



TCE versus TCO:

Revealing the True Costs of Hand-held Computing



Executive summary

The unprecedented investment undertaken by the UK government to arrest economic decline and shore up the banking sector has created budget pressures that will inevitably result in cuts in public spending. While the depth, target and timing of cuts are debated, local government is almost certain to face an imminent upward revision to the 3 per cent annual efficiencies target (equating to \$4.9 billion) expected to be achieved by March 2011 as defined by the 2007 Comprehensive Spending Review.

Allied to budget cuts is a steep drop in council revenues as a direct or indirect consequence of the downturn. For instance, according to the Local Government Association, reduced revenues from the sale of land, council buildings and other capital projects as well as lower interest earnings (thought to be down \$1.3 billion) are estimated at \$4 billion over the last two years¹.

With this in mind, there's no doubt that if 'efficiency' has always been a constant on the agenda of local government, it's now centre stage as local government organizations strive to rein in spending. While budgets will fall, cash will be freed for projects that demonstrably deliver cost savings. Consequently, the potential of new technology to achieve efficiencies will come under the microscope. One such area is mobile computing. It's increasingly being deployed by local government teams across waste and refuse, facilities management, enforcement (e.g. parking and street patrols), highways, social care, and environmental services operations as recognition grows that the technology can transform the service performance and productivity of departments while simultaneously reducing costs.

When it comes to deploying a new technology – especially where it's expected to reduce costs – it's tempting to invest in the lowest price option. That can lead organizations to deploy hand-held computers based on products used in consumer markets, as opposed to rugged products designed for professional users. This decision is understandable. The capabilities of rugged and consumer devices appear similar. Moreover, it's not unusual for mobile service carriers to provide their hand-held devices at a reduced cost. And in many cases where large deployments are concerned, products are offered free of charge, clearly pointing the bottom line to consumer devices.

However, the Total Cost of Entry (TCE), defined as purchasing the hardware used by staff, is just part of the financial jigsaw when it comes to operating a fleet of mobile computers. Many more variables, from servicing to repairs and support, must be taken into account when assessing the Total Cost of Ownership (TCO) over a typical five-year deployment: variables which, more often than not, mean that consumer-based products represent an expensive false economy. The reasoning behind this perspective is explained in more detail in this paper. It calls on research among over 6,000 IT decision makers and 2,500 mobile workers in Europe and the US – including responses from the government sector – to accentuate the importance of properly evaluating the TCO liability.

¹ <http://www.localgov.co.uk/index.cfm?method=news.detail&id=81666>

Overview: Mobile computing on the march

The capabilities of hand-held mobile computers have advanced markedly in recent years on the crest of a number of trends. Wireless communication is faster and more ubiquitous with field teams able to access networks from virtually anywhere with close to instantaneous connectivity to key applications. Hand-held devices have become much more powerful and user-friendly, sporting very clear screens, intuitive interfaces and a wide range of capabilities, from basic voice calling to text messaging, and advanced GPRS and bar-code scanning. The number of vendors building hand-held devices has increased too, as has the community of companies creating software and services for field teams: developments which fuel innovation and an increasingly vibrant market.

In the wake of the technology's progress, so recognition has grown across public and private sectors that mobile computing can deliver against critical drivers familiar to all types of business: the need to be more efficient, enhance productivity and cut costs.



The case for mobile computing

Mobile computing connects field teams with a wide range of applications, back-office systems and – through communications – with their customers, colleagues and control and dispatch personnel. With critical intelligence and services at the immediate disposal of field teams, they're better equipped to dynamically receive jobs, plan their day, make decisions quickly, access the information they require to efficiently perform tasks and report back to base. The technology is extremely versatile supporting a huge range of applications. Brief highlights of some key categories include:

- **Dynamic job allocation:** Jobs can be dynamically sent and scheduled to field teams, from maintenance staff to engineers, waste and refuse teams, highway maintenance personnel, street cleaners, parking wardens and many more. Where GPS is deployed, dispatchers can visualize the location of personnel and send the closest resource to respond to ad hoc requests – delivering improved service to customers, a more efficient workforce and, with mobile operations (e.g. highways and building maintenance), significant fuel and time savings to help reduce operating costs.
- **Integrated workflows:** The ability to integrate mobile data and communications with standard IT systems improves operations. For example, with facilities management teams, connecting a job management system with workers in the field simplifies scheduling of maintenance and enables dynamic changes as needed for ad hoc customer requests. Integration with parts inventories and tool databases ensures that the right equipment is reserved and available for each technician so jobs can be completed on the first visit. So eliminating fuel costs and vehicle wear and tear associated with excessive mileage and enhancing customer service. The result? A well-informed and cost-efficient operation, capable of executing maintenance quickly and accurately.

Environmental efficiencies

Mobile computing improves environmental performance. Trucking and logistics firm DB Schenker has equipped its vehicles operating in Sweden with 4,000 MC75 Enterprise Digital Assistants from Motorola. One of the applications of the devices is to apply GPS to ensure drivers take the most efficient route, while telematics data is applied to advise drivers to moderate driving styles.

The company estimates it's achieving fuel savings of 7 per cent per vehicle each year as a result of the deployment.

- **Data capture:** Template data entry forms on hand-held computers are designed to be highly intuitive. The forms can comply with industry standards such as Six Sigma with drop-down menus that standardize records collation and, where possible, auto-fill fields. Some computers are also equipped with bar-code scanners and cameras that can quickly capture information. Scanners can be used to rapidly populate forms via back-end databases using bar codes. 'Quick-fill' forms save minutes every time a manual record would have been made: small efficiencies which, over time, equal big savings. For instance, parking attendants can scan and check the validity of residents' parking permits, print and rapidly serve notices (which are automatically registered in databases) and take a picture of the ticket. Where manual data entry is eliminated, accuracy of notation is greatly increased, reducing incidents of error. Similarly, the duplication of work (and possible errors) caused by mobile teams needing to key handwritten notes into office-based IT systems is removed.
- **Advancing agility:** With mobile computing, the timeline for the flow of information is compressed; data moves freely between the business and the field and vice versa, where it's immediately actionable as opposed to being trapped in a piece of paper awaiting entry into a computer. Furthermore, by enabling records to be updated on-the-fly, users don't need to return frequently to the office: a capability that greatly enhances productivity and service delivery by keeping front-line teams in the field longer.

- **Everything to hand:** Through hand-held computers, teams have push button access to the information they need to get the job done. Engineers, for instance, can conduct risk assessment against template forms and file these with the office before commencing work. Using the bar-code scanner, they can ensure that they're inspecting the correct piece of equipment and access maintenance manuals and pass service histories to assess the problem. If they don't have the necessary parts to hand they can order these remotely. With more intelligence to hand, teams are better prepared to complete their tasks more efficiently, improving service and advancing productivity.

Mobile worker technology provides incremental productivity benefits and cost savings across many functions and applications. No matter what the type of task personnel are overseeing, workers spend more time 'doing' and less time managing paperwork in the office when they're supported by mobile computers. With the ability to automate records creation and collation – with audit trails, the facility for remote teams to access intelligence from the field and to transmit data to back-office systems – the capabilities of a worker equipped with a mobile computer are transformed. Their productivity is advanced, efficiency improved, Service levels excel, and operating costs in many areas are trimmed.

Just as the business case for hand-held computers is compelling, the most cost-efficient way to deliver the technology also appears straightforward. Local government organizations are faced with a clear-cut choice between devices that are used in consumer markets – based on smart phone and PDA models – and products that are designed to be rugged for professional use. On the face of it, consumer products that are much cheaper appear the optimum choice. But hidden costs cloud the picture. And unfortunately, the true expense of the two types of computer only shines through once products are in the field. In an effort to support local government organizations in making the right choice for their organization at the outset, the following section of this paper looks at the relative merits of consumer and professional rugged computers. It applies research from among 6,000 IT decision makers to add weight to the analysis.

TCE versus TCO

Organizations that decide to provide consumer-base devices to staff typically cite several common reasons for doing so. These include acquisition costs of the hardware, the preference of end-users, specifications and innovation. These factors are examined in tandem with the research published by the Venture Development Corporation in 2009: Total Cost of Ownership for Mobility Computing and Communications Platform Review.

- **Cost:** Any IT project comes under a 'high-powered' cost microscope. And with mobile computers, the TCE differential (rugged versus consumer) can be very marked. In fact, with some service providers offering consumer-based devices for nothing, in return for lengthy service contracts, hardware costs can appear extremely attractive. So attractive that, when justifying costs to decision makers, it's hard not to recommend the lower-priced option.

However, the research among IT decision makers paints a different portrait when it comes to the lifetime bill for the technology. Standard deployments of hand-held computers last three to five years. During this period, aside from the initial hardware cost, five additional overheads come into play. These include: software (upfront fees, licence, development and customization costs), development (application design, integration and staging), training (of

Research insight

The research cited in this document was conducted by the Venture Development Corporation. In all, 6,000 senior IT decision makers at line of business and above, including VPs, CIOs and IT directors, completed the survey along with 2,500 mobile workers. The areas covered included mobility drivers, spend, applications, reliability and overall cost assumptions for hardware deployments.

OCS makes the move to rugged devices

OCS is a privately owned company. It offers many of the services that would typically be fulfilled by a council's facilities management teams including a full range of property support services, catering, cleaning, hygiene, textile care, pest control, waste management, grounds maintenance and security. It turned over £674 million in the last financial year and employs 60,000 people worldwide.

OCS is a renowned pioneer of new technology.

Recognizing the capabilities of mobile computers to improve the performance and customer service delivered by its remote teams, the company deployed a consumer PDA in a 'rugged holster' provided by a UK mobile provider. The deployment was problematic. Devices typically changed every six to nine months and, every time a new version came out, applications had to be recertified and peripherals and accessories changed. The units also proved too fragile for use within a service workforce. Over time, with new devices replacing old, OCS had a mixed estate of products, which increased maintenance costs. Furthermore, product changes were disruptive to the smooth running of OCS' service operations.

OCS now uses Motorola's MC35. The hand-held computer supports a wide range of applications and is achieving a key aim of OCS: to lower TCO. Based on a three-year life cycle, each MC35 will have a total cost of ownership which equates to 66 per cent of the cost of the equivalent consumer device. This difference includes loss of productivity due to devices being on repair, the cost of any repairs, and additional test and validation expense necessitated by the arrival of new models. The figures also include purchase cost, swap-outs, the relative life cycle of each product, application certification and warranty support – any lost or damaged device is replaced, no questions asked, the next day.

GSH

GSH is a leading provider of technology-driven facilities and energy management solutions.

The company had deployed consumer devices to link field engineers who maintain customer facilities (e.g. heating, ventilation, and air-conditioning systems) in real time to its Maximo asset management application.

The deployment initially met requirements. However, the handhelds weren't designed for rugged use so breakages were frequent. Moreover, as the objectives for the system evolved, the limitations of the devices became more apparent; it wasn't easy to develop bespoke applications and key functions were unavailable, including bar-code scanning, touch screens and signature capture. With these issues in mind, GSH has equipped its workforce with Motorola MC70 rugged hand-held computers, which are generating cost savings across operations with £250,000 recouped by electronic timesheeting alone. Commenting on the deployment, Maxwell Segal, Director of IT Innovation, GSH, highlights TCO benefits: 'Our customers expect to see that our engineers have access to the correct information through the most robust technology – it confirms that they made the right decision in working with GSH. The MC70 delivers – it's highly visible to the customer and shows we're ahead of the game. It also plays a pivotal role in enhancing productivity and customer service while generating a range of cost benefits: from cutting administration time for engineers, to being more reliable and lowering TCO compared to other mobile devices.'

users upfront and ongoing), operations (maintenance, tech support, upgrades and application management), and downtime (hardware replacement, servicing, lost manpower and productivity as a result of device failures).

When asked to estimate the cost drain of the above categories, respondents report that by far the largest expense associated with their devices is downtime as a result of lost productivity and servicing and replacing products.

Especially so for companies that have opted to deploy consumer devices: they disclose that downtime accounts for 64 per cent of operating overheads. The figure is similar – 63 per cent – for organizations that use 'durable' handhelds (consumer-style devices 'strengthened' for professional use).

The survey also uncovered the relative 'failure' rates for hand-held computers over five years of rugged products versus consumer or 'durable' type products. The disparity is marked. In year three for example, 18.2 per cent of rugged products fail. This compares to 82.6 per cent of consumer products. The mean failure rate over five years is 66 per cent for consumer/durable handhelds.

It's half that figure at 32.18 for rugged computers with no real problems in year one (3.3 per cent failure rate), year two (7.8 per cent failure rate) and year three (18.2 per cent failure rate).

	1st Year	2nd Year	3rd Year	4th Year
Rugged Mobile Computers	3.3%	7.8%	18.2%	55.4%
Non-Rugged Mobile Computers	18.0%	38.5%	82.6%	96.8%

Figure 1: Percent of Installed Mobile Computer Units Replaced by Year

When asked to estimate TCO, taking into account upfront purchase of devices through software, development, training, operations and downtime, the participants in the survey revealed that consumer devices cost \$21,149 each over five years. Fully rugged devices come in at \$12,958 – a disparity that suggests any early TCE benefits of consumer products are swamped by TCO.

	Fully Rugged HH/PDA	Semi-Rugged HH/PDA	Durable HH/PDA	Consumer Grade HH/PDA
Five-Year TCO	\$12,957	\$14,344	\$19,815	\$21,149
Annual TCO	\$2,592	\$2,869	\$3,963	\$4,230

Figure 2: TCO of device categories over five years

It's understandable that project teams may opt for the low-cost option when acquiring hardware. Indeed, the survey revealed that 34 per cent of companies who use consumer-style models make this decision on the core belief that they are considerably cheaper. Another 34 per cent report that they'd conducted detailed TCO analysis which pointed to consumer devices.

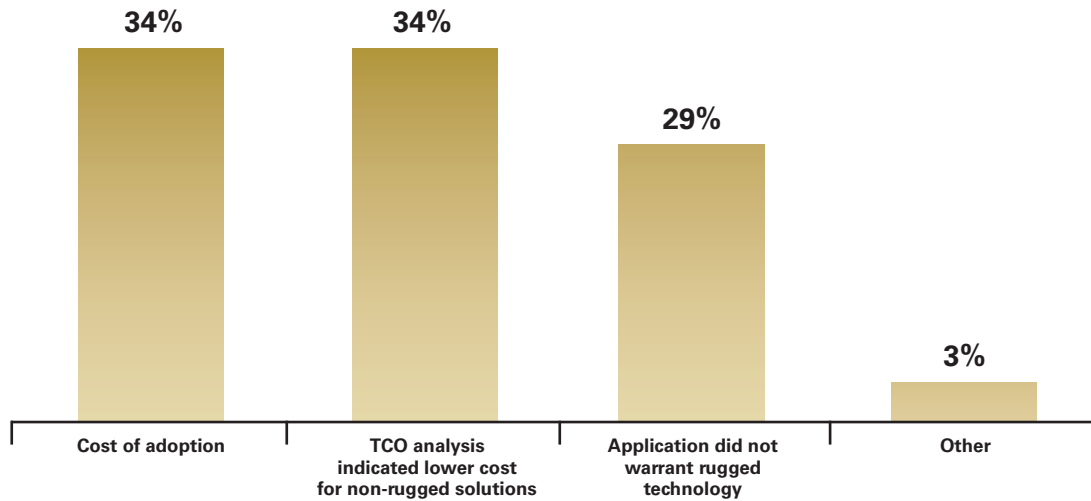


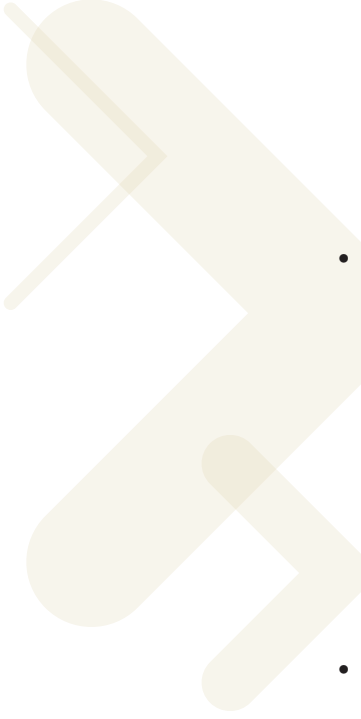
Figure 3: Reasons for buying non-rugged devices

While it's difficult to know what was involved in the TCO equation, evidence suggests that the decision to 'go consumer' is often predicated on short-term cost evaluations, which don't fully take into account the complete life cycle costs of devices.

Companies typically report a range of issues with consumer devices. They are not designed for continual operation. In busy environments, they don't cope well with the knocks and drops associated with professional use. Also, very quickly, mobile computers become indispensable for users so when their unit fails, they need it replaced, yesterday. However, many companies that supply devices are not geared to the needs of commercial customers and cannot meet the demands of organizations to replace damaged computers quickly. A growing body of anecdotal evidence suggests that, in many cases, suppliers of consumer devices often contest the cause of damage which results in protracted replacement times.

Consequently, a high number of companies that contact Motorola for RFPs are doing so to replace consumer-style mobile computers as their full expense comes into sharp relief.

- **User opinion:** Portability and style are, for end-users at least, a primary concern when it comes to their Enterprise Digital Assistant (EDA); a smart phone tends to be more desirable than a piece of equipment that's truly designed for professional, rugged use. So when companies put devices in the field for a trial, staff can be tempted by smaller products. However, Motorola's customers reveal that rugged devices quickly earn the respect of end-users who recognize that they are designed for purpose. For instance, handholds are available that are certified for operating in hazardous environments, and provide large buttons and much improved audio for users who need to wear bulky gloves and work in raucous backgrounds. Furthermore, products are extremely tough – they can be dropped and knocked and continue to support their user and provide capabilities such as scanning and GPS that are industrial-strength and outperform consumer devices.

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- **Innovation:** Consumer product models can be replaced by a new version every six months. Such speed of innovation has been promoted as a benefit. In reality, it can create severe operational headaches. When a product fails, this needs to be replaced. However, due to the fast change cycle, only the new model might be available. Given the high failure rate of consumer devices, in less than 12 months companies can be juggling a mixed estate of products, which increases maintenance costs. Also, every time a new model comes out, it's likely that the operating system will change too. While professional hand-held computers often come with staging systems to update software quickly across the estate of computers, this facility is uncommon with consumer-based products. So each device needs to be updated individually, often at considerable cost, while staff may need to be retrained on the product too. Innovation is not the domain of consumer devices either. In fact mobile computers for professional markets, which integrate GPS, scanners, cameras and a range of wireless connectivity options, are among the most advanced portable computers in the world with a level of reliability that's unmatched.
 - **Specifications:** Where companies have consumer devices in place, the TCO research questioned the drivers behind this decision. Just under a quarter (24 per cent of companies) revealed that workflow analysis suggested applications used in the field could be managed by consumer devices. While it's impossible to know how these companies planned to use their hardware – units might not, for example, be exposed to the elements with users working outside, or be constantly on the move and in and out of trucks – there is one constant that does undermine this reasoning: continuous operation. Consumer smart phones might be on all day. But rarely are they used constantly and are not subject to the high degrees of associated wear and tear. So even if a device is planned to be used predominantly out of the weather, it will be in operation continuously and may also be subject to the odd drop and knock – demands that will result, suggests the research, in a high degree of downtime.

With the above issues in mind, the business case for consumer devices, predicated on TCE, is deflated when compared to the more comprehensive and realistic assessment of TCO.

The business case for rugged devices

For the majority of local government organizations seeking to provide their staff with the best equipment at optimum cost, rugged computers may not appear to be the obvious choice. But the products are more often than not the right choice from operational, and commercial, perspectives.

Innovation beyond technology

While mobile computing technology has advanced markedly in recent years, the way that systems are purchased has remained the same with organizations paying a fee on a per device basis. However, the downward pressure on budgets has seen customers, particularly in the public sector, press for more innovative ways to purchase and maintain hand-held computers. The industry has responded through the design of managed service contracts, which can cover the complete installation, maintenance and management of devices. The cost of services is typically spread over a three or five-year period.

Rugged computers are truly designed for purpose as opposed to a product prepared for the consumer market that has been customized for the needs of professional users. Where needed, rugged hand-held computers can be certified for use in hazardous environments and include design features that are tailored to support users who need their computer to work day in, day out or operate in uniquely challenging environments. Devices also come typically with the option of a range of accessories to make it easy

to work with them. And companies can choose from an extensive range of customizable applications such as dispatch, telematics, advanced messaging and data capture capabilities that provide the scope to enhance return on investment from the initial spend through the life cycle.

When reviewing professional devices in the round, the business case becomes even stronger. Most vendors of professional hand-held computers provide support packages that are vastly superior to those operated by mobile service providers. Motorola for instance recognizes that mobile computing is not a 'nice to have': it's business critical. The company offers a wide range of versatile support packages that recognize this imperative. For instance, if a product is dropped, smashed, fails of its own accord or is in any way faulty, it's replaced the next day. No questions asked. No hassle. It's a service that's properly tailored to the needs of dynamic organizations.

For further information on TCE versus TCO of mobile computing or to receive a presentation of Motorola's TCO research, please contact:

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