

## Wireless Network Drive Test Tools—Lowering the Total Cost of Ownership

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*This paper considers the Total Cost of Ownership (TCO), from an operator perspective, for drive test systems used to gather mobile network data. We do not consider the running cost of a drive test campaign, but rather the cost of ownership of drive test tools, and will consider ways to lower the TCO.*

It has become widely accepted in the Information and Communications Technologies (ICT) industry that the correct method for analyzing the cost of a vendor's products or services is to do a Total Cost of Ownership (TCO) analysis. Rather than focusing solely on price, buyers of ICT products and services must consider the additional, often hidden, costs of training, operating, managing and upgrading their purchases. Addressing only the purchase price for drive test tools will not sufficiently make a difference.

In this paper, we will look at the factors and elements that make up the TCO for mobile network data gathering systems. Over the last ten years, the TCO for drive test tools has continued to increase due to advances in technology, drive test product limitations and increased Mobile Network Operator (MNO) competition. Those institutions that have already addressed and developed strategies and programming to reduce the cost of ownership of mobile network data gathering systems are now seeing benefits. If your institution has not addressed this issue then you are probably not seeing a cost reduction. In fact, institutions and companies that have not addressed TCO are continuing to experience out-of-control cost increases for mobile network data gathering and drive test systems.

Sweeping changes and improvements in technology continue to challenge our industry to reshape and redefine how best to deploy mobile network data gathering and drive test systems. Unless you have a handle on what it takes to acquire, implement, and support drive test tools, it may prove too expensive to stay **current**. By addressing the components that make up the TCO, your institution will be in a position to take full advantage of the latest innovation in mobile network data gathering techniques. You will find it very difficult, even impossible, to implement an institutional mobile network data gathering and drive test methodology aimed at including future technologies when your enterprise is using a bespoke technology and frequency limited system.

### Why Bother With TCO?

TCO is more than the original cost of purchasing the system. We have found that more than 70% of the TCO is involved in non-purchasing activities. It must include all direct and indirect costs associated with mobile network data gathering and drive test systems, which have a typical life span of five years. At some institutions this life span may be more like ten years, but in both cases the older units are removed and abandoned as redundant because they cannot be used to test and measure the latest network infrastructure upgrades.

Introducing the wrong drive test systems to your network can be very costly. Being aware of the TCO components is the first step in lowering your mobile network data gathering cost. Limiting choices and setting standards

are the best methods for starting to get control of your drive test systems cost. Ensuring that all parties use a single type of system is usually the fastest way to bring mobile network data gathering and drive test systems costs under control. However, it is not always easy to implement when both individuals and group networks have developed enough expertise and knowledge to be able to specify and utilize their own drive test systems.

Institutional implementation of soft standards will work best in bringing the entire enterprise to accept a standard and limited choice. Limited choice must include enough variety to cover the user's requirements, which should include engineering (optimization & integration), special coverage groups (in-building & special coverage projects), marketing (benchmarking) and management (key network performance indices).

## What Makes Up TCO

We have defined seven different base elements that make up the cost components for drive test systems. These are: (1) purchase price for all hardware and software; (2) staff training costs; (3) installation and implementation costs; (4) support services and update costs; (5) cost of required functional upgrades; (6) technology upgrades; (7) interoperability costs.

## Basic Elements for Tracking TCO

Institutional TCO consists of more than simply the original purchase of hardware and software. Each of the seven complex base elements listed above includes several types of expenditures. Listed here are the definitions for each of these base elements:

**Purchase price** should include all direct and indirect purchases for a drive test system. Generally we are talking about the drive test tool hardware, software, data collection supported devices, and log file (output) manipulation. The price should include warranties, extended warranties and maintenance agreements.

**Training costs** should include all direct and indirect expenditures for training activity required to effectively run the drive test system. Formal and informal training usually occurs with the installation of the drive test system. Costs and methods vary according to vendor.

**Installation and implementation costs** should include all direct and indirect expenditures involved in ensuring that the system is installed correctly and meets your institution's standard operating procedures. This may vary from tools needed for hardware installation to server configuration to accommodate the storage and access of log files.

**Support services costs** include all staff costs incurred in providing adequate personnel support to the drive test system. This includes on-site technical support, as well as remote support via telephone, e-mail and the internet. Installers, troubleshooters and skilled support staff are all involved in maintaining the system.

**Functional change upgrade costs** should include both direct and indirect expenditures necessary to make ongoing changes to the drive test systems operation. This will allow the institution to increase its drive test efficiencies, including the deployment of the latest software updates, the addition of extra parameters, and the improvement of data displays.

**Technology upgrades costs** should include direct and indirect costs involved in acquiring new tools or upgrading the current system to include the latest mobile technologies. i.e. CDMA 1x to EVDO or HSPA to LTE.

## Cost Breakdown of Base Elements<sup>1</sup>

During the life span of a drive test system the proportional costs of the base elements tends to fluctuate. The aver-

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<sup>1</sup> Based on Andrew's Inven NxG wireless measurement solutions.

age first-year purchase price for a network drive test tool is \$25,600. During the first year of operation we found the cost elements at the following levels:

- Purchasing 80.6%
- Training 18.2%
- Installation and implementation costs 1.2%
- Support services costs 0%
- Functional change upgrades costs 0%
- Technology upgrades costs 0%

**TCO by elements 1st year**

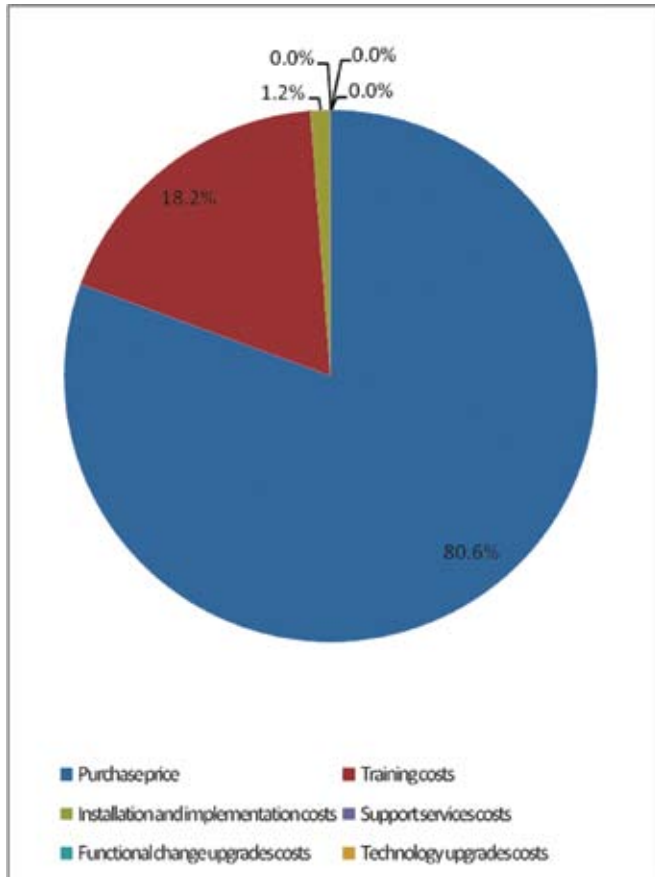


Figure 1 - TCO by elements 1st year

Over a five-year period a modern day network drive test tool will require one or more technology upgrades in order to work to its maximum efficiency. We will here consider the upgrade from HSPA to LTE. The proportional costs of the base elements will change.

The five year cost for a network drive test tool is \$46,500. This includes all the hardware, software, and devices upgrades necessary for actual operation in a current network. After five years of operation we found the cost elements at the following levels:

- Purchasing 42.9%
- Training 9.7%
- Installation and implementation costs 0.6%

- Support services costs 25.8%
- Functional change upgrades costs 5.8%
- Technology upgrades costs 15.2%

**TCO by elements 5th year**

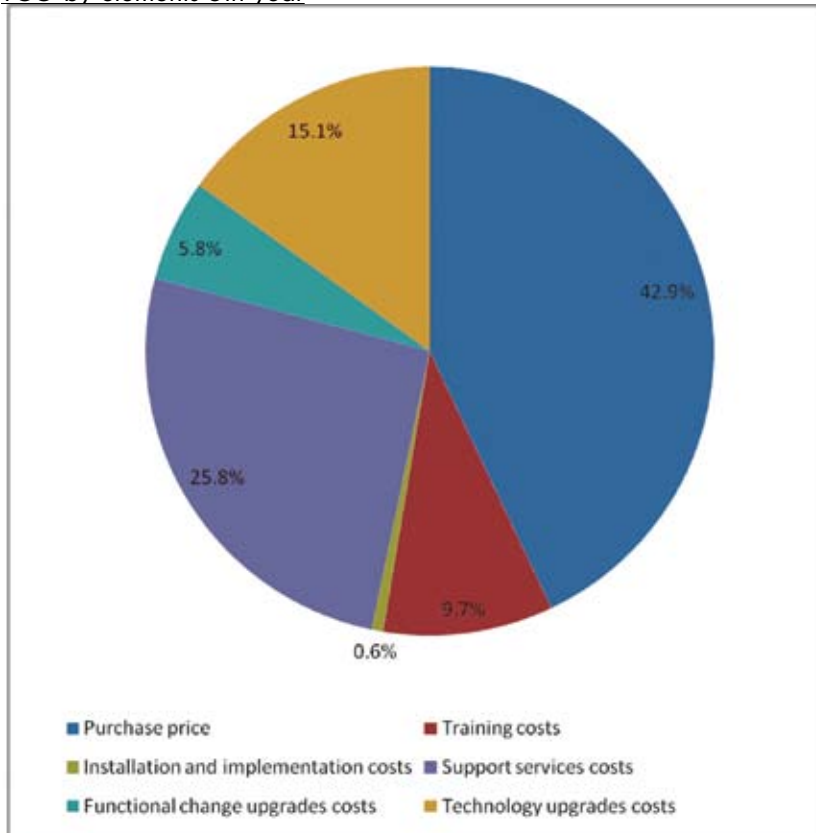


Figure 2 - TCO by elements 5th year

**NOTES**

**Purchasing Prices**

It is important to plan ahead in order to accommodate escalating costs required for the selection and acquisition of drive test tools.

**Limits to your TCO Model**

For the mobile network data gathering environment we limit the TCO model to the network drive test tool.

**Soft Standards**

"Soft Standards" are implied standards resulting from simplified procedures, lower cost, full support, and ease of acquisition.

**Training Costs**

Users of drive test tools require training. This training may be formal or informal, on-site or off-site, personal or computer based.

Training sessions should be scheduled on an annual basis to accommodate application changes, and on an ad-hoc basis each time there is a major upgrade to the drive test system.

### **Loss of Productivity**

The level of training required by the users of drive test tools can limit staff productivity levels. Some institutions implement a regular training schedule where a single person will attend each formal training session and then train the rest of the team in order to limit the effect on their productivity. In some situations this is the only method of training used.

This type of training still incurs an indirect cost due to loss of time on behalf of both the trainer and the trainee. Based on an hourly rate of \$48 (including benefits) for formal training, an average informal training session costs around \$33 per hour.



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