PURPOSE

Total Cost of Ownership (TCO) modeling is a tool that systematically accounts for all costs related to an information technology investment decision. This document provides answers to frequently asked questions about TCO modeling.

TOTAL COST OF OWNERSHIP MODELING

What is Total Cost of Ownership modeling?

TCO modeling is a tool that systematically accounts for all costs related to an information technology (IT) investment decision. TCO models for IT investments were popularized by Gartner Research in 1987 and are now widely used. TCO evaluates all costs - direct and indirect - incurred throughout the life-cycle of an IT asset, including acquisition and procurement, operations and maintenance, and end-of-life management.

While comparing the cost of different IT products and vendors can appear to be a simple task, there are frequently less obvious costs unrelated to the initial purchase price which can strongly influence the "best choice." In fact, the initial procurement cost is typically a small part of the total cost of owning and operating most IT products.

How does TCO modeling differ from "life-cycle cost analysis" or "full cost accounting?"

Life-cycle cost analysis and full cost accounting are both systematic accounting approaches that seek to evaluate all costs associated with a product or practice, similar to TCO. All of these approaches can help organizations reduce total costs over time and document the benefits of practices like energy conservation and environmentally sound recycling.

Life-cycle cost analysis is often applied to energy technologies and building projects. For example, a life-cycle cost analysis can show that spending more initially on additional building insulation can produce a net savings (due to reduced heating and cooling costs) over the lifetime of a building.

The term full cost accounting is sometimes used interchangeably with life-cycle cost analysis, but is typically used to evaluate ongoing programs. For example, the U.S. Environmental Protection Agency promotes full cost accounting as an appropriate tool for evaluating the costs of local solid waste management programs. It allows a municipality to account for such things as avoided disposal costs associated with recycling that otherwise might not be taken into account.

These cost analysis tools are also sometimes used to identify externalities, like the reduced pollution resulting from recycling, or the purchase of electronic products with reduced quantities of hazardous substances. TCO modeling provides a systematic framework for considering these types of costs, as they relate to IT assets, in order to make better purchasing decisions.

Why should federal agencies and facilities use TCO modeling?

TCO modeling:
- Provides a consistent, systematic framework for comparing IT alternatives, increasing productivity, and reducing overall costs over time.
- Establishes a standardized way to track and compare IT costs over time.
- Educates and raises awareness about the full costs of IT, showing that the initial IT procurement cost is a relatively small part of the full cost of ownership.

Federal agencies have additional incentives to use TCO:

- Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, directs federal agencies to "take into consideration environmental measures as well as economic and social benefits and costs in evaluating projects and activities based on lifecycle return on investment."
- A wide range of federal policies and resources, such as Office of Management and Budget (OMB) Circular A-94: *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, encourage the use of life-cycle cost analysis. Additionally, OMB Circular A-131 requires federal agencies to use "value engineering," a tool similar to TCO modeling.

TCO modeling is particularly useful for federal organizations that are partners in the Federal Electronics Challenge because it is an established, widely accepted method for evaluating costs related to all three phases of IT ownership: acquisition and procurement, operations and maintenance and end-of-life management. TCO modeling can help justify certain costs by showing, for example, that purchasing and appropriately using an ENERGY STAR® qualified computer can significantly reduce product lifecycle costs, or showing that the cost of properly reusing or recycling a computer might be only 1 percent or less of the full cost of ownership.

What is evaluated in a TCO model?

The following table summarizes the types of costs typically included in a TCO analysis. These costs are broken down by the three electronics life-cycle phases. Note that these costs are typically calculated on an annual basis by dividing by the expected product lifetime.

Category	Examples of Costs
Acquisition and Procurement	- Administrative costs such as developing bid specifications, evaluating proposals, gathering data, budgeting, and negotiating. - Researching and evaluating options such as upgrade, rebuy, lease, seat management or purchase. - Developing contracts, tracking purchases, transfer and delivery. - Hardware (purchase or lease), including all peripherals, storage, networking, and other related equipment. - Spare systems and parts, annual supplies, and materials. - Software licenses. - Warranties.
Operations and Maintenance	- Administrative costs, including contract management, asset management, overseeing contractors, a share of human resources, and other operating costs. - Vendor-contracted and/or in-house training of staff and IT personnel for product installation and maintenance, and help desk support. - Migration to new equipment. - IT support such as database management, network management, and software management. - Retooling to accommodate new hardware and software. - Software and hardware upgrades over time. - Share of floor space, furniture, and other fixed office costs. - Internet and other network access costs. - Energy use. - Training for IT staff and users. - Informal staff self-support of computer users. - Down time due to hardware/software malfunctions and/or user errors. - Ensuring security, including prevention and recovery. - Backup and recovery. - Insurance.

Category	Examples of Costs
End-of-Life Management	• Administrative costs including asset management, documenting inventory, vendor contract procurement and management, and invoice payment. • Staging (removing and consolidating equipment). • Sanitizing hard drives and other storage media. • Testing and/or preparing for reuse. • Providing follow-on support to employees or others purchasing used equipment. • Recycling/disposal fee and/or outsourcing fee. • Shipping. • Value of sold products and materials.

What are typical values for TCO?

When Gartner published their initial TCO models for IT investments, their conclusion that personal computers can cost an organization up to $10,000[1] per year was met with skepticism. Over time, the methodology and estimates of typical TCO values have been widely accepted.

Recent studies have shown that while the TCO of office personal computer can be lowered by proper computer management, the average TCO of a $1,300 desktop computer can be up to around $5,400 when hardware/software costs, support, recurring costs such as internet access, and administration costs are included.[2] A notebook computer, or laptop, that costs $1,500 can have a TCO ranging from $5,000 to close to $10,000 if not taken care of properly.[3]

What are some limitations of TCO modeling?

Like any tool, TCO modeling does have limitations. For example:
• Although very likely to reduce long-term costs, TCO modeling itself may initially add cost by asking procurement decision makers to gather and consider more information.
• Since TCO modeling tracks long-term, life-cycle costs, capturing the benefits of TCO analysis in a single year's budget can be difficult.
• TCO modeling does not assess risk or how well a particular technology fits with an agency's or facility's strategic goals or needs.
• TCO modeling does not necessarily track environmental or social costs and benefits.

What resources are available from the FEC?

The FEC has developed a basic TCO Calculator Tool, which allows users to compare the costs of different options for IT asset management with an emphasis on decisions that may have an environmental impact. The Tool is available as a Microsoft Excel® spreadsheet at the FEC website:
http://www2.epa.gov/sites/production/files/fec/resources/tco_tool.xlsx.

REFERENCES

The text of Executive Order 13514 is available at: http://www.fedcenter.gov/programs/eo13514/.

OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, is available at: http://www.whitehouse.gov/omb/circulars_a094.

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[1] "Why is Total Cost of Ownership Important?" John Taylor Baily and Stephen R. Heidt. Darwin Magazine, November 2003.
[2] "Total Cost of Ownership (TCO) of IT." Making every IT dollar count. Nash Networks, Inc. 2009.
<http://www.nashnetworks.ca/total-cost-of-ownership-tco-of-it.htm>
[3] Gartner (February 2008) http://www.gartner.com/it/page.jsp?id=636308>

OMB Circular A-131, *Value Engineering*, is available at: http://www.whitehouse.gov/omb/circulars_a131.

CONTACT INFORMATION

If you have questions related to this resource or need other assistance with the Federal Electronics Challenge, please contact your Regional Champion: http://www2.epa.gov/fec/technical-assistance.

Visit the FEC online: http://www2.epa.gov/fec/

E-mail the FEC: fec@epa.gov