your service. This is because Microsoft support for most Windows mobile operating systems has ended, with the final versions coming to a close in October 2023. Failure to upgrade to an alternative system could put you at risk of catastrophic security breaches, device failures and productivity loss.

The good news for businesses is that carrying out this vital upgrade won't just solve these problems – it will bring further benefits, too. By green-lighting a migration, you will move from an outdated operating system that struggles to keep up with today's complex work demands to powerful, user-friendly software that will improve workflows and processes, transform employee and customer experiences, and lower IT costs. Together, these are likely to add up to a competitive advantage that will increase market share and profits.

However, a word of caution. IT projects are notorious for breaking deadlines and budgets. You should plan your migration carefully, considering which operating system, app migration and devices are right for you, so that your business can make a smooth transition.

This paper takes a look at why you should migrate, the processes you should follow and important decisions you should consider along the way. We've also outlined how Nuffield Technologies can help support your successful Windows CE to Android migration, as well as additional services we offer to help optimise your mobile technology to keep you ahead of the competition.

The End of Legacy Operating Systems

Windows CE was released in 1996 and widely deployed across many industries because it allowed apps to run effectively on small, rugged mobile devices. However, as technology evolved, Microsoft announced that they would be ending support for Windows Mobile operating systems, with no like -for-like replacement.

Microsoft Mainstream Support

Mainstream support has ended for all versions of Windows CE and Windows Embedded Compact. This means Windows customers can no longer raise tickets for assistance with any OS configuration or general OS issues.

Microsoft Extended Support

Extended support has ended for Windows CE 5.0, Windows Embedded 6.0. and Windows Embedded Compact 7. Windows Embedded Compact 2013 support will end in 2023. During the Extended Support phase, only patches relating to security are deployed. Once the extended support phase ends, no further security patches are applied, leaving businesses vulnerable to security risks. Figure 1 shows Windows mobile operating system support end dates.

Products Released	Mainstream Support End Date	Extended Support End Date
Microsoft Windows CE 5.0	13/10/2009	14/10/2014
Windows Embedded CE 6.0	09/04/2013	10/04/2018
Windows Embedded Compact 7	12/04/2016	13/04/2021
Windows Embedded Compact 13	09/10/2018	10/10/2023

Figure 1. Support is ending for Windows mobile operating systems.

Avoid security breaches, device failures and productivity loss by upgrading to a modern operating system now.

Security Risks of Unsupported Operating Systems

Unsupported operating systems put your business at risk of the security breaches shown in figure 2.

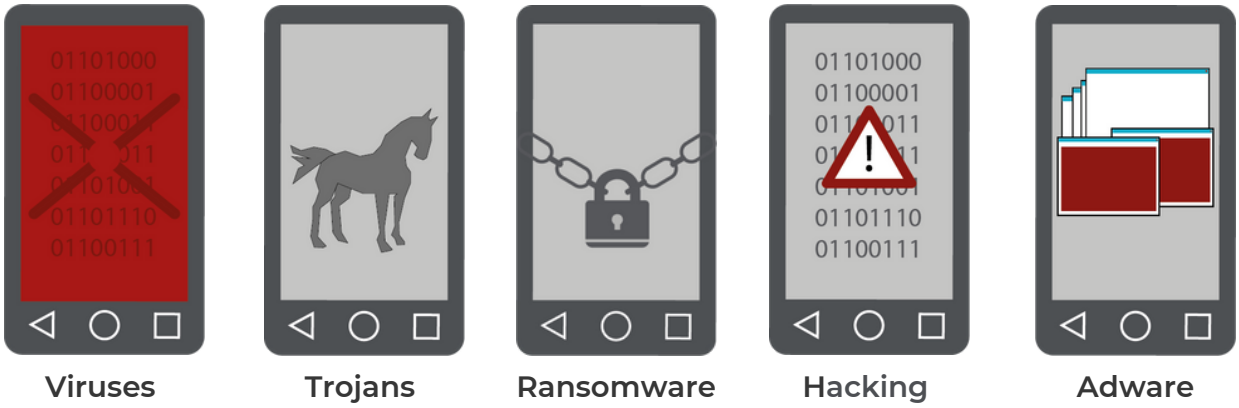


Figure 2. Security Risks Posed by Out of Date Operating Systems.
Guard your business against security breaches by modernising your systems to meet today's complex threats.

What does this mean for my business?

The risk of security breaches poses a huge threat to UK companies. 98% of UK organisations surveyed by Carbon Black reported an increase in cyber attacks on their business in the last 12 months[1]. OS vulnerabilities were the top cause of security breaches (15.5%).

Impact of security breaches for UK Enterprise

- 17.5% said they suffered severe financial impact[1].
- 71% said they suffered reputational damage[1].
- 33% said they lost customers after a breach[2].

Cost of Data Breaches



Figure 3. Cost of Data Breaches on UK Businesses.
Security breaches can be costly. Update legacy operating systems to protect your business.

Alongside security risks, a lack of software updates and reliance on outdated devices can lead to performance issues and an increase in device failures, ultimately costing your business more. In order to mitigate the risks caused by the end of Windows Mobile OS support, businesses need to choose an alternative OS, select new devices and redeploy applications.

Delaying Windows CE migration

Although many organisations have already transitioned to a new OS, some businesses have delayed action and remained on legacy platforms.

VDC research found that the top three barriers that Operational and IT teams face when it comes to migrating OS are:[5]

1. Budgets
2. Cost and time to recode legacy apps
3. Migrating legacy apps

Delaying migration is an option, however the risks associated with this are significant.

In addition to loss of security patches and software updates, companies face a lack of support from developers. This is because developers are no longer trained in these systems and so the skillset has become fairly rare. Although some developers will continue to support their customers with legacy systems, businesses may be relying on support from just one person who has retained these skills.

This creates a risky single point of failure for business critical operations.

Most developers have turned their attention to Android and iOS app development. Investment in research and development also reflects this trend.

Migrating your OS requires upgrading your mobile devices. This can seem like an additional cost; however, failure rates of old devices increase year on year, as shown in figure 4.



Figure 4. Mobile Device Failure Rates[5]
Reduce downtime and cost of repairs or replacements by upgrading your mobile devices.

Continued use of outdated mobile devices increases Total Cost of Ownership, as discussed in our Consumer vs Enterprise white paper, hitting your bottom line. Device failures disrupt critical operations, and can severely impact your productivity, efficiency, revenue and customer service.

As manufacturers' stocks of legacy parts run low, it is becoming more difficult and expensive to maintain and repair devices. Old battery technology means that outdated devices are less likely to last a worker's full shift. With a dwindling supply of replacement batteries, these devices have to be removed from use.

Legacy application rewrites and migration need to be factored into the decision to transition from Windows CE, and this can delay businesses making the decision to switch. However, old apps running on Windows Mobile OS do not have the capabilities of modern apps and do not provide the same intuitive user experience. This has a detrimental impact on user satisfaction and restricts productivity. Modern, touch-centric apps provide a familiar and intuitive experience for users, helping them to get the job done faster.

Although it is possible to delay migrating from Windows CE to a more modern OS such as Android, this decision can be costly in terms of disruption to operations and lower productivity.

Windows CE to Android: Making the move

With support for Windows Mobile OS ending and no like-for-like Microsoft replacement, it is now the time to decide which OS is right for the current and future needs of your business.

iOS or Android?

Although Apple's iOS is an option, it is unable to support more specialised apps often used in enterprise environments. Furthermore, Apple do not currently make enterprise-grade rugged mobile devices, making iOS unsuitable for many businesses. This leaves Android as the most viable OS option.

Android has led the global mobile OS market since 2017 and now has around 80% of the market share[6]. It began its life as a consumer OS; however, developments in recent years have led to more businesses embracing Android to meet their needs. Google has been working closely with industry partners to develop Android Enterprise, which addresses the specific needs of organisations by adding features to deploy, secure and maintain large numbers of Android devices.

The Android Enterprise Recommended Program lists mobile devices that Google have assessed and validated as meeting the high standards required for enterprise solutions. As support for Windows mobile operating systems ends, many organisations are realising the additional opportunities of migrating from Windows CE to Android and making the switch.





Benefits of moving from Windows CE to Android

Functionality

Legacy hardware and Windows mobile operating systems do not have the functionality needed to stay on top of today's enterprise demands. Modern operating systems and mobile devices leverage new technologies and far outclass outdated systems.

Functionality of Modern Operating Systems and Mobile Devices

- Faster data capture
- Greater processing power
- Faster, more reliable Wi-Fi
- Better power management
- Longer battery life
- Longer active use
- Less time to charge
- Can be used to access entire work package
- Smaller devices
- Better mobile network connectivity

Security

Enterprise environments need an OS that is current, supported and secure. Android's multi-layered security keeps your data and devices safe. Isolated processes and device encryption protect against data breaches, and built-in malware protection prevents harmful applications accessing your data.

Android allows businesses to have a greater level of control over how devices operate so they have the ability to meet your specific security requirements. Some mobile device manufacturers, such as Zebra, have created software layers that allow you to extend Android's OS, and add security features. With Zebra MX, you gain an extra level of device and applications management. You can restrict access to features, choose applications to install, and push updates. This suite of tools also allows you to configure hardware features of devices, for example barcode scanners.

Manageability

Modern operating systems such as Android provide flexible options for managing devices and data. Businesses can take complete control of mobile device management. Android allows companies to:

- Lock down devices to job-specific functionality
- Centralise provisioning and large-scale deployment
- Define timing for OS updates to allow for in-house testing.

User Experience

Modern rugged devices are often designed to resemble robust smartphones, and Android Enterprise provides a similar user-interface to the mobile devices that most people use day to day. Staff members are able to use Android devices with touch screens intuitively, increasing satisfaction and productivity and reducing training time to hours rather than days.

New Technologies and Software

Migrating to Android allows businesses to leverage new technologies such as Bluetooth® location beacons, Near Field Communication (NFC) and 4G/5G. The data and insights that can be gained by using new technologies are absolutely vital for companies to remain competitive, increase productivity and efficiency and improve customer experience.

Wireless Communication

New devices benefit from the latest wireless networks such as 5G, WiFi 6 (802.11ax) and Bluetooth 5. Fast, reliable and alternate backup network connections are vital to smooth operations, whereas using technology which is several generations out of date can severely impact your organisation's productivity.

Rugged Device Availability

Android is the leading choice for rugged device manufacturers and it is becoming more difficult to find high quality Windows CE devices. Figure 5 shows the growing range of Android devices now available.



Figure 5. Android devices for every task.

There are many rugged Android devices on the market. Nuffield can help you choose the right mobile device for your business.

This wide range of hardware allows you the flexibility to choose the right device for your enterprise environment. The rugged device manufacturing industry is moving firmly towards Android, and research and development into new products reflects this. This shift to Android devices will mean that it is increasingly difficult to find replacement parts and devices for equipment still running on Windows mobile operating systems. Switching to Android allows stable support and maintenance availability for the entire lifecycle of the device.

Even without the upcoming certainty of Windows CE support ending, there are many reasons for businesses to migrate to Android. Outdated hardware platforms and Windows OS are not designed for modern work requirements. Modernising your OS, devices and apps will allow you to work faster. It is an opportunity to improve both employee satisfaction and customer experience.

How to migrate and what to consider

Switching OS can seem like a daunting task and it has the potential to disrupt both operations and customer experience. Figure 6 shows that the biggest challenges facing businesses looking to migrate are time and cost.

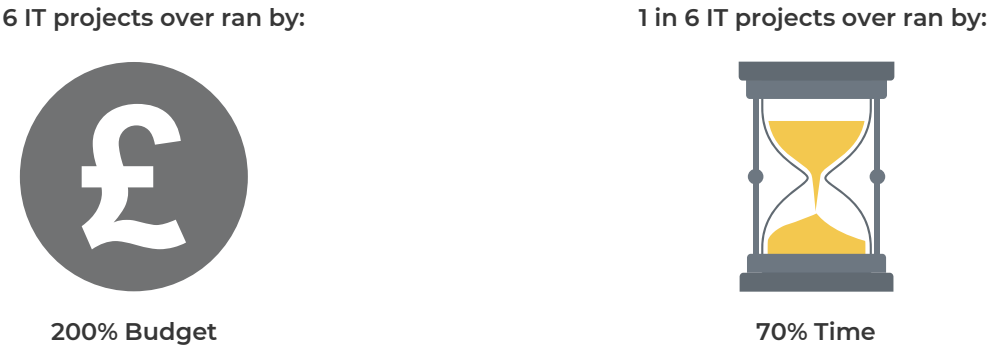


Figure 6. Time and Cost Challenges of IT Projects.
Avoid budget and time for migration spiraling out of control by ensuring you have a comprehensive plan, covering every factor involved.

It is possible to mitigate these risks. It is vital to have a robust plan in place, ensuring that every aspect of the migration is considered.

Three Step Plan for Migrating from Windows CE to Android

Step 1: Choose your OS

Whilst iOS can be an option, the vast majority of businesses making the switch choose Android for the enhanced functionality, security and availability of rugged devices. In some cases it may not be possible to standardize OS across an entire organisation due to many different use cases, and it may be necessary to to support a multi-OS environment.

Step 2: App migration

The number of apps used in your organisation may surprise you, and it is essential to carry out discovery work to uncover every app and every dependency in play. Some workflows may depend on more than one app and, unless this is recognised, it could lead to team members having to carry more than one device. This is also an opportunity to consider workflow and process improvements, rather than just creating new versions of legacy apps. Creating like-for-like apps may not be the most effective use of new technology.

A good place to start is the Google Play Store. There are currently 2.9 million apps on the Play Store and many of these are business focussed[8]. You may find an off-the-shelf app that fulfills the function that your business needs. If you do need a bespoke app, you will need to consider your app migration options. This will depend on the type of apps you have: terminal emulation (TE), native or web apps.

Terminal Emulation (TE)

If your mobile applications are already using Terminal Emulation, it may be possible to continue using these applications on a new device simply by using a TE client app. However TE itself is now very outdated and can be expensive to maintain. If you are replacing your mobile device fleet it may also be a good time to consider updating your TE system to a more modern infrastructure.

Cost:

TE systems can be costly to replace, but they can be even more costly to maintain.

Web Apps

If you are already using web apps on your Windows CE devices, then you may be able to use the same web apps on Android. In order to make sure your web apps are fully compatible with your new devices it is essential that thorough testing is carried out. Web apps designed for Windows mobile operating systems were often designed for fixed screen resolutions and may not display properly on newer devices with higher resolutions.

Cost:
The difficulty and cost of upgrading a web app designed for a legacy device will depend on how the web app was initially built, how well it has been maintained, and whether the source code for the web app is still available. Mobile web browser technology has improved substantially in the last few years, so there may be opportunities to enhance the functionality and user experience of legacy web apps by upgrading them.

Native Apps

A native app is an app that has been built for a specific operating system. If you are currently using apps that have been written for a Windows mobile operating system, these will need to be rebuilt for Android.

Native Android apps have some major advantages over both terminal emulation and web apps. They integrate much more closely with the operating system and therefore they can result in lower battery consumption, faster operation, and have better access to the device's hardware features.

They are also more likely to handle intermittent network access properly, which is essential if you operate your mobile devices anywhere where network connection (either via WiFi or mobile data) is patchy.

Cost:
The cost of rebuilding native apps is extremely variable, depending on several factors such as the complexity of the application, the connectivity requirements, and the experience level of the team employed to build it. Ensuring that the development team you are working with has the right skill set and approach is one of many ways you can reduce this cost.

Step 3: Choose your mobile devices

The key to choosing the best mobile phones and tablets for your business is to match the device with the environment and the tasks that will be performed[9]. Consider the level of 'ruggedness' required for your environment. Even in less harsh enterprise environments, such as warehouses and outdoors, devices will frequently be dropped. This means that although they may have lower upfront costs, consumer-grade devices are rarely suited to enterprise environments. Figure 7 shows common mobile device challenges in enterprise environments.

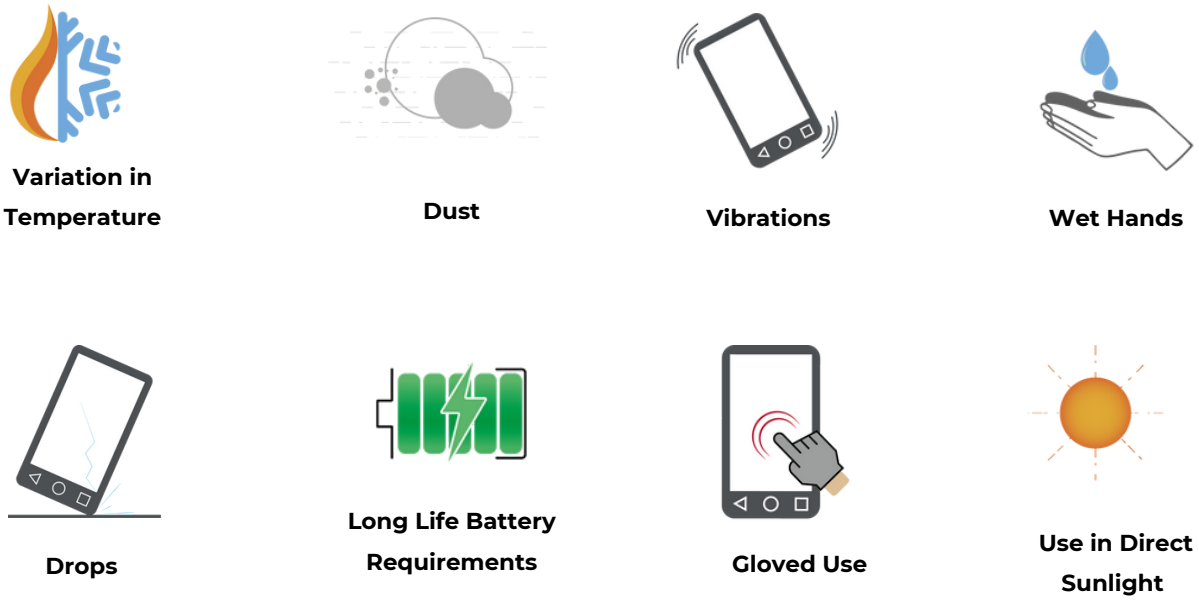


Figure 7. Mobile devices in enterprise environments are often subjected to far greater challenges than consumer devices typically face.

Reduce total cost of ownership of mobile devices by assessing the environment carefully. This will help you choose the best devices for your business.

It can be difficult to understand the full costs and benefits of different mobile devices, particularly as many of these costs emerge over time. This is why Total Cost of Ownership (TCO) must be factored into the decision to invest. TCO is a financial calculation that enables you to assess the overall cost of investing in mobile technology, including both upfront costs such as hardware and software, and hidden costs such as maintenance, training and the impact of downtime. Our Consumer vs Enterprise white paper introduces the concept of Total Cost of Ownership, and will help you to make the best decisions for your business when investing in mobile devices.

How Nuffield Technologies can help

We help businesses plan and implement migration from legacy Windows CE to Android, ensuring a smooth transition.

Device selection and procurement
Nuffield Technologies help organisations to choose the right Zebra mobile technology for fast and accurate job performance. Zebra is the industry leader in enterprise mobile computing and offers a range of mobile computer design forms to equip your workers for all use cases. We work with you to select business grade mobile phones, computers, tablets, printers and scanners that exactly match your job needs. Then we negotiate on your behalf to secure the best possible value. Nuffield carry out detailed Total Cost of Ownership analyses for you to ensure that you are investing in the right mobile devices for your business.

Application Development Services
We design and develop mobile, web and desktop applications for logistics and business productivity.

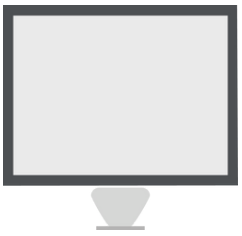
Our apps can integrate with your existing software and hardware platforms.



Mobile Apps



Web Apps



Desktop Apps

We can port your existing apps to Android or rebuild and modernise them using Nuffield Technologies' app building framework, CoreXam.

CoreXam is our modular framework for building line-of-business applications. It can be used to build apps for Android, iOS and Windows from a single shared code base. Apps can be built quickly and cost effectively by using off-the-shelf modules for common features, and building business processes to your specification. This reduces the need for bespoke development work by up to two thirds and simplifies support. Apps can be developed in as little as 1.5 - 3 months dependent on size. As CoreXam is based on Microsoft Xamarin, we can sometimes reuse significant portions of code from existing Windows CE applications.

Our apps are reliable, secure and intuitive to use.

Lifecycle management

Nuffield Technologies can help you with a complete mobile solution.

Initial implementation

From streamlining your existing work processes to designing and developing apps that increase productivity, we partner with you to ensure smooth transition to Android. We make sure your back-end systems are seamlessly integrated and can help you to get your teams up to speed with their new tools, so that your day-to-day operations are not disrupted.

Ongoing support

Your business is impacted when devices fail. We provide a bespoke package of technical software alongside extended updates and support, keeping your mobile devices in service for longer. We offer fast replacements and repairs to make sure your business runs smoothly.

Conclusion

As Microsoft ends support for Windows mobile operating systems, businesses must migrate to more modern operating systems in order to avoid disruption.

Alongside security breaches, organisations which delay migration face software and device failures and a lack of support from developers to maintain their systems. However, the case for making the switch goes beyond these risks. Today's world of work requires businesses to move fast to keep up with the competition. Increased customer demand and expectations mean that companies need more advanced mobile computing technology. Updating your mobile platform to modern operating systems, apps and devices has many benefits, shown in figure 8.

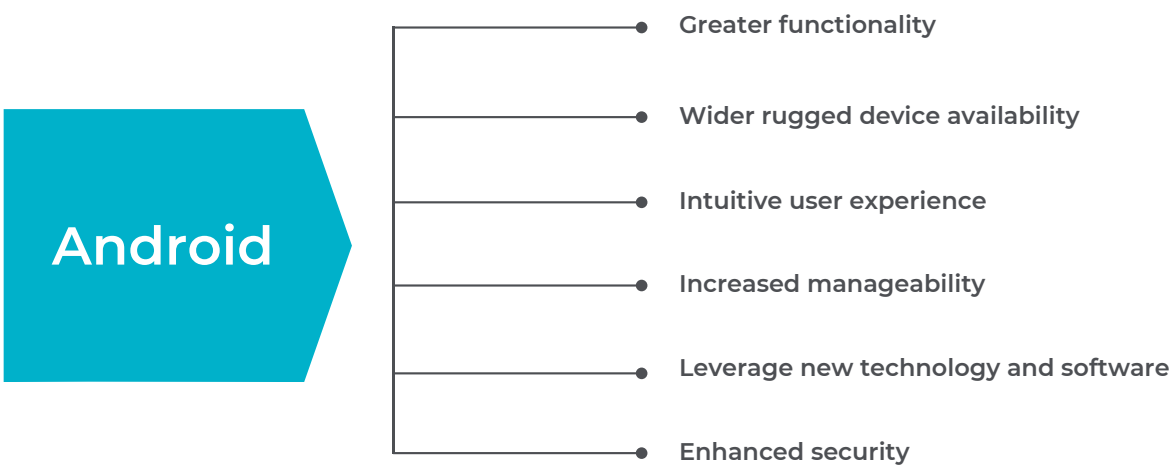


Figure 8. The Benefits of Migrating to Android OS.
Move to a powerful modern OS that will improve workflows and processes, transform employee and customer experiences, and lower IT costs.

Migration from Windows CE to Android may seem like a daunting task; however with careful planning and a staged approach, the move can be made fast with minimal disruption to day-to-day operations.

Nuffield Technologies can help you with updating your OS, rewriting legacy apps and selecting the right mobile devices to suit your business environment. Our experienced team can support you every step of the way to make sure your transition goes smoothly. Contact us to discuss your mobile solution requirements in readiness for when support for Windows CE ends.

About Nuffield Technologies

Nuffield Technologies specialise in mobile computing and data capture for enterprise and public sector organisations.

Our end-to-end services cover mobile device procurement, development and security. We can help your business with:

- Enterprise or “Rugged” mobile hardware procurement
- Developing mobile, web and desktop applications
- Implementing data capture solutions
- Deploying Android technology in security-critical environments
- Service, repair and support

We keep businesses on the go with flexible mobile solutions that are perfectly tailored to your environment.

Call us on +44 1202 665885

info@nuffieldtechnologies.com

References

1. VMware Carbon Black. June 2020. UK “Threat Report. Extended enterprise under threat.” VMWare Cabon Black https://www.carbonblack.com/wp-content/uploads/VMWCB-Report-GTR-Extended-Enterprise-Under-Threat-UK.pdf
2. Atomik Research and Red Seal. July 2019. “RedSeal B2B Research.” Atomik Research https://www.redseal.net/files/PDFs/RedSeal%20UK%20B2B%20Research%20SUMMARY_July2019.pdf
3. IBM and Ponemon Institute. 2020. “Cost of Data Breach Report 2020.” IBM https://www.ibm.com/uk-en/security/data-breach
4. Hiscox. 2020. Hiscox Cyber Readiness Report 2020. Hiscox https://www.hiscox.co.uk/cyberreadiness
5. Krebs. D.. 2015. “Migrating Legacy Enterprise Mobile Applications. Getting it right means everything.” VDC Research Whitepaper https://scanonline.com/wp-content/uploads/2015/10/OS_Migration_Getting_It_Right_WP.pdf
6. Statista. 2020. “Mobile Operating Systems’ Market Share Worldwide from January 2012 to July 2020.” Statista https://www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/
7. Flyvbjerg, B and Budzier, A. Sept 2011. “Why Your IT Project May Be Riskier Than You Think.” HBR. https://hbr.org/2011/09/why-your-it-project-may-be-riskier-than-you-think
8. Statista. 2020. “Number of available applications in the Google Play Store from December 2009 to September 2020.” Statistica. https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store/
9. VDC Research Group, Inc. December 2018. “Total Cost of Ownership Models for Line of Business Mobile Solutions.” Enterprise Mobility. https://www.vdcresearch.com/Coverage/emob/reports/18-Total-Cost-of-Ownership.html

NUFFIELD TECHNOLOGIES

Contact Details

+44 1202 665885
info@nuffieldtechnologies.com

The Old Bank, 42 High Street
Poole, Dorset, BH15 1BT

Windows CE to Android White Paper | Rev B | 03/05/2023 |
Copyright © 2020 Nuffield Technologies Ltd. All rights reserved.
All other trademarks are the property of their respective owners.