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Using Gartner's TCIO Model to Optimize Costs, 2016

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Requiring only six readily available data inputs, Gartner's total cost of infrastructure and operations model helps I&O leaders optimize costs, develop business cases and make key budget decisions.

Key Challenges

- Properly allocating a typically overly constrained IT budget is a major challenge, and since infrastructure and operations (I&O) costs typically comprise over half of that budget, it's essential to gain a thorough understanding of these costs.
- Understanding I&O costs is difficult because of the volume, detail and complexity of the costing data. Also, the data usually comes from multiple, often inconsistent sources.
- These complexities require that a structured estimation model be created to understand and analyze component costs.
- No I&O environment is "average," so understanding where you are and where you want to be in relation to your peers is critical.

Recommendations

I&O leaders should:

- Estimate your I&O costs by using Gartner's total cost of infrastructure and operations (TCIO) model.
- Adjust your TCIO estimate by refining assumptions and parameters to fit your particular situation.
- Use the TCIO model to identify cost optimization opportunities, support development of the I&O budget and build investment business cases.

Introduction

In this research, we show how to estimate your TCIO, illustrate the calculations with an example and discuss how you can best apply TCIO (see Figure 1 and Note 1). This is an update of "How to Quickly Estimate I&O Costs, 2015." That research used Gartner's 2015 IT Key Metrics Data (ITKMD); this version uses 2016 ITKMD. (For more on ITKMD in general, see Note 2.)

Figure 1. Cost Optimization in the Age of Digital Business

Source: Gartner (February 2016)

Analysis

Estimate Your I&O Costs by Using Gartner's TCIO Model

IT leaders need to gain a good understanding and control of I&O costs, because these costs typically comprise more than half of the total IT budget. With hundreds, or even thousands, of I&O assets, it's easy to be overwhelmed by the sheer detail of the costing data. Furthermore, there may be data gaps, and it can be difficult to examine costs on a consistent basis (for example, comparing one-time capitalized costs and ongoing operating costs).

To address these issues, we have devised a simple and straightforward high-level structure and approach to estimate I&O costs, which Gartner refers to as "TCIO" (the total cost of ownership [TCO] of only I&O). Used in conjunction with Gartner's ITBudget tool, TCIO can help you optimize costs (see "IT Cost Optimization Should Be an Ongoing Discipline").

At the highest level, TCIO requires only six readily available data inputs. (Clients should take the approach described herein as a starting point; this approach is part of, and not a replacement for, an IT financial management discipline or initiative.)

Putting I&O Into Financial Perspective

Within ITKMD, Gartner defines I&O as consisting of four "technology domains":

- **Data center:** Enterprise computing and storage owned by IT and located in either small equipment/computer rooms (up to 200 square feet) or larger data centers, including the LAN in data centers, as well as facility-related costs, such as for power and cooling equipment
- **Networking:** Voice and data communications inside buildings and connecting enterprise sites; includes LAN and WAN equipment, as well as telecom services
- **Client computing:** Desktops, laptops, tablets and related devices, including peripherals such as printers
- **Service desk:** Staff, tools and hardware/software associated with the receipt, placement and/or handling of technical support calls or contacts within the enterprise

Each technology domain consists of one or more "platforms" representing readily definable I&O components, such as Windows servers. Each platform has an associated cost metric — for example, in the case of the mainframe, this metric is TCIO/millions of instructions per second (MIPS)/year. Thus, by knowing or estimating the number of MIPS, we can estimate mainframe TCIO. The TCIO methodology uses the ITKMD I&O platform cost models as building blocks.

Costs in each domain include operating expenditure (opex) and capital expenditure (capex). Both direct and all allocated costs are included. Capex and other one-time costs have been amortized over the expected economic life of each platform (for example, a four-year economic life is typical for a Windows server). Hence, TCIO is an annualized cost.

The major components of each domain include hardware, software, staff and facilities/power. In the case of networking costs, a fifth component is added for telecom services — that is, use of the networks of, and related products/services from, providers such as Verizon and BT.

Data Center TCIO

The major IT systems/platforms of the data center are computing, storage and LAN networking. ITKMD provides cost metrics on four major types of computing platform:

- Mainframe
- Windows server
- Linux server
- Unix server

To estimate the total cost of a data center using the TCIO approach (see Table 1), you need the following information:

- Mainframe: MIPS
- Number of Windows servers (installed physical machines or operating instances)
- Number of Linux servers (installed physical machines or operating instances)

- Number of Unix servers (installed physical machines or operating instances)
- Configured terabytes (TBs) of raw storage
- For the data center LAN only: Number of LAN ports

Table 1. Data Center TCIO Platforms

Platform	Unit	2016 Average TCIO/Unit/Year
Mainframe	No. of MIPS (installed)	$3,057
Windows Server	No. of OS instances (installed)	$5,662
Linux Server	No. of OS instances (installed)	$8,454
Unix Server	No. of OS instances (installed)	$27,483
Storage	No. of TBs (raw configured)	$2,009
LAN	No. of ports (active)	$100
From ITKMD, 2016		

Source: Gartner (February 2016)

To estimate data center TCIO, please note the following:

- Server platform TCIO uses the metric, "number of OS instances." To estimate the number of OS instances when only the number of physical machines is known, multiply the number of physical machines by the following average number of OS instances per physical machine from ITKMD:
  - Windows server: 3.7
  - Linux server: 2.9
  - Unix server: 3.8
- Table 1 excludes the facility costs associated with the data center proper — i.e., power and cooling equipment, racks for IT equipment, fire suppression devices, and physical security, such as video monitoring. Table 1 does include the costs associated with personnel occupancy (i.e., office space and systems). To estimate data center facility costs, multiply the estimated TCIO for each platform by the following ITKMD-derived factors:
  - Mainframe: 1.01
  - Windows server: 1.04
  - Linux server: 1.05
  - Unix server 1.03
  - Storage: 1.04

  - Data center LAN: 1.01

  Note: The average data center facility TCIO varies widely and is dependent on area occupied, power consumed, designed uptime and energy usage efficiency. We are in the process of building a more refined facility TCIO cost model for 2017.

- Except for the data center LAN, all other networking costs are included in the networking TCIO (discussed in the following section).

Non-Data-Center TCIO

Using the ITKMD, we have developed simple cost estimate models for all I&O platforms external to the data center (see Table 2):

- Data networks (excluding data center LAN)
- Voice networks
- Client computing
- Service desk

Table 2. Non-Data-Center TCIO

Platform	Unit	2016 Average TCIO/Unit/Year
Data Network	No. of employees	$780
Voice Network	No. of employees	$622
Client Computing	No. of end-user devices	$1,015
Service Desk	No. of agent-handled contacts	$19.07
From ITKMD, 2016		

Source: Gartner (February 2016)

To estimate TCIO for all platforms external to the data center, please note the following:

- With the ITKMD, we developed per-user costs for each of these platforms. In most cases, "number of users" equals "number of employees." However, for situations in which certain employees (such as factory shift workers) make no or only minimal use of I&O assets, we recommend multiplying the number of employees by a suitable factor to adjust the number of employees to those that use I&O assets heavily in the performance of their jobs. Alternatively, as can be seen in the various ITKMD metrics, each platform has a per-unit metric (for example, number of ports for LANs). For simplicity, we have converted the per-platform metrics to a per-employee metric.

- If the number of client-computing devices per end user is not known, multiply the number of end users by an estimated factor. Use 1.3 as the factor in lieu of any available enterprise data.
- If the number of agent-handled contacts is not known, you can estimate it by assuming each user makes, on average, 13.9 agent-handled contacts per year (again, in lieu of any available enterprise data).

Putting It All Together: An Example

For the data center costs, we use the following example:

- Servers: 500 (in this example, Windows servers comprise 100% of enterprise computing; that is, there are no mainframes, or Linux or Unix servers).
- Storage: 3,000 TB
- Data center LAN: 16,000 ports

Note: We constructed this example based on several clients' actual data centers of a moderate size (approximately 2,500 square feet).

For this example, the data center TCIO is calculated in Table 3.

Table 3. Data Center TCIO: Example

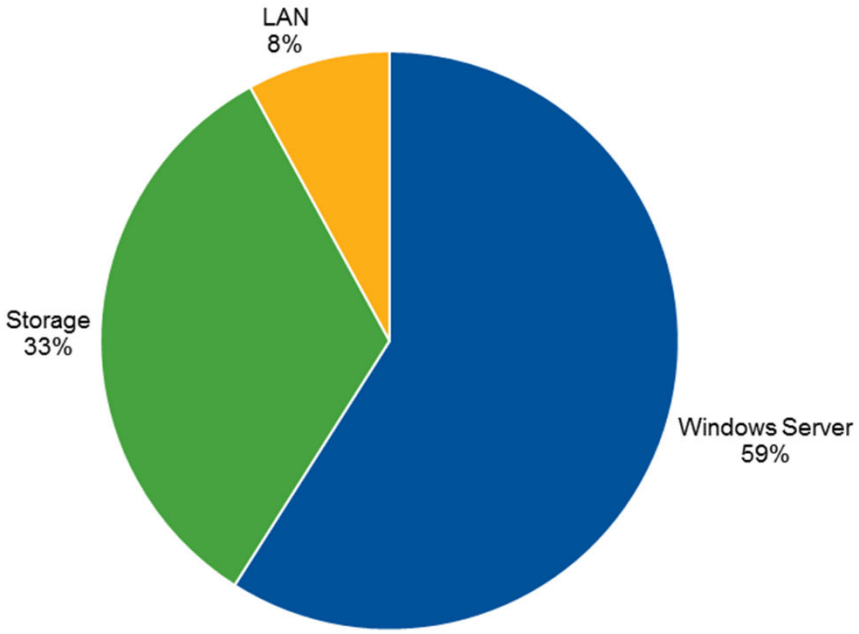
Platform	Unit	Average TCIO/ Unit/Year	Number of Units	Platform TCIO/Year (No. of Units x TCIO/ Unit/Year)
Windows Server	No. of physical machines (installed)	$21,787	500	$10,893,500
Storage	Configured TBs (raw)	$2,089	3,000	$6,147,000
LAN	No. of ports (active)	$101	16,000	$1,616,000
			Total Data Center TCIO/Year:	**$18,656,500**

Notes:
TCIO per physical machine/year = (Average TCIO/year/OS instance) x (Average no. of OS instances/physical machine) x (facility factor). For our example: TCIO per physical machine/year = ($5,662 x 3.7) x 1.04 = $21,787.

Source: Gartner (February 2016)

Figure 2 shows the distribution of TCIO costs for our example.

Figure 2. Data Center TCIO Distribution



Source: Gartner (February 2016)

Table 4 provides the non-data-center TCIO.

Table 4. Non-Data-Center TCIO: Example

Platform	Unit	Average TCIO/End User/Year	Number of End Users (Employees)	Platform TCIO/Year (No. of End Users x TCIO/End User)
Networking	No. of end users	$1,402	8,000	$11,216,000
Client Computing	No. of end users	$1,320	8,000	$10,560,000
Service Desk	No. of end users	$265	8,000	$2,120,000
			Total Non-Data-Center TCIO/Year:	**$23,896,000**

Notes:
No. of employees = No. of end users = 8,000 (At $250,000 revenue/employee, the enterprise in the example would have revenue of about $2 billion.)
Networking TCIO per end user = Data Networking + Voice Networking = $780 + $622 = $1,492
Data Networking = LAN (external to data center) + Data WAN; Voice Networking = + Voice Technology Voice WAN
Client computing TCO per end user = Client Computing/Device x no. of devices/end user = $1,015 x 1.3 = $1,320
Service desk per end-user TCIO = $19.07/agent-handled contact x 13.9 contacts/end user = $265/end user

Source: Gartner (February 2016)

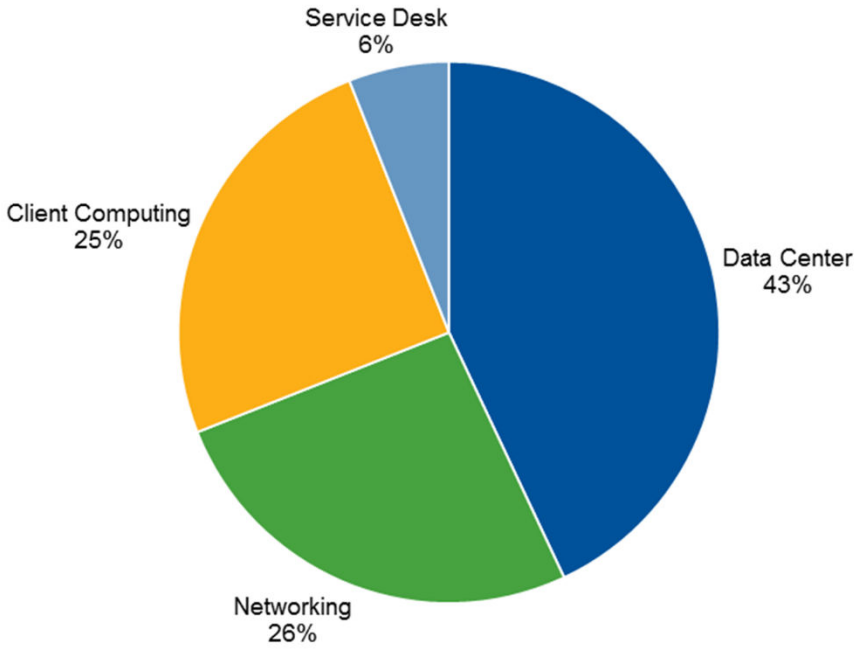
The overall TCIO/year for our example is simply the addition of the data center TCIO/year and the non-data-center TCIO/year:

- Total data center TCIO/year: $18,656,500
- Total non-data-center TCIO/year: $23,896,000
- **Overall TCIO/year: $42,950,500**

The data center represents about 43% of the total TCIO, with the remaining 57% composed of networking (26% of TCIO), client computing (25%) and service desk (6%).

Figure 3 shows the cost distribution across the four domains: data center, networking, client computing and service desk.

Figure 3. TCIO Distribution by Technology Domain



Source: Gartner (February 2016)

Adjust Your TCIO Estimate by Refining Assumptions and Parameters to Fit Your Particular Situation

Your costs will vary. In our economic analysis thus far, we have used average costs from ITKMD for the key I&O platforms/systems. However, in reality, no I&O environment is average.

As shown in Table 5, in ITKMD, the data quartiles create a fairly large range relative to the averages. The table shows the average ITKMD for each platform/system and the percentage differences relative to the average represented by the upper and lower quartiles. Note that the percentage differences are not symmetric. On average, costs are about 25% higher for those in the upper

quartile; average costs are about 40% lower for the lower quartile. These results indicate that, for most enterprises, there remains a significant opportunity to reduce costs. For example, going from average to half-way to the lower quartile can mean a reduction by about 20%.

Table 5. TCIO by Platform: Average and Upper/Lower Quartiles

Platform	Unit	2016 Average TCIO/Unit/Year	Upper Quartile (Percentage Above Average)	Lower Quartile (Percentage Below Average)
Mainframe	No. of MIPS (installed)	$3,057	13%	41%
Windows Server	No. of OS instances (installed)	$5,662	20%	29%
Linux Server	No. of OS instances (installed)	$8,454	30%	41%
Unix Server	No. of OS instances (installed)	$27,483	35%	42%
Storage	No. of TBs (raw configured)	$2,009	19%	35%
LAN	No. of ports (active)	$100	30%	35%
Data Network	No. of employees	$780	15%	62%
Voice Network	No. of employees	$622	13%	68%
Client Computing	No. of end-user devices	$1,015	18%	24%
Service Desk	No. of agent-handled contacts	$19.07	212	46%

Notes: Both data network and voice network are composed of separate ITKMD components. Using the component ITKMD reports will likely yield a more refined TCIO estimate.
For Linux and Windows x86 servers, consider factoring in that certain clients with 70% or more of their workloads virtualized may want to use a pricing factor lower than that of the lower quartile; in such cases, 50% may be appropriate. That is, for highly virtualized Windows x86 and Linux environments, assume that the TCIO per OS instance is about one-half that of the average TCIO amounts shown in this table.

Source: Gartner (February 2016)

Use the quartile data to modify your initial TCIO estimates, which were based on the averages. For example, if you feel you have done a particularly good job of optimizing server costs (or perhaps have just completed a major upgrade project), you may want to assume that your costs are nearer the lower-quartile level than the average value. Additionally, smaller environments tend to have higher I&O platform costs.

However, whatever you assume, remember that this estimation methodology is meant as a starting point, not an endpoint. Refine your estimates with actual data where you can. If you follow the ITKMD structure, you can compare your actual costs to the ITKMD as a baseline. (Gartner Benchmark Analytics offers various levels of custom benchmarking that go beyond what ITKMD can provide.)

You may also need to restate the I&O budget, so that the costs are relatively close to an "apples to apples" comparison. For example, you may have separate opex and capex budgets; by amortizing capex in your I&O budget, you can then directly compare the TCIO estimate to your (restated) I&O budget.

In summary, a key best practice in our approach is to go beyond using ITKMD averages by making refinements using related ITKMD data, such as upper- and lower-quartile values. We encourage you to document key assumptions and the rationale behind those assumptions.

Use TCIO to Identify Cost Optimization Opportunities, Support Development of the I&O Budget and Build Investment Business Cases

There are three major applications of TCIO:

- Identifying cost optimization opportunities
- Supporting the development of the I&O budget
- Building investment business cases

Identifying Cost Optimization Opportunities

Take the following steps:

- Focus on those I&O platforms in which your costs per unit are higher than the TCIO average cost.
- Use total expenditures in those platforms to prioritize cost optimization projects.
- Assess the relative sizes of various I&O costs, such as voice versus data networking.
- Use TCIO to ascertain where to cut when faced with budgetary constraints, rather than making risky across-the-board cuts.
- Benchmark your I&O budget by comparing actual costs (if available) with TCIO estimates.

Supporting the Development of the I&O Budget

Take the following steps:

- In conjunction with Gartner's ITBudget tool, use TCIO to get an initial handle on your I&O expenditures before detailed budget line data is available.
- Structure your I&O budget to make it suitable for presentation to CxOs.

- Adopt the TCIO structure (and ITKMD definitions/assumptions) to build a more detailed I&O chart of accounts, because the finance department's chart of accounts is usually too coarse to assess I&O costs.

Building Investment Business Cases

Take the following steps:

- Use TCIO to estimate the financial benefits of specific investments.
- Use TCIO to decide among various investment options.

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"IT Key Metrics Data 2016: Executive Summary"

"IT Key Metrics Data 2016: Index of Published Documents and Metrics"

"Use Benchmarking to Identify IT Cost Optimization Opportunities"

"Five Principles Underpin IT Cost Optimization Success"

"IT Cost Optimization Should Be an Ongoing Discipline"

Note 1 Cost Optimization in the Age of Digital Business

Cost optimization in the age of digital business means organizations must use a mix of IT and business cost optimization for increased business performance, while preparing for digital futures.

Note 2 IT Key Metrics Data

ITKMD is part of the Gartner Benchmark Analytics range of solutions, and offers macrolevel and platform-level looks at Gartner's global database of comprehensive cost and performance measures. The annually published ITKMD reports contain relevant database averages and other statistics from a subset of metrics and prescriptive engagements available through Gartner Benchmark Analytics. ITKMD consists of more than 2,000 IT cost and performance statistics. In 2015, Gartner collected ITKMD from over 2,000 enterprises worldwide. The data collected through 2015 formed the basis of the 2016 ITKMD series of reports.

ITKMD provides immediate access to authoritative data on IT staffing and investment levels, as well as key technology cost and performance metrics. ITKMD is multilevel: from macrostatistics (such as IT expenditures/employee) to platform-level statistics (e.g., mainframe cost/MIPS).These metrics support improved budget and investment decisions with regard to the changing environments of business and IT. ITKMD is collected year-round through direct fact finding in our benchmarking and

consulting engagements, and through surveys of the Gartner community and at Gartner events, in addition to surveys of non-Gartner-based communities.

More on This Topic

This is part of an in-depth collection of research. See the collection:

- Cost Optimization in the Age of Digital Business

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