

TTCO

INSIGHTS ON RUGGED MOBILE COMPUTERS

Market Analysis By:





One-On-One With Analyst David Krebs

VDC analyst David Krebs discusses why he undertook this research project and its importance.



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WHAT DROVE YOU TO CONDUCT RESEARCH ON THIS TOPIC?

VDC's initial research on mobile computer total cost of ownership (TCO) in 2003/04 was driven by the continued surge in mobility investments by enterprise and government organizations coupled with the lack of standard or industry-accepted TCO models. While widely accepted as a critical technology investment criterion, available TCO data was frequently biased toward a specific

vendor's objectives or incomplete. Beyond establishing industry-accepted TCO models for mobile computing solutions, VDC was also interested in creating defensible TCO models that compared mobile TCO across a broad spectrum of mobile computer form factors, levels of ruggedness, and installation environments.

One of the key findings from the initial research was that due to the high failure rates of non-rugged mobile computers – as much as 40% annually in certain scenarios – rugged mobile computers enjoyed a favorable TCO in several application environments. Acknowledging these vulnerabilities, non-rugged mobile computer vendors – especially notebook vendors – have invested in designing a more durable device. Based on these technology developments, one of the objectives of the more recent TCO research conducted by VDC was to validate many of our initial conclusions.

WHAT IS THE IMPORTANCE OF YOUR FINDINGS?

Supported by a rigorous primary research methodology, VDC has created what we believe to be the most comprehensive analysis of mobile computing TCO for enterprise and government applications. Also, as the research was not sponsored by one specific vendor or group of vendors, we feel that the value of the data and conclusions presented for individuals making mobile computing investment decisions is heightened.

HOW WAS THE DATA GATHERED?

The data was primarily gathered using a Web-based survey methodology between January and March, 2007. Target respondents were individuals with mobile computing purchase, specification, and support responsibilities within end

user organizations. We received over 100 individual responses for each of the seven vertical markets or industry sectors surveyed. These seven markets are Government: Public Safety/EMS; Field Professionals and Field Service; Retail Services; Healthcare Service; Manufacturing; and Transportation and Distribution.

WHAT ARE THE TAKEAWAYS FROM YOUR RESEARCH?

Certainly one of the key findings is that rugged mobile computers continue to achieve a favorable TCO position in comparison to non-rugged mobile computers for many mission-critical applications. Clearly, in extremely harsh environments, such as the battlefield in the Middle East, the only realistic option is a rugged mobile computer. However, even in less-incllement conditions – such as those experienced by a field service technician or even an insurance adjuster – failure of non-rugged devices can be substantial. While VDC is not advocating the use of rugged mobile computers for all mobility applications, we recommend that end users evaluate rugged or semi-rugged mobile computers for applications that have a higher degree of mission criticality where device failure can have negative consequences to operational processes, customer service effectiveness and efficiency, and potentially revenues.

However, failure rates of non-rugged mobile computers have dropped in comparison, and the primary sources of failure have shifted. For example, display failure has replaced hard drive failure as the leading source of failure for notebook computers. This can be attributed to the investments made by non-rugged mobile computer vendors in shock-mounting hard drives or integrating accelerometers.

One area that has emerged over the past several years as a significant contributor to lost productivity and ultimately higher TCO is wireless transmission interruption – especially for solutions relying on wireless WAN technology. Each failed or interrupted transmission – assuming signal coverage – can result in up to 10 minutes of lost productivity as the end user has to log on again to the network through the VPN. As the wireless WAN transmission failure rate is typically higher for plug-in versus integrated solutions, VDC strongly urges end users to evaluate mobile computer vendors on their experience and ability to support integrated wireless communications.



The TCO Behind Rugged Mobility

Research supports the investment that companies make in rugged mobile computing platforms.

Today's enterprises are continuing their transformation to highly fluid and distributed organizations where key decisions are being made at the point of interaction. Ultimately, the ability to improve decision-making speed and scalability at the edge of an organization is what is setting apart best-in-class operations, and organizations are looking to mobile computing and wireless communications solutions to enable these real-time remote transactions.

VDC, a leading research authority on enterprise mobility solutions, recently released an update to its groundbreaking research on mobile computing Total Cost of Ownership (TCO), initially conducted in 2003/2004. The objectives of the research were to develop accurate and defensible TCO models for a variety of mobile computing form factors and levels of ruggedness or durability. In addition, the research set out to compare mobile computer TCO by a variety of applications or installation environments. Much has occurred since VDC last conducted this research, thus necessitating a refresh. Consider the following:

Emergence Of Durable Mobile Computers. Non-rugged mobile computer vendors are beginning to acknowledge the limitations of their hardware and are investing to improve their durability. Key developments include shock-mounting hard drives, integrating accelerometers, and spill-proofing keyboards. While these enhancements fall well short of the IP-, NEMA-, or MIL-STD-rated rugged hardware, can they significantly reduce the historically high failure rates of commercial-grade mobile computers?

Increased Dependency On Mobile Applications/Devices. As organizations continue to port more line-of-business applications onto mobile devices, the impact of a non-working device in the field may also extend into lost revenue opportunities. According to VDC's 2007 research, mobile device end users lost an average of 75 minutes of productivity each time the device failed. With the average device failing as many as 20 times per year, that can translate into as much as \$4,000 in lost revenues per employee per year.

Understanding mobile device TCO is simply becoming

more important, not only for current and potential end users but also for mobile device hardware manufacturers and systems integrators. Supported by a rigorous primary research methodology designed to draw comparisons by

MOBILE COMPUTER LEVEL OF RUGGEDNESS

Mobile Computer Ruggedness Scale	Definition
Fully Rugged	Mobile computers designed to meet MIL-STD 810-F and AT LEAST IP54 standards
Semi-Rugged	Mobile computers designed to meet IP54 standards (but not MIL-STD 810-F)
Durable	Mobile computers that are not MIL-STD/IP/NEMA rated but have features such as shock-mounted hard drives, accelerometers, and spill-proof keyboards
Commercial Grade	Mobile computers with no enhanced durability or ruggedness designed into device

mobile computer type, OS platform, level of ruggedness, application type, and user environment, VDC has developed the definitive unbiased third party research on mobile computing TCO analysis. This research note provides the summary findings of VDC's six-month research endeavor.

(Note that this research focuses on use cases where mobile computers are being exposed to harsh or semi-harsh environments and are being used in ways that may be more prone to damage and/or failure. Detailed definitions of mobile computer levels of ruggedness and a list of user environments are provided in tables above and at right.)

ENTERPRISE APPROACH TO TCO ANALYSIS

Enterprise mobility investment decision making, while multi-functional, is being centralized within organizations. Moreover, solutions for Fortune 1000 organizations are increasingly being planned on a global scale. However, organizations frequently do not have the analytical tools or information necessary to make informed decisions. This is perhaps best illustrated in an organization's use of TCO tools to make better mobile computing investments. In fact, according to VDC's most recent mobile computing research, fewer than one in three organizations currently use TCO analysis when investing in mobile computing solutions.

Although this is as much a factor of the overuse – or misuse – of TCO as a savvy marketing and sales tool by mobile



computing vendors and the larger IT community, it also relates to the lack of accepted or standard approaches to calculating mobile computer TCO. Most TCO analysis places greatest emphasis on up-front system acquisition, deployment, and training costs – in other words, hard costs. However, VDC’s research reveals that the soft costs associated with mobile computing solutions – device failure and downtime, productivity loss and maintenance/support costs – represent the most significant contribution to overall TCO.

Understanding these soft costs and being able to marry the best possible mobile computer with the target user and application is ultimately what will set apart mobility innovators and enable companies to fully leverage mobility investments as a true competitive advantage. However, organizations looking to cut expenditures will frequently opt for lower cost mobile computing hardware. In many cases this means the use of a non-rugged mobile computer for applications that are better served by rugged devices. Given the high current rate of failure of non-rugged mobile computers, this refers to a broad collection of mission-critical enterprise mobility applications and not just deployments in the most extreme environments.

WHERE RUGGED MOBILE COMPUTERS HAVE A TCO ADVANTAGE

VDC’s research again confirmed that the TCO of rugged mobile computers is in many cases lower when compared to non-rugged mobile computers in similar applications using the same mobile computer form factor. Key findings by form factor include:

Notebook Computers

- The average annual TCO of notebook computers is \$3,900. TCO varied by approximately \$1,800 per year between rugged and non-rugged notebook computers. With notebook computers, the primary factor driving variance in TCO is device failure. The average annual failure rate for non-rugged notebooks was estimated at approximately 30% while annual failure rates for rugged notebooks were less than one-third the non-rugged rate, or approximately 9%. (Device failure is defined as a mobile computer requiring some level of internal or third party help desk or technical support. It includes devices that are repaired by an internal service department and those shipped to a third party service organization.)
- Non-rugged notebook computer vendors are placing increasing emphasis on device durability and have implemented various design innovations to address the high failure rates of their devices. While this has elevated the public’s awareness of device failure, it has not substantially lowered the failure rate of these devices. Failure rates of durable devices are still more than twice as much as fully and semi-rugged notebooks.
- The leading sources of hardware failure for notebooks were cracked displays, damaged hard drives, and peripheral/accessory failure. One noticeable change was cracked displays replacing damaged hard drives as the single highest source of failure. This perhaps is a result of the increased investment most notebook manufacturers are making in providing greater durability to hard drives

END USER ENVIRONMENTS EVALUATED

User Environments	Definition
Public Safety/EMS	<p>Police — Organizations involved in providing safety and security to serve and protect the property and citizenry of their respective jurisdiction (i.e. local, state, federal). The employees respond to and thwart crimes, disturbances, and disputes, and investigate crimes.</p> <p>Fire/EMS — Organizations involved in responding to emergencies such as fires, accidents, and natural and man-made disasters, among others. Employees are typically trained in providing medical service, from basic levels to complicated care.</p>
Field Professionals/Service	<p>Field Service (MRO) — Field personnel whose primary job function is to maintain and repair all types of equipment. Key service segments include utilities, telecommunications, HVAC, office and building automation, and transportation equipment.</p> <p>Field Sales — Field personnel whose primary job function is to sell products and/or services to all types of companies. Major sub-segments include pharmaceuticals, insurance, and financial services.</p>
Manufacturing	<p>Factory Floor — Organizations involved in discrete or process manufacturing operations. Key industries include chemical/petrochemical, electronics, automotive/ transportation equipment, and consumer packaged goods, among others.</p>
Retail Services	<p>Shop Floor — Organizations involved in retail service operations. Key segments include mass merchants, DIY, grocery, specialty, gas/convenience, department stores.</p>
Healthcare Service	<p>Health Services — Organizations that employ personnel whose primary function is to provide medical care to the surrounding community and others, either on a profit or non-profit basis. Key segments include hospitals, long-term care facilities, GP offices, and community clinics.</p>
Transportation/Distribution	<p>Mail Courier/Freight — Organizations involved in the physical transporting of goods and/or passengers. Major sub-segments include postal services, courier services, trucking, air, rail, and marine.</p> <p>Distribution Center (DC)/Warehouse — Organizations involved in the operation of enclosed facilities supporting the management of inventory for fixed physical locations.</p>



through shock-mounting and/or integrating accelerometers.

- Another noticeable difference in performance and subsequent TCO between rugged and non-rugged notebooks is wireless transmission. For most enterprise mobility

ANNUAL MOBILE COMPUTER TCO			
	Annual Hard Costs ¹	Annual Soft Costs ²	Annual TCO
Rugged Notebooks ³	\$1,092.98	\$2,001.24	\$3,094.22
Non-Rugged Notebooks ⁴	\$820.00	\$4,030.96	\$4,850.96
Rugged Handhelds/PDAs ³	\$879.22	\$1,850.88	\$2,730.10
Non-Rugged Handhelds/PDAs ⁴	\$562.95	\$3,533.39	\$4,096.34

1 - includes hardware and software acquisition, system deployment, maintenance, and education costs
 2 - includes productivity loss from hardware failures, wireless transmission failures, and internal IT support costs
 3 - based on 48-month replacement cycle
 4 - based on 36-month replacement cycle

applications, wireless data transmission is a key requirement with the average user processing over 30 wireless data transactions per day. However, while most rugged notebook vendors are providing integrated wireless LAN and WAN options, non-rugged notebooks typically only provide integrated wireless LAN. For the most part, rugged notebook vendors have more experience at integrating multiple radios into their mobile computers and their users consequently achieve superior performance – in terms of range and throughput – and experience fewer dropped or failed transmissions. In fact, wireless transmission failure is almost three times as much for non-rugged notebooks when compared to rugged notebooks. Each failed transmission leads to 5 to 10 minutes in lost productivity (re-logging onto network through VPN) and as a result can significantly add to TCO, not to mention employee frustration. Plug-in peripherals, such as wireless WAN radio cards, also represent a key source of failure for non-rugged devices.

- One key research finding is that the failure rate of non-rugged notebooks increases substantially with time – annual failure rates range from 15% to 20% during the first year of use to exceeding 40% after the second full year of use – while rugged device failure rate remains fairly consistent over the course of its installed life. As a result, the lifecycles of rugged notebooks typically exceed those of non-rugged notebooks by over 18 months, decreasing the overall system deployment and integration costs. However, given the rate of technology advances, many organizations do not want to use notebooks beyond 30 to 36 months and will mandate faster replacement or upgrade cycles to have access to the most current solutions.

Handheld/PDA Mobile Computers And Smartphones

- The average annual TCO of handheld/PDA mobile computers is just over \$3,000. According to VDC’s research, rugged handheld/PDA TCO was approximately \$2,700 while the TCO of non-rugged handheld/PDAs exceeded \$4,000. The average annual failure rate for these mobile computers ranged from 11% for rugged devices to 38% for non-rugged devices.

- The primary sources of failure of non-rugged handheld/PDA mobile computers centered much more on environmental issues with exposure to extreme temperature fluctuations, water/moisture/humidity, excessive vibration, and, in certain cases, EMI (electromagnetic interference) exposure all contributing.

- In addition, non-rugged mobile computers are frequently equipped with numerous plug-in accessories to provide the same level of integrated functionality provided by a similar rugged computer. These plug-in scanners/imagers and wireless cards represent a significant source of failure when the device is dropped.

- As the use of smartphones proliferates within enterprise environments, organizations are looking to port more line-of-business applications to these devices and expand their functionality from communications-centric devices. Although smartphones are mostly deployed for white-collar professionals, they are increasingly being considered for gray/blue-collar worker applications. Some of the major smartphone limitations are similar to PDAs in terms of their lack of integrated input/output functionality. However, mobile phone and smartphone vendors are starting to introduce rugged options that conform to IP/NEMA specifications and may compete for market share for applications such as field service.

A CONCLUDING RESEARCH NOTE

The use of mobile computing solutions is exploding within enterprises to the point that notebook shipments are about to outpace traditional desktop computer shipments. However, mobile computing represents uncharted territory for many organizations, when considering the complexities of managing and supporting this increasingly distributed computing infrastructure. Going forward, it will be critical for organizations to conduct an unbiased assessment of the total cost of ownership of mobile platforms.



TCO INSIGHTS ON RUGGED COMPUTING PLATFORMS

Market Analysis By:



Venture Development Corporation is an independent market research and strategy-consulting firm that specializes in a number of mobile and wireless, automatic identification, embedded, and other enterprise IT markets. VDC has been operating since 1971, when graduates of Harvard Business School and MIT's Sloan School of Management founded the firm. Today we employ a talented collection of analysts and consultants who offer a rare combination of expertise in the market research process, experience in technology product and program management, and formal training in engineering and marketing.

ABOUT VDC'S TCO RESEARCH

VDC's *2006/2007 Total Cost of Ownership (TCO) Models for Mobile Computing and Communications Platforms: Second Edition* was published in June 2007. VDC published seven separate reports that cover a variety of user environments including: Field Service; Government – Public Safety/EMS; Healthcare Service; Manufacturing; Professional Service; Retail Services; and Transportation/Distribution. Individual reports can be purchased for \$3,450.00. A summary report covering all markets is available for \$995.00. For more information about VDC's TCO research, visit www.vdc-corp.com or call (508) 653-9000.

How Rugged Computers are Different

By Richard Lawson

Rugged computers differ from commercial computers in a few significant ways. These differences are what enable a rugged computer to operate in less than pristine conditions. These differences are also the reason rugged computers are higher priced than commercial computers, but also have a lower total cost of ownership as a result of the huge decrease in "downtime" over the life of the computer.

Casing

The first major difference is the casing. Commercial portable computers are made out of plastic. Rugged portable computers are made out of magnesium. Magnesium is up to twenty times stronger than plastic. The magnesium casing provides protection against drops and other bangs and knocks.

Shock Mounted

The second difference is called shock-mounting. A rugged computer always has a shock-mounted disk drive and often will have a shock-mounted display screen. The shock-absorb-

ing materials allow the disk drive to withstand drops and also the type of vibrations that are prevalent in a moving vehicle. This is particularly important in a work vehicle or public safety vehicle that must drive on dirt roads, bumpy roads or drive at high speeds in an emergency.

Waterproof

The third difference is sealing or waterproofing. Fully-rugged computers are totally sealed against the outdoor elements. This keeps out rain, humidity, fog, dust, dirt, high and low ambient temperature and other environmental elements consistent with outdoor or dusty conditions. Semi-rugged computers are not totally sealed but normally have at the minimum a spill-proof keyboard and display screen. This protects against liquid spills, such as coffee or soft drinks, which can often occur in a mobile environment.

Screen Brightness

The last major difference is the brightness of the display screen. Most semi-

rugged and all fully-rugged portable computers offer brighter displays. These high bright displays are mandatory if you hope to be able to read the screen outdoors or in a vehicle with the sun shining through the windows.

Other Options

Finally, there are other features of rugged portable computers that are usually offered as options that are normally not offered in a commercial, plastic computer. These include such items as backlit keyboards for night time use, touch screens (which are easier to use in a vehicle or field environment), integrated mobile broadband wireless communications cards, integrated GPS receivers, and vehicle docks and mounts specifically designed for the model of rugged computer that you purchase.

In summary, there is a proper tool for every job. Rugged computers are the proper tool for people who work in and out of their vehicles, out in the field, in dusty warehouses, repair shops or factories.





RUGGED TCO

SUPPLEMENT SPONSORS

GENERAL DYNAMICS Itronix

General Dynamics Itronix, based in Spokane, WA, has been a world-class developer of wireless, rugged computing systems for nearly two decades. Serving mobile workers in markets such as commercial field services, telecommunications, utilities, government, military, and public safety, GD-Itronix is known for its wireless integration expertise, comprehensive offering of rugged, mobile devices designed from the ground up, and award-winning services. Customers include hundreds of Global 2000 companies with network diverse work environments and world-recognized organizations such as Sears, Verizon, U.S. Army, U.S. Air Force, U.S. Navy, U.S. Marines, UK Ministry of Defense, FBI, Royal Canadian Mounted Police, and a variety of public safety agencies.

Intermec®

Intermec develops, manufactures, and integrates technologies that identify, track, and manage supply chain assets. The company's products and services are used by customers in many industries worldwide to improve the productivity, quality, and responsiveness of business operations. From next-generation mobile devices and radio frequency identification (RFID) readers to breakthrough scanning technology, our full range of products are built tough for dependable, reliable service. Our product line is designed to take the abuse of harsh environments, preserve the data, and last for a full shift of operation, all with the fastest performance so workers can perform at top speed.

Panasonic TOUGHBOOK®

For over 15 years, Panasonic has been the leader in mobile wireless computing technology. Today, Panasonic's rugged, reliable, and wireless Toughbook notebook PCs are the number one choice of field service providers. Toughbook PCs are not just durable laptops; they're total solutions that stand up to harsh environments and help you run your business with maximum uptime and productivity no matter where your job takes you. Toughbook notebook PCs are covered by a three-year limited warranty and offer an array of value-added and premium services to further guarantee uptime and better manage your Toughbook assets. Work anywhere. Risk nothing.



Sprint Nextel offers a comprehensive range of wireless communications services bringing the freedom of mobility to business users. Sprint Nextel is widely recognized for developing, engineering, and deploying innovative technologies, including two robust wireless networks, serving 53.6 million customers at the end of the first quarter 2007; industry-leading mobile data services; instant national and international walkie-talkie capabilities, and a global Tier 1 Internet backbone.

Group mobile™ Rugged & Mobile Computers

Group Mobile is a premier provider of rugged, mobile, and field-use computing products. Headquartered in Phoenix, AZ, Group Mobile serves customers all over North America. Group Mobile's line card consists of rugged laptops, rugged tablet PCs, rugged UMPCs, rugged handheld, and fixed-mount computers as well as rugged mobile printers, vehicle computer docks, mounting gear, peripherals, and accessories. Group Mobile carries all the top brands such as Panasonic Toughbooks, Itronix GoBooks, Xplore Tablet PCs, Getac Rugged Computers, and more.

JANAM

Janam Technologies, LLC is a provider of rugged, handheld computing devices for mobile workers. Janam combines deep industry knowledge with advanced technologies to deliver products and accessories that increase productivity, reduce costs, and improve customer satisfaction. Specializing in purpose-built mobile computers that scan bar codes and communicate wirelessly, Janam's products are ideally suited for mobile applications in retail, healthcare, hospitality, manufacturing, and logistics.

PSION TEKLOGIX www.pSIONteklogix.com

Psion Teklogix is a global provider of solutions for mobile computing and wireless data collection. The company's fully integrated mobile computing solutions include rugged hardware, secure wireless networks, robust software, professional services, and exceptional support programs. For over three decades, companies have turned to Psion Teklogix to empower their mobile workforces by increasing efficiency and improving productivity – essential elements for business growth, profitability, and competitiveness. Psion Teklogix offers a wide range of rugged mobile computers fully supported by responsive and reliable customer service and a creative approach to addressing your logistics needs.

xplore TECHNOLOGIES.

Xplore Technologies' iX104 Tablet PC computer combines patented ruggedization techniques and leading-edge technology. This product is built to operate in demanding environments including exposure to vibration, extreme temperatures, moisture, dust, or drops to concrete. Warranties are supported by independent third-party testing to Military Standard guidelines. The iX104 incorporates integrated wireless capabilities, magnesium alloy housings, shock-mounted hard drives, enhanced XGA displays, Intel processors, and onboard ports for expansion. Resistive pen touch and/or inductive pen interfaces are available with the iX104. This product utilizes full Windows operating systems so that organizations can utilize a variety of industry-leading software.