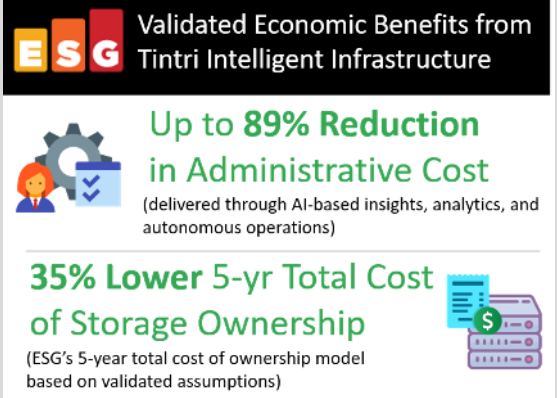ESG Economic Validation

The Economic Benefit of Autonomous Storage Operations with Tintri's Intelligent Infrastructure

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Executive Summary

Digital business demands are accelerating, and IT complexity is rising in response. Organizations face an increasing number of systems which require real-time and continuous optimization that relies on human intervention. Skilled infrastructure personnel are in high demand and becoming scarce. IT infrastructure must, therefore, become more intelligent and provide enough self-optimizing capabilities to meet increased demands and free up personnel. Intelligent infrastructure is designed to replace people-driven activities, which can be extensive, time-consuming, costly, risky, and reliant on tribal knowledge with intelligent data-driven technologies that are validated, proven, integrated, and repeatable. This does not mean that people are replaced. Automation, and, specifically, autonomous AI-driven operations, close the skills gap, reduce operating expenses, and enable IT to focus on delivering agile services and responding to changes on demand.

ESG Validated Economic Benefits from Tintri Intelligent Infrastructure

Up to **89% Reduction** in Administrative Cost
(delivered through AI-based insights, analytics, and autonomous operations)

35% Lower 5-yr Total Cost of Storage Ownership
(ESG's 5-year total cost of ownership model based on validated assumptions)

The fully automated data center is a long-term goal for most IT leaders—and on the infrastructure side, a handful of manufacturers may be closer to the goal post than many people realize. Digital transformation is top of mind, as IT organizations look to optimize technologies and processes to better address the challenges ahead. Much of this demand is being driven by advanced applications and the shift toward systems that can provide more intelligence and automation to deliver tools and capabilities in a way that accelerates business innovation. This is where we find Tintri's workload intelligent storage management infrastructure taking hold and helping thousands of organizations with autonomous capabilities that extend into the software stack for both end-to-end and granular management, real-time optimization, predictive analytics, and automated responses. The ESG analysis found substantial administrative cost savings as **high as 89%** in organizations adopting Tintri. When combined with other qualitative and quantitative factors, the savings resulted in a 35% lower 5-year total cost of storage ownership as modeled in this economic validation study.
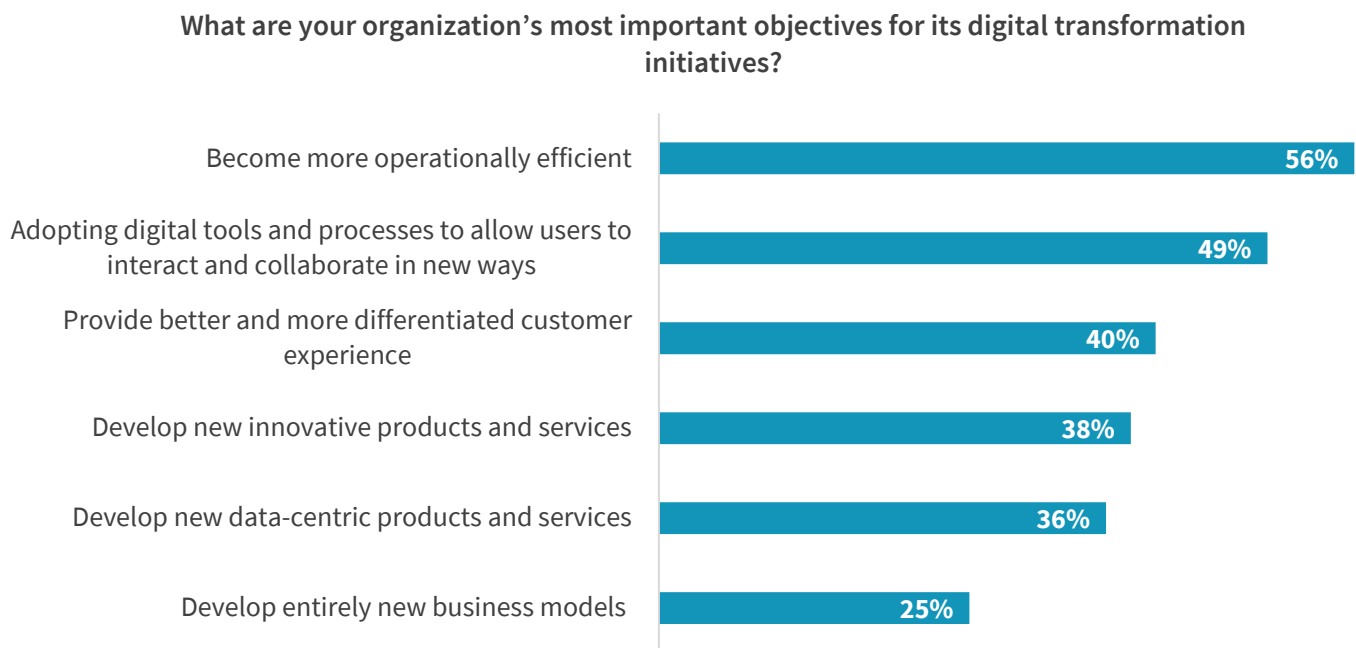
Introduction

This ESG Economic Value Audit focused on the quantitative and qualitative benefits organizations can expect from leveraging Tintri's workload intelligent infrastructure—specifically Tintri VMstore systems—as their optimized solution designed to move an organization toward autonomous operations and services delivery and away from manual processes. ESG created a modeled scenario that considered the operational benefits of deploying Tintri and the expected cost savings over a five-year period.

Challenges

In a recent research survey, as shown in Figure 1, ESG asked organizations what their most important objectives were for their digital transformation initiatives. 56% of respondents selected *becoming more operationally efficient* as one of their most important objectives.[1] For most organizations, becoming more operationally efficient includes leveraging new technology such as AI, orchestration, data intelligence, and automation to improve decision making and drive down operational costs and overall IT spending. In the same ESG study, 49% of all respondents indicated that one of their digital transformation objectives is to adopt digital tools and automated processes, enabling users to interact and collaborate in new ways. As an organization begins to adopt smarter technologies, it drives innovation and frees up IT resources to focus more on business objectives and less on running day-to-day technical routines. Organizations focused transitioning toward automated processes become more operationally efficient, require fewer specialized IT experts, and can replace both the most mundane as well as challenging human-driven manual tasks with machine-learned intelligence that can ultimately lead to full automation.

Figure 1. Operational Efficiency Tops Most Important Objectives for Digital Transformation

What are your organization's most important objectives for its digital transformation initiatives?

Become more operationally efficient	56%
Adopting digital tools and processes to allow users to interact and collaborate in new ways	49%
Provide better and more differentiated customer experience	40%
Develop new innovative products and services	38%
Develop new data-centric products and services	36%
Develop entirely new business models	25%

Source: Enterprise Strategy Group

When ESG asked respondents to describe the state of their IT digital transformation initiatives for 2021, half of the respondents indicated that they were currently implementing and executing on various digital transformation initiatives, but only 22% felt that they had mature systems in place. Another 16% were just beginning and 10% had not yet started any

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[1] Source: ESG Research Report, *2021 Technology Spending Intentions Survey*, January 2021.All ESG research references and charts in this economic validation have been taken from this research report.

initiatives. While organizations may know what they want to achieve, results show that they are still in the early stages of digital transformation and may be looking for the right technology partners to assist them in achieving their goals.

The Solution: Tintri VMstore

Tintri's AI-enabled infrastructure learns about an organization's environment—quickly and thoroughly to simplify and automate storage management. Tintri VMstore systems offer a combination of autonomous operations and intelligent real-time and predictive analytics that delivers continuous workload optimization and maximizes performance so organizations can refocus efforts on high-impact projects and business innovation. Tintri Analytics are key to VMstore's value, helping organizations simplify and accelerate operations and driving precise data-driven business insights for timely decision making. Thousands of Tintri customers save millions of management hours and billions of dollars annually using Intelligent Infrastructure. Key differentiators include:

- **The right level of visibility and control:** VMstore combines broad visibility across the infrastructure stack with granular performance and capacity metrics and visualization. Because there are no LUNs, volumes, or other traditional storage constructs to manage, the system provides immediate insight into latency, IOPs, throughput, and space usage at the managed object level—VM, database, or container level. This granular visibility and insight enable much greater efficiency because users can quickly respond to application needs and don't have to spend an inordinate amount of time locating the source of bottlenecks and other problems. Granular cloning, backup, and restore are also tied to efficient operations. For example, it is faster and less disruptive to restore a single VM than an entire LUN.

- **Self-optimization**: This includes autonomous Quality of Service (**Auto-QoS**), which, among other things, ensures that each application incurs less than 1ms latency and will not experience any performance degradation regardless of system capacity utilization. Auto-QoS and other autonomous operations help VMstore customers avoid time-consuming performance management and costly resource overprovisioning. Because VMstore automatically and continuously adapts to application dynamics and changes to application load or specific user behavior, it also facilitates business agility. Organizations realize considerable enhancements to economic value and productivity because users aren't hobbled by slow performance.

- **Intelligent predictive analytics:** VMstore leverages machine learning and three years of the customer's historical data as a means of reducing capital expenses and the inordinate amount of time spent on cumbersome resource planning. VMstore can accurately predict future capacity and performance requirements up to 18 months in advance and utilizes sophisticated "what-if" analysis and scenarios to calculate the performance and capacity impact of additional applications over time to avoid over- and under-provisioning resources.

- **Empowerment of end-users and IT generalists**: VMstore is so easy to deploy and use that organizations don't need a team of storage experts and associated overhead, training, delays, trouble tickets, etc. Users are empowered by the architectural simplicity, which results in far fewer resources to monitor and manage compared to LUNs and volumes. This lower complexity also means that there are far fewer things that can potentially go wrong. Generalist-friendly administration improves agility and flexible resource management because any IT staff member can manage the storage environment. Developers and DBAs, for example, can easily manage the system and setup or tear down dev/test environments within minutes using zero-impact cloning that doesn't affect production environments.

**Figure 2. Tintri VMstore's Intelligent Infrastructure**
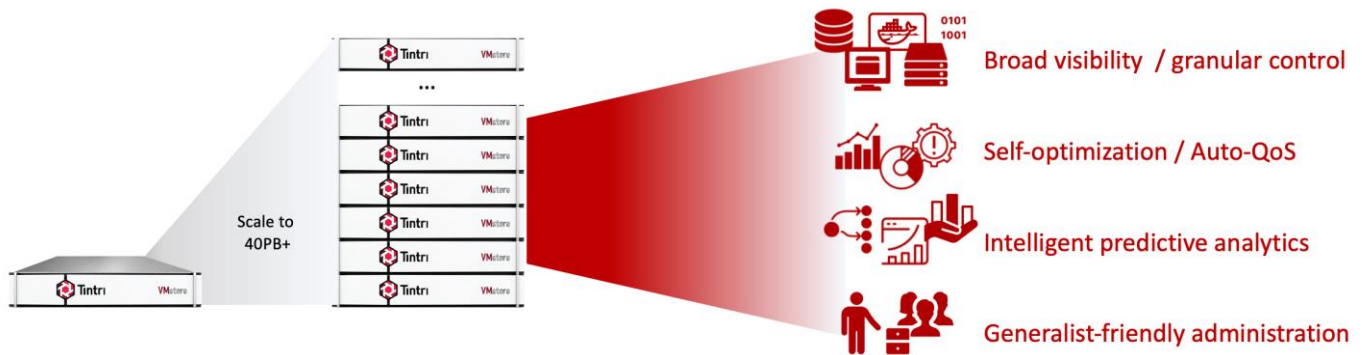
Storage Automation versus Autonomous Storage

The time-consuming tasks that are demanded of a traditional storage administrator include managing the storage environment and infrastructure, supporting application requirements, optimizing performance, protecting data, monitoring and reporting, capacity planning, evaluating features and technologies, and installing new instances. Over the years, many of these tasks have seen improvements in user simplicity (UIs), task automation (scripts and wizards), integration with other components (storage functions initiated through hypervisors or applications), and even added intelligence (guidance and alerts as a result of system analysis). Many storage vendors claim to have various levels of automation and intelligence built into their traditional storage systems but are not at the advanced level of Tintri.

Traditional storage solution vendors have attempted to build various types of intelligence and automation into their systems across multiple categories, starting with simplifying planned actions (through increased insight), simplifying the day-to-day operations (through assisted optimization), and, finally, attempting to simplify unplanned actions (through problem prediction and avoidance). Each of these sets of tasks becomes increasingly complex and difficult to deliver in an autonomous manner (especially as the environment grows and resources are added), and the limitations of traditional storage system code compatibility and infrastructure often prevent these capabilities from being effectively implemented.

Much like the automobile industry, which has incorporated features and systems to aid the driver, with the eventual goal of realizing a truly autonomous self-driving car, the storage industry similarly strives for fully autonomous storage systems that can be operated without a dedicated administrator. Autonomous storage removes siloed workflow bottlenecks (between storage admins, virtualization admins, DBAs, etc.) and empowers IT generalists to streamline delivery of services to the business. While no storage vendor is fully autonomous yet, Tintri has been leading this effort and working toward this goal for years, focusing on purpose-built Intelligent Infrastructure that avoids the limitations of traditional architecture and provides what are widely considered the highest levels of storage autonomy available in the market today.

Figure 3. Tintri Is on the Path to Deliver Fully Autonomous Storage
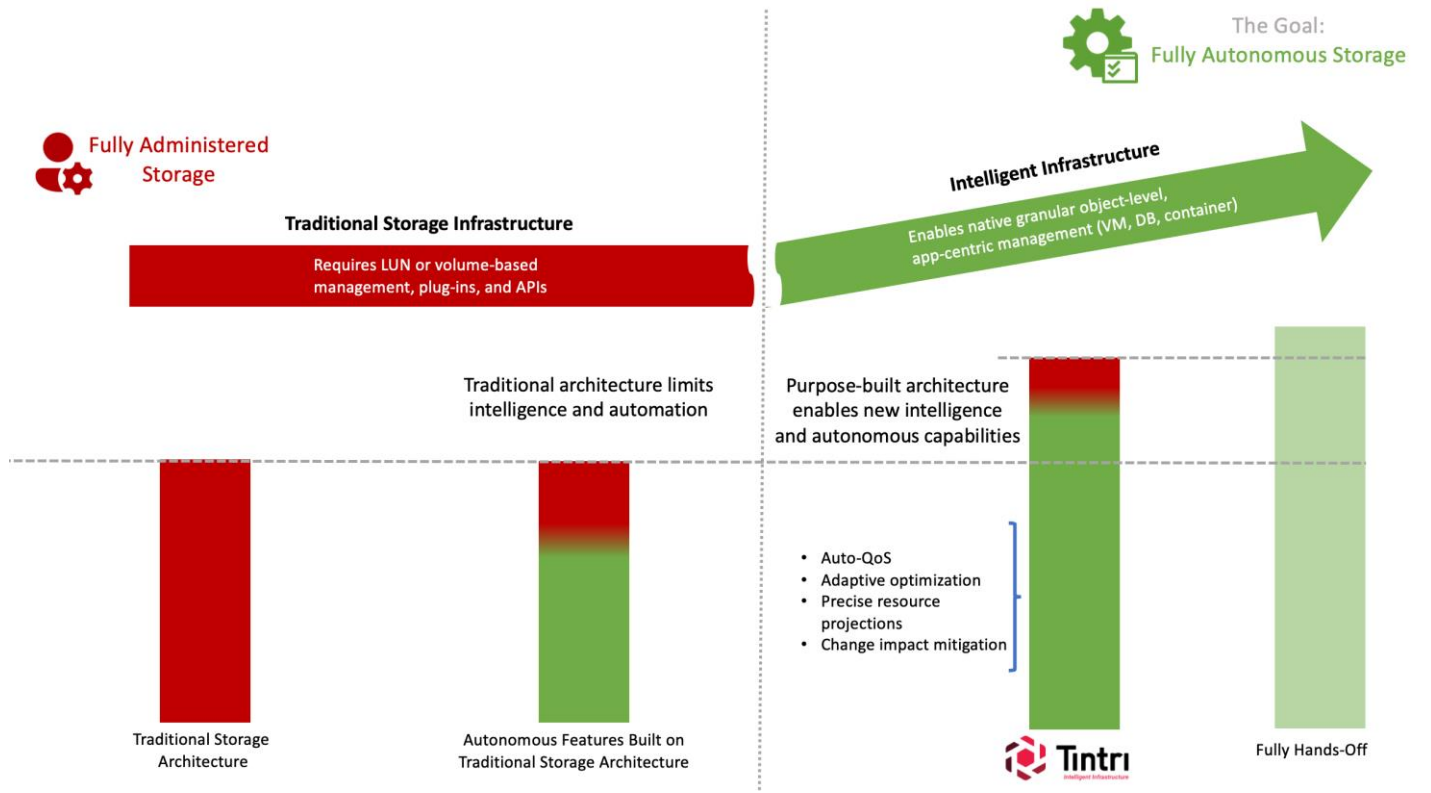
Source: Enterprise Strategy Group

ESG Economic Validation

ESG has completed a quantitative and qualitative economic analysis of Tintri's intelligent infrastructure. Focus was placed on the operational efficiencies and economic benefits organizations can expect when leveraging Tintri VMstore compared with traditional storage architectures and solutions.

Tintri VMstore Economic Overview

ESG's Economic Validation process is a proven method for understanding, validating, quantifying, and modeling the economic value propositions of a product or solution. The process leverages ESG's core competencies in market and industry analysis, forward-looking research, and technical/economic validation. ESG performed technical validation, reviewed vendor case studies/economic models, and conducted in-depth interviews with end-users to better understand and quantify the impact of Tintri's technology on their organizations, particularly in comparison with previously deployed alternative solutions. The findings were used as the basis for an economic model comparing the expected costs of operations with standard infrastructure to the costs after deploying Tintri VMstore.

With Tintri, organizations are set on a path to automate nearly all their storage-related tasks and create an environment where storage systems can respond more intelligently to the changing demands of modern applications and businesses. As organizations moved toward autonomous storage with Tintri, they found strong benefits in these three core areas:

- **Autonomous Administration** – Slashes operating costs and empowers IT generalists to deliver premium storage services for the modern organization. Autonomous operations reduce the skills gap while enabling operational freedom for end-users, IT generalists, and existing storage administrators.

- **Faster Time to Value** – Improves operating efficiencies, which accelerates time to value and delivers high infrastructure ROI at scale for enterprise workloads.

- **Enhanced User Experience** – Each stakeholder gains an elevated experience from benefits that meet persona-specific requirements, greatly improving satisfaction for end-users, freedom for IT admins, agility for IT managers, and predictability executives.

Reduced Operational Expense Through Autonomous Administration

Customers reported that their Tintri VMstore storage systems were significantly simpler to deploy, operate, manage, and maintain, helping to reduce storage-related operational expense by at least 66%. Tintri's AI-driven workload intelligent infrastructure autonomously performs up to 95% of traditional storage configuration, optimization, troubleshooting, maintenance, and tuning tasks, removing the burden from experienced storage administrators and enabling IT generalists to effectively operate and deliver enhanced storage services across the organization. More importantly, Tintri maintained autonomous Quality of Service for all applications and managed objects (VMs, databases, containers), enforced persistent self-healing policies to ensure data protection, and implemented and propagated policies for snapshots, replication, and QoS with limited human intervention. The positive impact of these unique, autonomous operations led many customers to experience a "lightbulb moment" when realizing how inefficiently they had been operating based on historical workflows.

"Tintri gives us current and historical intelligence into performance of compute, network, and hypervisor layers that lets us not only predict our storage needs but the needs of our entire solution – I don't know any other solution that can do that."

"We just let the algorithms do their thing and there is never any need to second guess the intelligence – it just works and keeps things performing beautifully."

In addition to saving operating *effort* by eliminating storage-related administrative tasks, Tintri VMstore also provides operational workload *intelligence* to enable faster and more informed decisions beyond the storage system (compute, network, and storage) and for all managed object data sets (VM, DB, DB file, or container). Users gain visibility, insight, and detailed metrics across the infrastructure to speed root cause analysis for bottlenecks, identify object behavioral outliers and anomalies, and proactively resolve hotspots and issues before users can be affected—and often before they are even aware of any problem.

Faster Time to Value to Enable Modern Businesses Agility and Maximize ROI

Modern businesses place great burden on the IT organization to provide agile cloud-like services to support and scale application demands that are constantly changing. Lack of coordinated visibility into storage, compute, and network layers with isolated management of virtual machines and databases limits business agility, making it difficult to provision, tune, or scale to meet changing demands. Tintri VMstore can be deployed, provisioned, scaled, protected, and recovered in a fraction of the time required by traditional systems, resulting in accelerated development cycles, faster time to value for application services, and reduced infrastructure risk.

"We are no longer micromanaging the replication and snapshot process. We are now able to take the entire environment, instead of piecing it together and trying to fit it into proper maintenance windows, and run it 24x7 without impacting our end customers."

ESG also validated that Tintri's workload intelligent infrastructure can help reduce CapEx by avoiding the cost of overprovisioned resources and optimizing capacity for snaps, clones, and replicated data. Tintri also provides consistent support and maintenance costs over five years, eliminating the sharp increase in years 4 and 5 charged by most storage vendors. These savings, coupled with the substantial efficiencies provided via autonomous operations, result in a quick and substantively better return on investment (ROI).

Enhanced User Experience to Accelerate Efficiency, Productivity, and Innovation

Tintri VMstore represents more than time and monetary savings to the organization. It's about an experience that makes life easier and better for all stakeholders. Autonomous storage is about streamlining operational workflows; providing seamless visibility and operations between technologies and objects under management; and enabling end-users, IT staff, and executives to achieve greater things. ESG validated that Tintri provided the following experiences for users of their technology:

- **The Right Visibility, Control, and Outcomes for All** – Tintri VMstore provides visibility and actionable insights for multiple personas from a single screen and allows for granular control, telemetry, and management from an application, VM, DB, or container level that is not possible through legacy storage-centric architectures, constructs, or administration.

- **Satisfaction for End-users** – Application admins, developers, engineers, and data scientists benefit from self-service capabilities, predictable and guaranteed performance, and sub-millisecond latency enabled by autonomous workload isolation and auto-QoS.

> *"We just have so much more visibility into the solution with Tintri – we can drill down by network, file system, disk, and can track down wherever there is a problem in minutes where it used to take us hours across multiple tools and interfaces and a series of support calls."*

- **Freedom for IT Administrators** –Autonomous operations, supported with intelligence and intuitive actions, empower IT generalists, virtualization admins, DBAs, and developers to be more productive, responsive, and capable across the entire technology stack without the need for additional training or storage expertise. IT staff are able to complete tasks more efficiently without introducing workflow delays that require involvement of additional team members.

- **Agility for the IT Manager** – IT managers and directors are able to achieve their goals in a more agile manner by getting more from their junior administrators and less-experienced staff and enabling more flexibility around storage management staffing. Managers can gain greater insight into the impact of all production and test/dev behaviors on storage usage and reduce the number of helpdesk tickets substantially, while experienced staff members work on higher value and forward-looking projects. Tintri VMstore sets up managers to get more out of their limited resources and focus on proactive rather than reactive management.

- **Predictability for the IT Executive** – The detailed telemetry data and predictive analytics provided by VMstore enable IT executives to understand and predict system resources from a longer-term and more holistic application- or workload-centric point of view rather than simply from a storage-centric view. Executives can trust the Tintri machine learning models to accurately predict resource needs up to 18 months in advance. In addition to capacity requirements, they can proactively predict performance requirements and optimize resources, avoiding overprovisioning costs and improving efficiencies to get the most out of IT assets and personnel. This

makes it far easier for the executive to achieve planning, budgeting, service level goals, and positive outcomes for the business.

ESG Analysis

Taking what we learned from our validation, ESG created a matrix that identifies a number of important storage attributes and application-enabling functions (tasks) and evaluates how easily and autonomously they can be performed across different categories of storage technologies. Figure 4 summarizes our analysis in a graphical manner. As shown by the columns, going from left to right, the more sophisticated the technology the less effort is required:

- Traditional or legacy storage systems that require tasks to be planned and performed manually.

- Traditional storage systems that can automate tasks.

- Intelligent storage infrastructure, which leverages autonomous operations, machine learning, and artificial intelligence.

- A forward-looking category where all tasks are performed by storage in an autonomous fashion.

While no storage system on the market today is fully autonomous, Tintri VMstore provides a higher level of autonomous operations than those that are limited by traditional storage architectures. Figure 4 summarizes our analysis in a graphical manner.

Figure 4. Characterizing Manual Versus Autonomous Functionality across Storage Functions
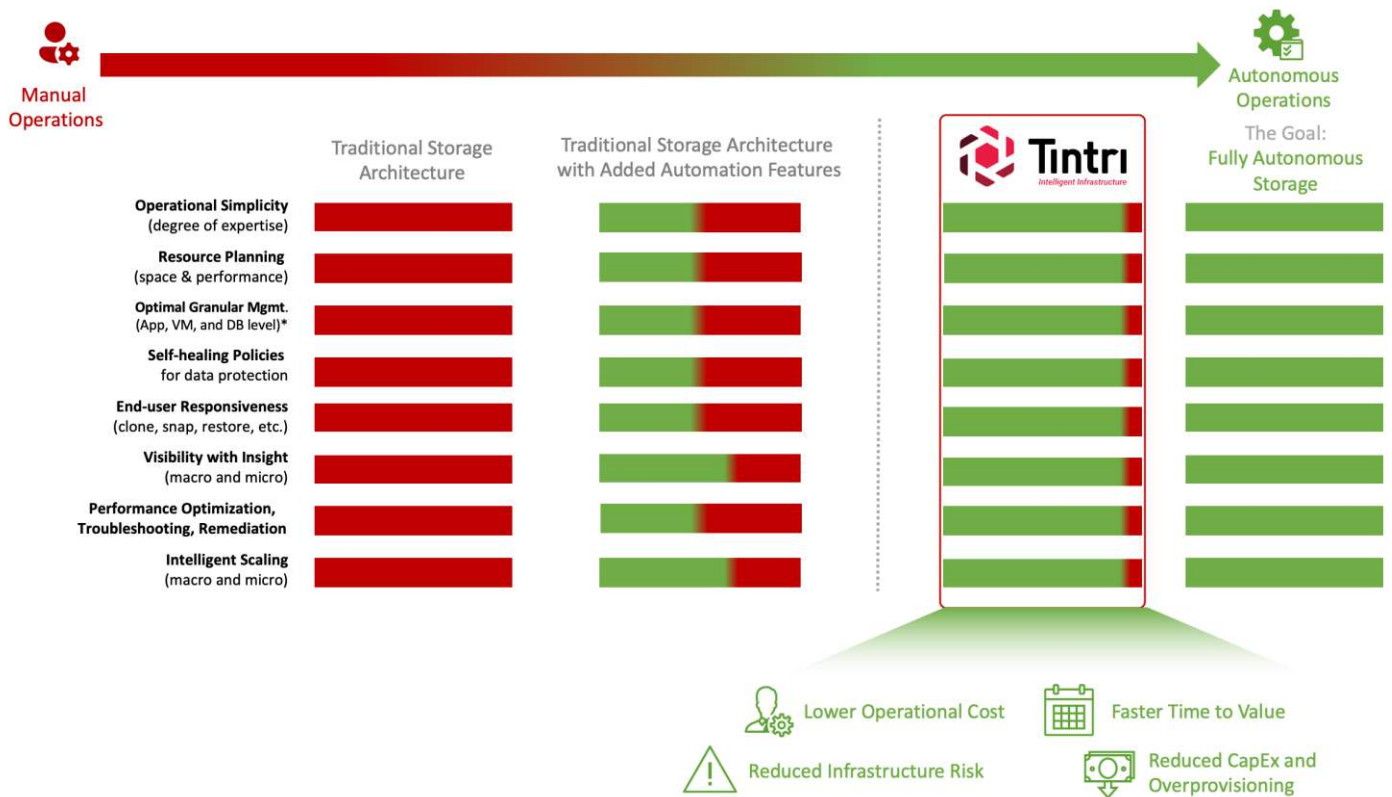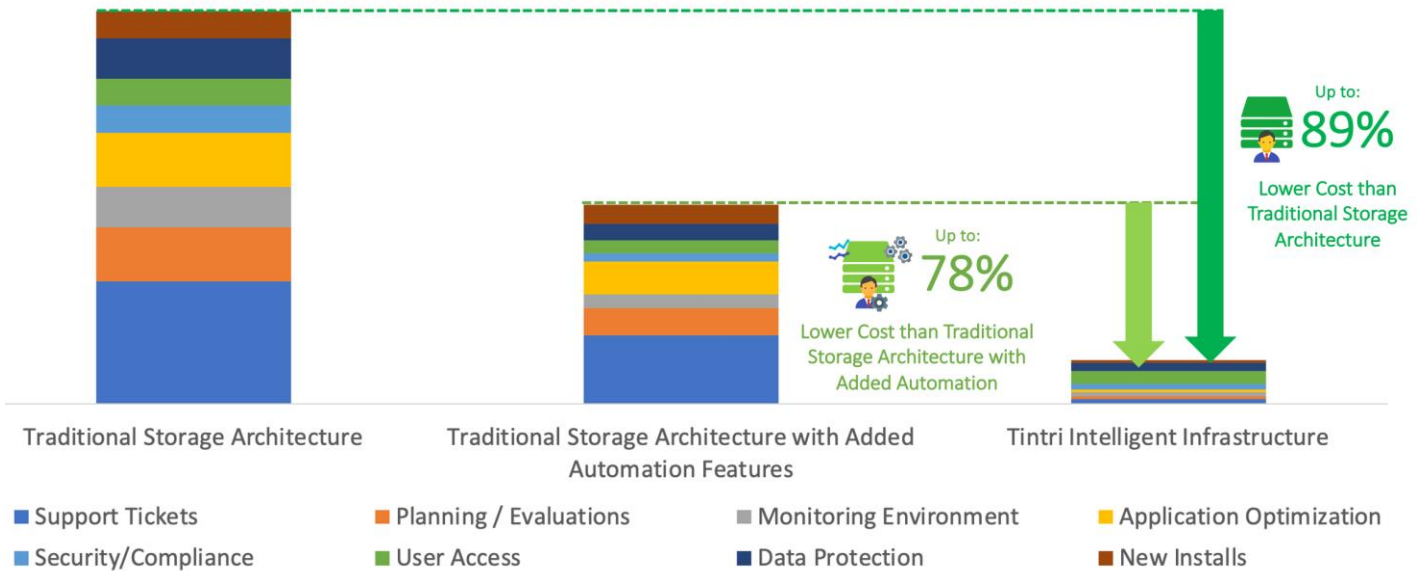

Source: Enterprise Strategy Group

ESG's 5-Year Modeled Scenario

ESG leveraged the information collected through vendor-provided material, public and industry knowledge of economics and technologies, and the results of technical and economic validation to create a five-year storage cost of administration and TCO/ROI model. The model compares the costs and benefits of supporting VMs, databases, and applications with Tintri VMstore to both a traditional manually administered storage array and a storage array with autonomous features built on a traditional storage architecture (storage systems that require management of LUNs, RAID groups, volumes, and other hierarchical storage objects).

ESG assumed the organization currently has two full-time administrators managing services on a traditional storage system with 1PB of effective storage capacity. We then created a detailed storage administration model that considered the time required to manage typical storage-related functions over a five-year period. ESG then used the validated analysis summarized in Figure 4 to estimate and model the expected reduction in person-hours for each management. These calculations were based on the value of built-in intelligence, automation, and autonomous functions that could be expected from a leading traditional storage array with autonomous features built in and then with Tintri Intelligent Infrastructure. The results (shown in Figure 5) predict that Tintri VMstore can provide up to 89% lower cost of storage administration when compared with a traditional storage array. While autonomous features built on top of the traditional storage array provided significant administrative savings, the advanced autonomous features enabled by, and built into, Tintri's Intelligent Infrastructure would still be expected to provide up to 78% lower cost of administration.

Figure 5. Five-year Modeled Cost to Administer 1PB of Storage for VMs, Databases, and Applications

Source: Enterprise Strategy Group

Next, ESG's models estimated the expected total cost of ownership (TCO) over this 5-year period for the three storage arrays (assuming parity at a $/usable GB). ESG found that in addition to the administrative savings, Tintri VMstore can provide CapEx savings by avoiding the need to overprovision unused capacity (best practices for many traditional storage solutions suggest purchasing extra capacity to provide space for data services, garbage collection, and optimal performance while Tintri customers report running at 97% capacity with no performance degradation) and also by providing predictable, economical support and maintenance over a 5-year period. In contrast, many traditional storage vendors substantially increase the cost of support and maintenance contracts after the initial 3-year coverage period expires. ESG's models predicted that Tintri can reduce the expected 5-year total cost of ownership by over a third when compared to traditional storage solutions (results shown in Figure 6).

Figure 6. Results of ESG's Modeled 5-year TCO Analysis
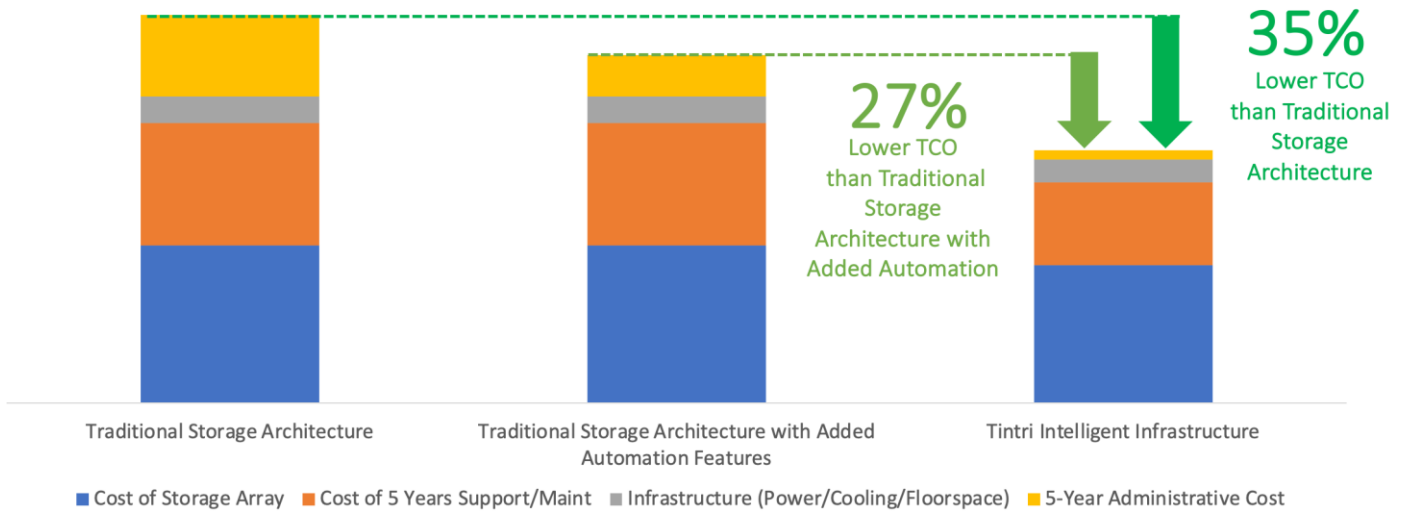
Source: Enterprise Strategy Group

The Bigger Truth

Simply keeping pace with digital business initiatives is no longer good enough. If a business wishes to succeed, IT must play a larger role in accelerating operations. The dilemma is that, as digital initiatives proliferate, IT complexity also increases. Siloed management functions, performed manually across technologies and applications is inefficient, result in increased risk, decrease quality of service, and inhibit business growth. In addition, purchasing and managing traditional storage architectures is no longer cost-effective. Hiring technical talent to support infrastructure growth and complexity has become more difficult, resulting in problematic skill shortages, and the inability to deliver on storage SLAs can result in shadow IT projects or increased cloud storage spending. This results in overspending from a capital operational perspective and limits time to value, which often directly keeps organizations from capitalizing on time-dependent revenue opportunities.

Relying solely on increasing budgets and head count does not solve the core problem. Infrastructure must become "smarter," capable of reducing and automating manual tasks, more aware of the systems and applications that it interacts with, and able to make intelligent decisions based on both holistic and precise insight and analysis. This is the promise of intelligent infrastructure. It can automatically adapt to better serve the specific needs of any business application by using its knowledge about the state of the infrastructure, environment, users, applications, and data to autonomously take appropriate actions without human intervention.

Organizations are looking for data management solutions that are easy to use and highly scalable with predictable high performance. These solutions need to be easily deployed and deliver faster insight while maximizing the value of complex, distributed data. The evolution toward intelligent infrastructure and autonomous storage systems is well on its way and organizations need to consider the trends in automation, AI, robotics, IoT, containers and more as they go through digital transformations. The data center and IT infrastructure in coming years will be transformed to meet the requirements of enabled applications and devices, with far less reliance on human intervention. This changes how we deploy, manage, monitor, troubleshoot, and adjust systems.

ESG's analysis of Tintri's workload intelligent infrastructure revealed a fundamental shift in the way IT operates by using storage to accelerate development cycles, simplify management, and predict every need as organizations scale workloads. We were able to see administrative cost reductions of up to 89%. AI-driven automation, combined with granular visibility

and intelligent insight, frees staff resources, enabling staff to focus on strategic initiatives and support cloud-like levels of storage agility, scalability, and predictability—but with greater performance, control, and cost-efficiency. ESG has also identified industry trends that point toward a much more autonomous, hyper-enabled world in the coming years, with investments by IT organizations becoming heavily weighted toward leveraging more intelligence across the organization.

If your business applications can benefit from an intelligent storage management solution that delivers cloud-like agility through autonomous operations and intelligence, ESG recommends you consider Tintri.

Enterprise Strategy Group is an IT analyst, research, validation, and strategy firm that provides market intelligence and actionable insight to the global IT community.